



Stormwater Management Report and Servicing Brief

Apartment Building
770-774 Bronson Ave
Ottawa, Ontario

Prepared for:

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1 INTRODUCTION AND SITE DESCRIPTION

LRL Associates Ltd. was retained by Katasa Group to complete a Stormwater Management Analysis and Servicing Brief for the ultimate development of a mixed-use residential high rise, which will consist of a 22-storey tower and a 9-storey tower. The site is located at 770-774 Bronson Avenue and 557 Cambridge Street South.

The subject property consists of three (3) lots that are legally described as Lots 3, 4, 37 and part of lots 1, 2, 38, in registered plan 28. The subject lots are designated Arterial Mainstreet in the City of Ottawa and are zoned AM10[2373] and AM1[2003] S296 (Arterial Mainstreet Subzone 1, Exception 2006, Schedule 296).

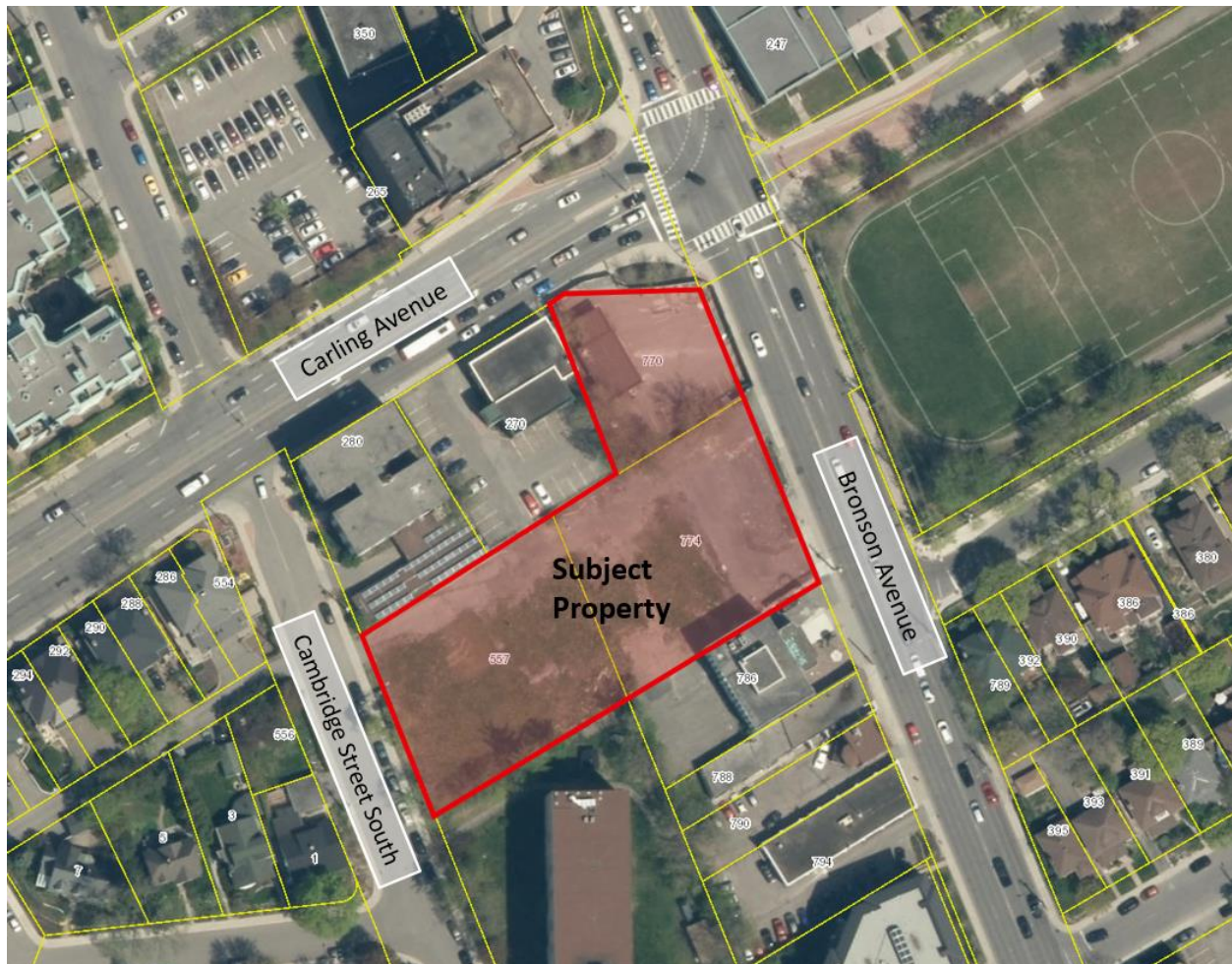


Figure 1: Aerial View of Proposed Development

The subject property, as a whole, has approximately 64 m frontage along Bronson Avenue, 32 m frontage along Carling Avenue, and 40 m frontage along Cambridge Street South. The total site area is approximately **0.456 ha**.

The proposed development will be constructed in 2 phases. Phase 1 includes a 22-storey mixed-use residential building and Phase 2 includes a 9-storey residential building, consisting altogether of a total of **224** units, **71** units of which are dedicated to student housing. The 22-storey building



in Phase 1 includes **71** student units, **117** residential units and **1097m²** of amenity space. There is also a proposed café located on the main level of this building with an area of approximately 105m². The 9-storey building in Phase 2 includes **90** residential units and **457m²** of amenity space. Both buildings will share a 2-level underground parking garage. The two (2) levels of underground parking extend below the majority of the site. It is proposed that the entirety of the underground parking will be constructed during Phase 1 of the project and the 9-storey building will be constructed in Phase 2. Refer to the **Site Plan** included in **Appendix F** for more details.

This report has been prepared in consideration of the terms and conditions noted above and with the civil drawings prepared for the new development. Should there be any changes in the design features, which may relate to the stormwater considerations, LRL Associates Ltd. should be advised to review the report recommendations.

2 EXISTING SITE AND DRAINAGE DESCRIPTION

The subject site measures **0.456 ha** and currently consists of a 1-storey commercial automobile building with paving and gravel covering the majority of the site. Elevations of existing site range between 73.59 m at southwest corner to 76.10 m at the northwest corner of the site.

Sewer and watermain mapping, along with as-built information collected from the City of Ottawa indicate the following existing infrastructure located within the adjacent right-of-ways:

Bronson Avenue:

- 610 mm diameter UCI feedermain
- 127 mm diameter UCI watermain
- 375 mm diameter concrete combined sewer

Carling Avenue:

- 406 mm diameter UCI watermain
- 300 mm diameter concrete combined sewer

Cambridge Street South:

- 203 mm diameter PVC watermain
- 250 mm diameter PVC combined sewer

3 SCOPE OF WORK

As per applicable guidelines, the scope of work includes the following:

Stormwater management

- Calculate the allowable stormwater release rate.
- Calculate the anticipated post-development stormwater release rates.
- Demonstrate how the target quantity objectives will be achieved.



Water services

- Calculate the expected water supply demand at average and peak conditions.
- Calculate the required fire flow as per the Fire Underwriters Survey (FUS) method.
- Confirm the adequacy of water supply and pressure during peak flow and fire flow.
- Describe the proposed water distribution network and connection to the existing system.

Sanitary services

- Describe the existing sanitary sewers available to receive wastewater from the building.
- Calculate peak flow rates from the development.
- Describe the proposed sanitary sewer system.
- Review impact of increased sanitary flow on downstream sanitary sewer.

4 REGULATORY APPROVALS

An MECP Environmental Compliance Approval is expected to be required for installation of the proposed storm and sanitary sewers within the site. A Permit to Take Water is not anticipated to be required for pumping requirements for sewer installation. The Rideau Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.

5 WATER SUPPLY AND FIRE PROTECTION

5.1 Existing Water Supply Services and Fire Hydrant Coverage

The subject property lies within the City of Ottawa 1W water distribution network pressure zone. Surrounding the property there is an existing 610 mm and 127 mm watermains within Bronson Avenue, a 406mm watermain within Carling Avenue, and a 203 mm watermain within Cambridge Street. There are currently two (2) existing fire hydrants within 45 m from the proposed Siamese connections; one within Bronson Avenue and another within the Cambridge Street right-of-way. There are several existing hydrants available to service the development; refer to **Appendix B** for the fire hydrant locations.

5.2 Water Supply Servicing Design

According to the City of Ottawa Water Distribution Guidelines (Technical Bulletin ISDTB-2014-02), since the subject site has more than 50 residential units, it is required to be serviced with two water service laterals for redundancy and to avoid the creation of a vulnerable service area. Inside the building the laterals will be looped and are to be designed by the mechanical engineer at the detailed design stage. The proposed water servicing should meet both domestic and fire protection water service. Considering the presence of automatic sprinkler system inside the building and a recommended size to service the sprinkler system, the subject property is proposed to be serviced via two (2) 150 mm diameter service connections that will be connected within the site by mechanical. The dual service will be connected to the 406 mm watermain located within



Carling Avenue. This will service Phase 1 and Phase 2 of the development. The potential for a connection via Cambridge Street and Carling Avenue was explored. However, after receiving and analyzing boundary conditions received from the City of Ottawa, it was determined that a connection to the watermain within Cambridge Street would not provide sufficient pressure to service the site. Therefore, the most appropriate location for the dual connections was to be via the 406mm watermain located within Carling Avenue. Refer to Site Servicing Plan C.401 in **Appendix E** for servicing layout and connection points.

Table 1 summarizes the City of Ottawa Design Guidelines design parameters employed in the preparation of the water demand estimate.

Table 1: City of Ottawa Design Guidelines Design Parameters

Design Parameter	Value
Residential Bachelor / 1 Bedroom Apartment	1.4 P/unit
Residential 2 Bedroom Apartment	2.1 P/unit
Residential 3 Bedroom Apartment	3.1 P/unit ⁶
Other Commercial Average Daily Demand	2.8 L/m ² /d
Restaurant	125 L/seat/d
Average Daily Demand	280 L/d/per
Office	75 L/9.3m ² /d
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
Desired operating pressure range during normal operating conditions	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure shall not exceed	552 kPa
During fire flow operating conditions pressure must not drop below	140 kPa

**Table updated to reflect technical Bulletin ISDTB-2018-02*

The interior layout and architectural floor plans have been reviewed, and it was determined that the 22-storey building will house **78** 1-bedroom units, **59** two-bedroom units, and student housing units which account for a total of 184 beds. The 9-storey building will house **69** studio/1-bedroom units, and **21** two-bedroom units. Based on the City of Ottawa Design guidelines for population projection, this translates to approximately **417.1** residents in Phase 1 and **140.7** residents in Phase 2. Tables 2 and Table 3 below summarize the proposed development as interpreted using Table 4.1 of the City of Ottawa Design Guidelines, and Appendix 4-A of the Sewer Design Guidelines.

Table 2: Phase 1- Residential Population Estimate

Proposed Unit type	Persons Per Unit	Number of Units	Population
1 Bedroom Apartment	1.4	78	109.2
2 Bedroom Apartment	2.1	59	123.9



Boarding/Student Housing	1 Person/bed	184 beds	184.0
Total Residential Population			417.1

Table 3: Phase 2 - Residential Population Estimate

Proposed Unit type	Persons Per Unit	Number of Units	Population
Studio/1 Bedroom	1.4	69	96.6
2 Bedroom Apartment	1.4	21	44.1
Total Residential Population			140.7

For the purpose of determining water demands, the projected populations from the two phases were combined and used to calculate the anticipated water demands. The population used to calculate the demands is 557.8. The required water supply requirements for the residential units in the proposed buildings have been calculated using the following formula:

$$Q = (q \times P \times M)$$

Where,

q = average water consumption (L/capita/day)

P = design population (capita)

M = Peak factor

The following factors were used in calculations as per Table 3-3 in the MOE:

- Maximum Daily Demand Residential Factor = **2.5**
- Maximum Daily Demand Commercial Factor = **1.5**
- Peak Hour Demand Residential Factor = **2.2**
- Peak Hour Demand Commercial Factor = **1.8**

Using the above-mentioned factors and design parameters listed in Table 1, the anticipated demands were calculated as follows:

- Average daily domestic water demand is **1.86** L/s,
- Maximum daily demand is **4.60** L/s, and
- Maximum hourly is **4.07** L/s.

Refer to **Appendix B** for water demand calculations.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand, as indicated in the boundary request correspondence included in **Appendix B**. Table 4 below summarizes boundary conditions for the proposed development.



Table 4: Summary of Anticipated Demands and Boundary Conditions

Design Parameter	Anticipated Demand (L/s)	Boundary Conditions @ Carling Avenue* for Previous Demands (m H ₂ O / kPa)
Average Daily Demand	1.86	115.1 / 403.0
Max Day + Fire Flow (per FUS)	4.6+216.7	108.6 / 339.3
Peak Hour	4.07	106.3 / 316.7
*Assumed Ground elevation at connection point = 74.00 m. Water demand calculation per City of Ottawa Water Design guidelines. See Appendix B for details.		

As indicated in Table 4, pressures in all scenarios meet the required pressure range stated in Table 1 as per City of Ottawa Design Guidelines. Refer to **Appendix B** for Boundary Conditions.

The estimated fire flow for the proposed buildings was calculated in accordance with *ISTB-2018-02*. The following parameters were provided by the Architect, see **Appendix A** for collaborating correspondence:

- Type of construction – Non-Combustible Construction;
- Occupancy type – Limited Combustibility; and
- Sprinkler Protection – Fully Supervised Sprinkler System.

The fire flow demand for the site was estimated to be **13,000 L/min**, see **Appendix B** for details.

There are seven (**7**) existing fire hydrants in close proximity to the proposed buildings that are available to provide the required fire flow demands of 13,000 L/min. Four of the seven fire hydrants will be in proximity to the siamese connection located at the Phase 2 building and will provide the required fire flow. Three of the seven fire hydrants are in proximity to the siamese connection located at the Phase 1 building and will be able to provide the required fire flows. Refer to **Appendix B** for fire hydrant locations. Table 5 below summarizes the aggregate fire flow of the contributing hydrants in close proximity to the proposed development based on Table 18.5.4.3 of *ISTB-2018-02*.



Table 5: Fire Protection Summary Table

Building	Fire Flow Demand (L/min)	Fire Hydrants(s) within 75m	Fire Hydrant(s) within 150m	Available Combined Fire Flow (L/min)
Proposed multi-storey building (Phase 1)	13,000	1	2	(1 x 5678) + (2 x 3785) = 13,248
Proposed multi-storey building (Phase 2)	13,000	1	3	(1 x 5678) + (3 x 3785) = 17,033
Combined	13,000	2	5	(2 x 5678) + (5 x 3785) = 30,281

The total available fire flow from contributing hydrants for Phase 1 is equal to **13,248L/min** and **17,033L/min** for Phase 2. The total combined available fire flow from contributing hydrants for both phases is equal to **30,281L/min** which is sufficient to provide adequate fire flow for the proposed development. A certified fire protection system specialist will need to be employed to design the building's fire suppression system and confirm the actual fire flow demand.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

6 SANITARY SERVICE

6.1 Existing Sanitary Sewer Services

There is an existing 375 mm dia. combined sewer within Bronson Avenue, and another 250 mm dia. combined sewer within Cambridge Street South across the subject site.

The post-development wet total flow was calculated to be **7.36 L/s**, combined for Phase 1 and 2, as a result of the proposed residential population and a small portion of infiltration. Refer to **Appendix C** for further information on the calculated sanitary flows.

6.2 Sanitary Sewer Servicing Design

The proposed development will be serviced via two (2) 150 mm dia. sanitary service laterals; one service dedicated for each phase of the development. Proposed wastewater flow from Phase 1 of the development was calculated to be **5.74 L/s**, which will be conveyed to the existing 375 mm dia. combined sewer within Bronson Avenue. Proposed wastewater flow from Phase 2 was calculated to be **2.30 L/s**, which will be conveyed to the existing 250 mm dia. combined sewer within Cambridge Street South. Refer to LRL drawing C.401 for the proposed sanitary servicing.



The parameters used to calculate the anticipated sanitary flows are; residential average population per unit of 1.4 person for single units and 2.1 persons for two-bedroom units, a residential daily demand of 280 L/p/day, a residential peaking factor of 4.0 and a total infiltration rate of 0.33 L/s/ha. Refer to **Appendix C** for the site sanitary sewer design sheet.

7 STORMWATER MANAGEMENT

7.1 Existing Stormwater Infrastructure

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system as such, approvals for the proposed development within this area are under the approval authority of the City of Ottawa.

In pre-development conditions, drainage from subject lots are divided where approximately 60% of the subject property, depicted by EWS-01 (0.273 ha), drains uncontrolled overland to the east side towards Bronson Ave., and the remaining 40%, depicted by EWS-02 (0.184 ha), drains uncontrolled overland to the west side of the site towards Cambridge St. S., refer to plan C701 included in **Appendix E** for pre-development drainage characteristics. There is currently an existing 375 mm dia. combined sewer within Bronson Ave, and a 250 mm dia. combined sewer within Cambridge St. S. right-of-way. Refer to **Appendix D** for pre-development and post-development watershed information.

7.2 Design Criteria

The stormwater management criteria for this development are based on the pre-consultation with City of Ottawa officials, the City of Ottawa Sewer Design Guidelines including City of Ottawa Stormwater Management Design Guidelines, 2012 (City standards), as well as the Ministry of the Environment's Stormwater Management Planning and Design Manual, 2003 (SWMPD Manual).

7.2.1 Water Quality

The subject property lies within the Ottawa River West sub-watershed and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA). It was determined that no further treatment is required for stormwater runoff from the proposed development. Correspondence with RVCA is included in **Appendix A**.

7.2.2 Water Quantity

Based on pre-consultation with the City, correspondence included in **Appendix A**, the following stormwater management requirements for a combined sewer area were identified for the subject site:

- Meet an allowable release rate based on a Rational Method coefficient of 0.40, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration equal to or greater than 10 minutes; and
- Attenuate all storms up to and including the City of Ottawa 100-year storm event on site.



To calculate the allowable storm release rate for the subject site, the proposed dry sanitary wastewater flow was deducted from the calculated pre-development 2-year release rate. The total allowable storm release rate was calculated to be **31.42 L/s** (38.97 L/s – 7.55 L/s). Refer to **Appendix D** for calculations.

7.3 Method of Analysis

The modified Rational Method has been used to calculate the runoff rate from the site to quantify the detention storage required for quantity control of the development. Refer to **Appendix D** for storage calculations.

7.4 Proposed Stormwater Quantity Controls

The proposed stormwater management quantity control for this development will be accomplished using roof drains restricting the flow leaving the rooftop as well as proposed cisterns in the underground garage that will discharge at specified constant release rates. Storage required as a result of quantity control will be accomplished through a combination of rooftop storage and cisterns in the underground garage.

The subject site is proposed to be serviced via two 250 mm diameter storm sewer service laterals that will connect to the existing 375 mm dia. combined sewer within Bronson Ave and existing 250 mm dia. combined sewer within Cambridge St. S. The proposed servicing layout and connection points are shown on drawing C.401 in **Appendix E**, and detailed calculations can be found in **Appendix D**.

The existing site is delineated by catchments EWS-01, which currently drains uncontrolled towards the east of the property, and EWS-02 which drains to the west of the property.

The site has been analyzed and post-development watersheds have been allocated. To adhere to existing drainage characteristics, two outlets are proposed. Outlet 1 (in Phase 1) will be designed based on EWS-01 and Outlet 2 (in Phase 2) will be designed based on EWS-02. The allowable release rate in Phase 1 will be **17.67 L/s** and the allowable release rate in Phase 2 will be **13.75 L/s**.

7.4.1 Phase 1 Outlet – Bronson Avenue

In order to achieve the allowable post-development stormwater release rate established in *Section 7.2.2*, above, Phase 1 of the proposed development will use rooftop storage as well as an internal cistern, to be designed by a mechanical engineer using the specified release rates determined in this analysis. The internal cistern and the roof drain outlet will discharge to the existing 375 mm dia. combined sewer within Bronson Avenue via a 250 mm diameter storm service lateral. Refer to C401 in **Appendix E** for servicing layout and connection points.

Table 6 below summarizes the Phase 1 post-development drainage areas. Calculations can be found in **Appendix D**.



Table 6: Phase 1 Drainage Areas

Drainage Name	Area (ha)	Weighted Runoff Coefficient	100 Year Weighted Runoff Coefficient (25% increase)
WS-01 (ROOF)	0.009	0.90	1.00
WS-02 (ROOF)	0.016	0.90	1.00
WS-03 (ROOF)	0.007	0.90	1.00
WS-04 (ROOF)	0.011	0.90	1.00
WS-05 (ROOF)	0.011	0.90	1.00
WS-06 (ROOF)	0.007	0.90	1.00
WS-07 (ROOF)	0.011	0.90	1.00
WS-08 (ROOF)	0.018	0.90	1.00
WS-09 (ROOF)	0.011	0.90	1.00
WS-10 (ROOF)	0.006	0.90	1.00
WS-11 (ROOF)	0.011	0.90	1.00
WS-12 (CONTROLLED)	0.085	0.84	1.00
WS-13 (UNCONTROLLED)	0.012	0.71	0.89

The roof top of the 22-storey building in Phase 1 will include a total of **18** roof drains. Six (6) of the roof drains will not be controlled and will not provide any roof storage. The flows from these six (6) roof drains will be carried to the cistern in Phase 1. The remaining twelve (12) roof drains will be controlled to a flow of **0.63L/s** and are to be Watts RD-100-A with a closed exposed weir opening. The total controlled flow rate from the rooftop in Phase 1 will be **6.94L/s**. See **Appendix D** for more information on the selected roof drains and flow restrictors. See drawing C.601 in **Appendix E** for roof drain locations and information.

The total available roof storage (m^3) has been calculated using the following formula:

$$V = \left(\frac{D_{SI} * A_{Eff}}{3} \right)$$

Where:

V = available (provided) rooftop storage (m^3)



D_{Sl} = slope ponding depth (m)

A_{Eff} = effective roof area (m^2)

Based on the equation above, it was calculated that **51.78 m³** of rooftop storage would be available in the 100-year event for Phase 1. For additional details on the calculations for available area of rooftop storage, refer to **Appendix D**.

Table 7 below summarizes the release rates and storage volumes required to meet the Phase 1 weighted allowable release rate of **17.67 L/s** for 100-year flow rates. This release rate was calculated based on the area of EWS-01.

TABLE 7: SUMMARY OF RELEASE RATES AND STORAGE VOLUMES FOR PHASE 1

Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m ³)	Total Available Storage (m ³)
WS-01 (ROOF)	R.D.1	0.009	0.63	3.00	3.89
WS-02 (ROOF)	R.D.2	0.016	0.63	6.70	7.00
WS-03 (ROOF)	R.D.3	0.007	0.63	2.27	3.36
WS-04 (ROOF)	R.D.4	0.011	0.63	3.90	4.03
WS-05 (ROOF)	R.D.5	0.011	0.63	4.15	4.83
WS-06 (ROOF)	R.D.7	0.007	0.63	1.93	3.03
WS-07 (ROOF)	R.D.8	0.011	0.63	3.95	4.98
WS-08 (ROOF)	R.D.9	0.018	0.63	8.00	8.41
WS-09 (ROOF)	R.D.10	0.011	0.63	3.80	4.87
WS-10 (ROOF)	R.D.11	0.006	0.63	1.67	2.74
WS-11 (ROOF)	R.D.12	0.011	0.63	3.76	4.63
WS-12 (CONTROLLED)	*Cistern	0.085	5.29	29.83	30.00
WS-13 (UNCONTROLLED)		0.012	5.45	0.00	0.00
TOTAL		0.215	17.67	72.96	81.78

**Flow from uncontrolled R.D.6/13/14/15/16/17, Phase 1 Trench Drain, A.D.3/4/5, CB*

It is calculated that a total of **72.96 m³** of storage will be required to attenuate flows to the allowable release rate of **17.67 L/s** for Phase 1. The project runoff exceeding the allowable release rate will be stored on-site via rooftop ponding at the building rooftop and an internal building cistern. Approximate **29.83 m³** of cistern storage will be required in Phase 1 to attenuate runoff to the specified allowable release rate. The cistern is required to discharge at **5.29 L/s** to ensure the allowable release rate is respected. The 100-year maximum ponding extents can be found on drawing “C601 – Stormwater Management Plan” of **Appendix E**.

7.4.2 Phase 2 Outlet – Cambridge Street South

Phase 2 of proposed development will also use rooftop storage and an internal cistern, to be designed by a mechanical engineer using the specified release rates determined in this analysis. The internal cistern and the roof drain outlet will discharge to the existing 250 mm diameter



combined sewer within Cambridge Street South via a 250 mm diameter storm service lateral. Refer to C401 in **Appendix E** for servicing layout and connection points.

Table 8 below summarizes Phase 2 post-development drainage areas. Calculations can be seen in **Appendix D**.



Table 8: Phase 2 Drainage Areas

Drainage Name	Area (ha)	Weighted Runoff Coefficient	100 Year Weighted Runoff Coefficient (25% increase)
WS-14 (ROOF)	0.014	0.90	1.00
WS-15 (ROOF)	0.019	0.90	1.00
WS-16 (ROOF)	0.014	0.90	1.00
WS-17 (ROOF)	0.016	0.90	1.00
WS-18 (ROOF)	0.016	0.90	1.00
WS-19 (CONTROLLED)	0.143	0.61	0.77
WS-20 (UNCONTROLLED)	0.019	0.72	0.90

The roof top of the 9-storey building in Phase 2 will include a total of seven (7) roof drains. Two (2) of the roof drains will not be controlled and will not provide any roof storage. The flows from these two (2) roofs drains will be carried to the cistern in Phase 2. The controlled roof drains are to be Watts RD-100-A. Four (4) of the controlled roof drains will have a fully exposed weir opening and be controlled to a flow of **0.63 L/s** and one (1) of the controlled roof drains will have a ¼ opened weir opening and will be controlled to a flow of **0.95L/s**. The total controlled flow rate from the rooftop in Phase 2 will be **3.47 L/s**. See **Appendix D** for more information on the selected roof drains and flow restrictors. See drawing C.601 in **Appendix E** for roof drain locations and information.

It was calculated that **35.11 m³** of rooftop storage is available in the 100-year event for phase 2. For additional details on the calculations for available area of rooftop storage, refer to **Appendix D**.

Table 9 below summarizes the release rates and storage volumes required to meet the Phase 2 weighted allowable release rate of **13.75 L/s** for the 100-year flow rates. This release rate was calculated based on the area of EWS-02.

Table 9: Summary of Release Rates and Storage Volumes for Phase 2

Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m ³)	Total Available Storage (m ³)
WS-14 (ROOF)	R.D.18	0.014	0.63	5.36	6.05
WS-15 (ROOF)	R.D.19	0.019	0.63	8.62	8.87
WS-16 (ROOF)	R.D.20	0.014	0.63	5.56	6.33



WS-17 (ROOF)	R.D.21	0.016	0.95	5.90	6.59
WS-18 (ROOF)	R.D.22	0.016	0.63	6.56	7.27
WS-19 (CONTROLLED)	*Cistern	0.143	1.64	60.48	65.00
WS-20 (UNCONTROLLED)		0.019	8.64	0.00	0.00
TOTAL		0.242	13.75	92.48	100.11
<i>*Flow from R.D.23/24, Phase 2 Trench Drain, A.D.1/2, CB</i>					

It is calculated that a total of **92.48 m³** of storage will be required to attenuate flows to the allowable release rate of **13.75 L/s** for Phase 2. The project runoff exceeding the allowable release rate will be stored on-site via rooftop ponding at the building rooftop and an internal building cistern. Approximately **65.00 m³** of cistern storage will be required in Phase 2 to attenuate runoff to the specified allowable release rate. The cistern is required to discharge at **1.64 L/s** to ensure the allowable release rate is respected. The 100-year maximum ponding depths can be found on drawing “C601 – Stormwater Management Plan” of **Appendix E**.

8 EROSION AND SEDIMENT CONTROL

During construction, erosion and sediment controls will be provided primarily via a sediment control fence to be erected along the perimeter of the site where runoff has the potential of leaving the site. Inlet sediment control devices are also to be provided in any catch basin and/or manholes in and around the site that may be impacted by the site construction. Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification OPSS 577. Refer to LRL Associates drawing C.101 for erosion and sediment control details.

9 CONCLUSION

This Stormwater Management and Servicing Report for the development proposed at 770-774 Bronson Avenue presents the rationale and details for the servicing requirements for the subject property.

In accordance with the report objectives, the servicing requirements for the development are summarized below:

Water Service



- The maximum required fire flow was calculated at **13,000 L/min** using the FUS method.
- There are seven (7) existing fire hydrants available to service the proposed development. They will provide a combined fire flow of **30,281L/min** to the site. **13,248L/min** to the Phase 1 building and **17,033L/min** to the Phase 2 building.
- The new development will be serviced dual 150 mm Φ water service connections to be connected to the existing 406 mm Φ watermain within Carling Avenue.
- Boundary conditions received from the City of Ottawa indicate that sufficient pressure is available at Carling Ave to service the proposed site.

Sanitary Service

- Phase 1 of the proposed development will discharge **5.74 L/s** to the existing 375 mm dia. combined sewer within Bronson Avenue via a proposed 250 mm diameter sanitary service lateral.
- Phase 2 of the proposed development will discharge **1.73 L/s** to the existing 250 mm dia. combined sewer within Cambridge Street South via a proposed 150 mm diameter sanitary service lateral.

Stormwater Management

- Stormwater quality control are not required as per consultation with RVCA.
- The storm water release rates from the proposed development will meet the calculated allowable release rate of **31.42 L/s**.
- Stormwater quantity control objectives will be met through on-site storm water ponding on the roof and internal building cisterns to be designed by a mechanical engineer.

10 REPORT CONDITIONS AND LIMITATIONS

The report conclusions are applicable only to this specific project described in the preceding pages. Any changes, modifications or additions will require a subsequent review by LRL Associates Ltd. to ensure the compatibility with the recommendations contained in this document. If you have any questions or comments, please contact the undersigned.

Prepared by:

LRL Associates Ltd.



Tamara Harb
Civil EIT



Mohan Basnet, P. Eng.
Civil Engineer

APPENDIX A

Pre-consultation / Correspondence



DEVELOPMENT SERVICING STUDY CHECKLIST

Project #: 200436

Date: 2021-03-04

4.1 General Content

Executive Summary (for larger reports only).	N/A
Date and revision number of the report.	Report Cover Sheet
Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
Plan showing the site and location of all existing services.	Figure 1
Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
Summary of Pre-consultation Meetings with City and other approval agencies.	Section 4.0 & Appendix A
Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.	Section 5.1, 6.1, 7.1
Statement of objectives and servicing criteria.	Section 1.0
Identification of existing and proposed infrastructure available in the immediate area.	Section 5.1, 6.1, 7.1
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 7.0
Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	C301

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts. N/A

Proposed phasing of the development, if applicable. N/A

Reference to geotechnical studies and recommendations concerning servicing. C401

All preliminary and formal site plan submissions should have the following information:

- Metric scale

- North arrow (including construction North)

- Key plan

- Name and contact information of applicant and property owner C401

- Property limits including bearings and dimensions

- Existing and proposed structures and parking areas

- Easements, road widening and rights-of-way

- Adjacent street names

4.2 Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available N/A

Availability of public infrastructure to service proposed development Section 5.1

Identification of system constraints Section 5.1

Identify boundary conditions Section 5.2

Confirmation of adequate domestic supply and pressure Section 5.2

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development. Section 5.2

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Section 5.2
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
Address reliability requirements such as appropriate location of shut-off valves	N/A
Check on the necessity of a pressure zone boundary modification.	N/A
Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 5.2
Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 5.2
Description of off -site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 5.2
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 6.2
Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 6.1
Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 6.2 Appendix C
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 6.2
Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Section 6.1
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 7.1
---	-------------

Analysis of available capacity in existing public infrastructure.	N/A
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	N/A
Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 7.2.2
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 7.2.1
Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 7.4
Set-back from private sewage disposal systems.	N/A
Watercourse and hazard lands setbacks.	N/A
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 7.4
Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 7.4 Appendix D

Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Appendix D
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.	N/A
Identification of potential impacts to receiving watercourses Identification of municipal drains and related approval requirements.	N/A
Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 7.4
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	NA
Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 8.0
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
Identification of fill constraints related to floodplain and geotechnical investigation	N/A

4.5 Approval and Permit Requirements: Checklist

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

N/A

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

N/A

Changes to Municipal Drains.

N/A

Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

N/A

4.6 Conclusion Checklist

Clearly stated conclusions and recommendations

Section 9.0

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

Noted

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Noted

Amr Salem

From: Rebecca Dam <rdam@figurr.ca>
Sent: October 23, 2020 1:09 PM
To: Amr Salem
Cc: Tanya Chowieri; Roberto Campos; Melissa Du Plessis; Virginia Johnson; Maxime Longtin; Mohan Basnet
Subject: RE: 200436- RE: 2025 Katasa- Civil Coordination
Attachments: 2025 GFA Per Floor.pdf; 2025 Unit Breakdown.pdf; 2025_East Elevation.png; 2025_North Elevation.png; 2025_South Elevation.png; 2025_West Elevation.png

Follow Up Flag: Follow up
Flag Status: Completed

Hi Amr, please see below and attached our response to your questions.

Let me know if you need anything else.

Thanks,
Rebecca

Rebecca Dam OAA M.Arch B.A.S ORSA
Architect

Figurr
architects collective
figurr.ca

FIG. 1
190 Somerset St W #206
Ottawa ON
K2P 0J4
T 613 695-6122 X 304
M 613 618-3286

FIG. 2
3550, Saint-Antoine O.
Montréal QC
H4C 1A9
T 514 861-5122

This email and its contents are privileged and confidential.
If you are not the intended recipient, please notify the sender immediately and delete this email and its contents.

From: Amr Salem <asalem@lrl.ca>
Sent: Tuesday, October 20, 2020 11:25 AM
To: Rebecca Dam <rdam@figurr.ca>
Cc: Tanya Chowieri <tanya@katasa.ca>; Roberto Campos <rcampos@figurr.ca>; Melissa Du Plessis <mduplessis@figurr.ca>; Virginia Johnson <vjohanson@lrl.ca>; Maxime Longtin <mlongtin@lrl.ca>; Mohan Basnet <mbasnet@lrl.ca>
Subject: RE: 200436- RE: 2025 Katasa- Civil Coordination

Hey Rebecca,

Thanks for your prompt response.

A few points;

- So we can assume a max storage/ponding depth of 150mm can be provided on the majority of surface area of the 9th floor rooftop , tower rooftop and mech room rooftop over tower? — Yes
- I couldn't find elevations drawings. Please provide those ASAP once they're available. It's essential for our grading.— Attached are the elevations, note that the elevations are still a work in progress

As promised, the following info. is needed to estimate the fireflow demand. Please note the info below is needed to request boundary conditions from the City which is a lengthy process (takes at least 2 weeks typically.)

- Can you please provide a breakdown of unit types? I only need them listed based on # of bedrooms. — See attached unit type chart
- Can you please confirm the total floor area (excluding U/G parking)? — See attached floor area chart. We will indicate this on our site plan as well.
- Can you confirm if sprinklers are proposed for the building? If yes, please specify if sprinkler system is **fully supervised** and **automatic**? — Yes- fully supervised by the fire alarm system and will be an automatic system
- Kindly provide the **ISO class** for the building as per ISO Guide sections 1, 2 and 3. I have included a brief summary of ISO Guide (review chapter 2 for construction types) as well as the section from the City's technical bulletin. Note that ISO refers only to fire-resistive for fire ratings not less than 1-hour. — Class 4

A. Determine the type of construction.

- Coefficient *C* in the FUS method is equivalent to coefficient *F* in the ISO method:

Correspondence between FUS and ISO construction coefficients

FUS type of construction	ISO class of construction	Coefficient <i>C</i>
Fire-resistive construction	Class 6 (fire resistive)	0.6
	Class 5 (modified fire resistive)	0.6
Non-combustible construction	Class 4 (masonry non-combustible)	0.8
	Class 3 (non-combustible)	0.8
Ordinary construction	Class 2 (joisted masonry)	1.0
Wood frame construction	Class 1 (frame)	1.5

However, the FUS definition of fire-resistive construction is more restrictive than those of ISO construction classes 5 and 6 (modified fire resistive and fire resistive). FUS requires structural members and floors in buildings of fire-resistive construction to have a fire-resistance rating of 3 hours or longer.

- With the exception of fire-resistive construction that is defined differently by FUS and ISO, practitioners can refer to the definitions of the ISO construction classes (and the supporting definitions of the types of materials and assemblies that make up the ISO construction classes) found in the current ISO guide [4] (see Annex i) to help select coefficient *C*.
- To identify the most appropriate type of construction for buildings of mixed construction, the rules included in the current ISO guide [4] can be followed (see Annex i). For a building to be assigned a given classification, the rules require $\frac{2}{3}$ (67%) or more of the total wall area and $\frac{2}{3}$ (67%) or more of the total floor and roof area of the building to be constructed according to the given construction class or a higher class.
- New residential developments (less than 4 storeys) are predominantly of wood frame construction ($C = 1.5$) or ordinary construction ($C = 1.0$) if exterior walls are of brick or masonry. Residential buildings with exterior walls of brick or masonry veneer and those with less than $\frac{2}{3}$ (67%) of their exterior walls made of brick or masonry are considered wood frame construction ($C = 1.5$).

Feel free to contact me with any questions.

Thanks,



Amr Salem, EIT

Civil Designer

LRL Associates Ltd.

5430 Canotek Road
Ottawa, Ontario K1J 9G2

T (613) 842-3434 or (877) 632-5664 ext 248

F (613) 842-4338

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W www.lrl.ca

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Nous nous soucions profondément de votre opinion, nous vous invitons donc à nous faire savoir si nous avons satisfait vos attentes en remplissant notre [sondage sur la satisfaction de la clientèle](#)



Amr Salem

From: Wu, John <John.Wu@ottawa.ca>
Sent: October 27, 2020 1:06 PM
To: Amr Salem; Mottalib, Abdul
Subject: RE: 770-774 Bronson SWM Quantity Control Criteria

Follow Up Flag: Follow up
Flag Status: Completed

Hi, Amr:

The storm water management criteria is to control 2, 5, 100 year's storm to the site using C0.4, 2 year's storm event release rate.

Thanks.

John

From: Amr Salem <asalem@lrl.ca>
Sent: October 27, 2020 12:52 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Wu, John <John.Wu@ottawa.ca>
Subject: RE: 770-774 Bronson SWM Quantity Control Criteria

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

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

Hello Abdul, John,

Sorry for the confusion, my email now is asalem@lrl.ca. Please delete my previous e-mail from your contact list to avoid any confusion.

Regarding this file, please find attached the submission list provided on Dec 20,2019 which appoints John Wu as the infrastructure PM, hence my email. I also attached preconsult follow up correspondence.

Please let me know if someone else has taken this over since?

Thanks,

Amr Salem, EIT
Civil Designer

Amr Salem

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: March 3, 2021 3:45 PM
To: Amr Salem
Cc: Eric Lalande
Subject: RE: (LRL#200436) - 770-774 Bronson Ave - SWM Quality Control Criteria

Hi Amr,

I can confirm that if the stormwater is being directed to combined sewers, no onsite water quality control measures are required save and except best management practices. We would encourage you to look at the opportunity to incorporate LID components into the stormwater management plan.

Jamie Batchelor, MCIP, RPP
Planner, ext. 1191
jamie.batchelor@rvca.ca



3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

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From: Amr Salem <asalem@lrl.ca>
Sent: Tuesday, March 2, 2021 5:11 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: RE: (LRL#200436) - 770-774 Bronson Ave - SWM Quality Control Criteria

Hey Jamie,

I just wanted to follow up on this, can you please confirm the below.



Thanks,

Amr Salem

Civil Designer

LRL Associates Ltd.

5430 Canotek Road
Ottawa, Ontario K1J 9G2

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F (613) 842-4338

E asalem@lrl.ca

W www.lrl.ca

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Nous nous soucions profondément de votre opinion, nous vous invitons donc à nous faire savoir
si nous avons satisfait vos attentes en remplissant notre [sondage sur la satisfaction de la clientèle](#)



From: Amr Salem
Sent: October 27, 2020 2:32 PM
To: Jamie.batchelor@rvca.ca
Subject: (LRL#200436) - 770-774 Bronson Ave - SWM Quality Control Criteria

Hello Jamie,

I wanted to consult with you regarding a residential mixed-use development, we are working on located on 770-774 Bronson Ave and 557 Cambridge Street.

Existing runoff from the subject properties drain into existing combined sewers in Carling Ave & Bronson Ave right-of-ways, see figure below;



Figure 1 Subject Properties

Can you please confirm that no quality controls will be required since the proposed development will discharge into a combined sewer?

Thank you,



Amr Salem, EIT

Civil Designer

LRL Associates Ltd.

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Ottawa, Ontario K1J 9G2

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Nous nous soucions profondément de votre opinion, nous vous invitons donc à nous faire savoir
si nous avons satisfait vos attentes en remplissant notre [sondage sur la satisfaction de la clientèle](#)*

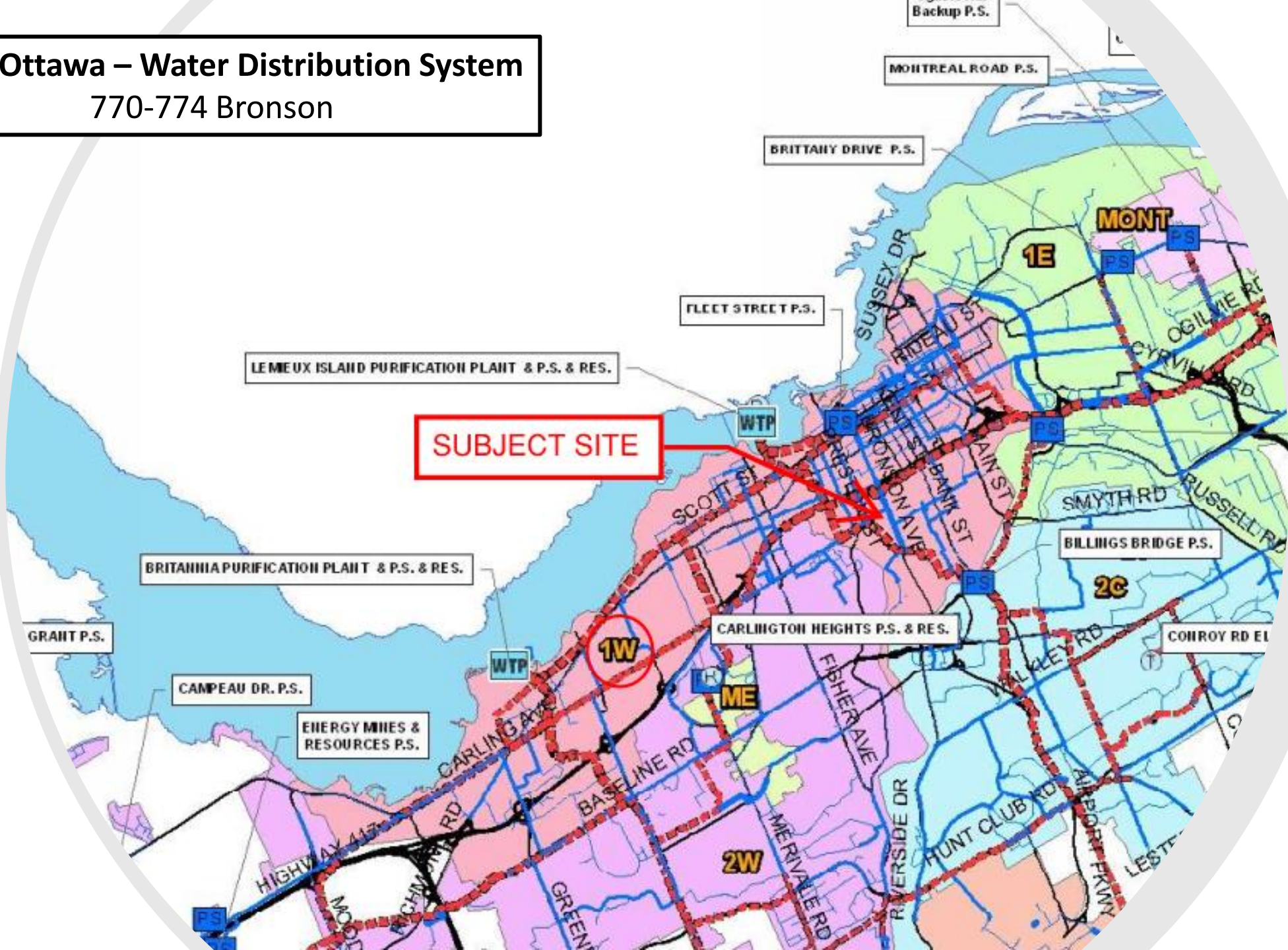
APPENDIX B

Water Supply Calculations

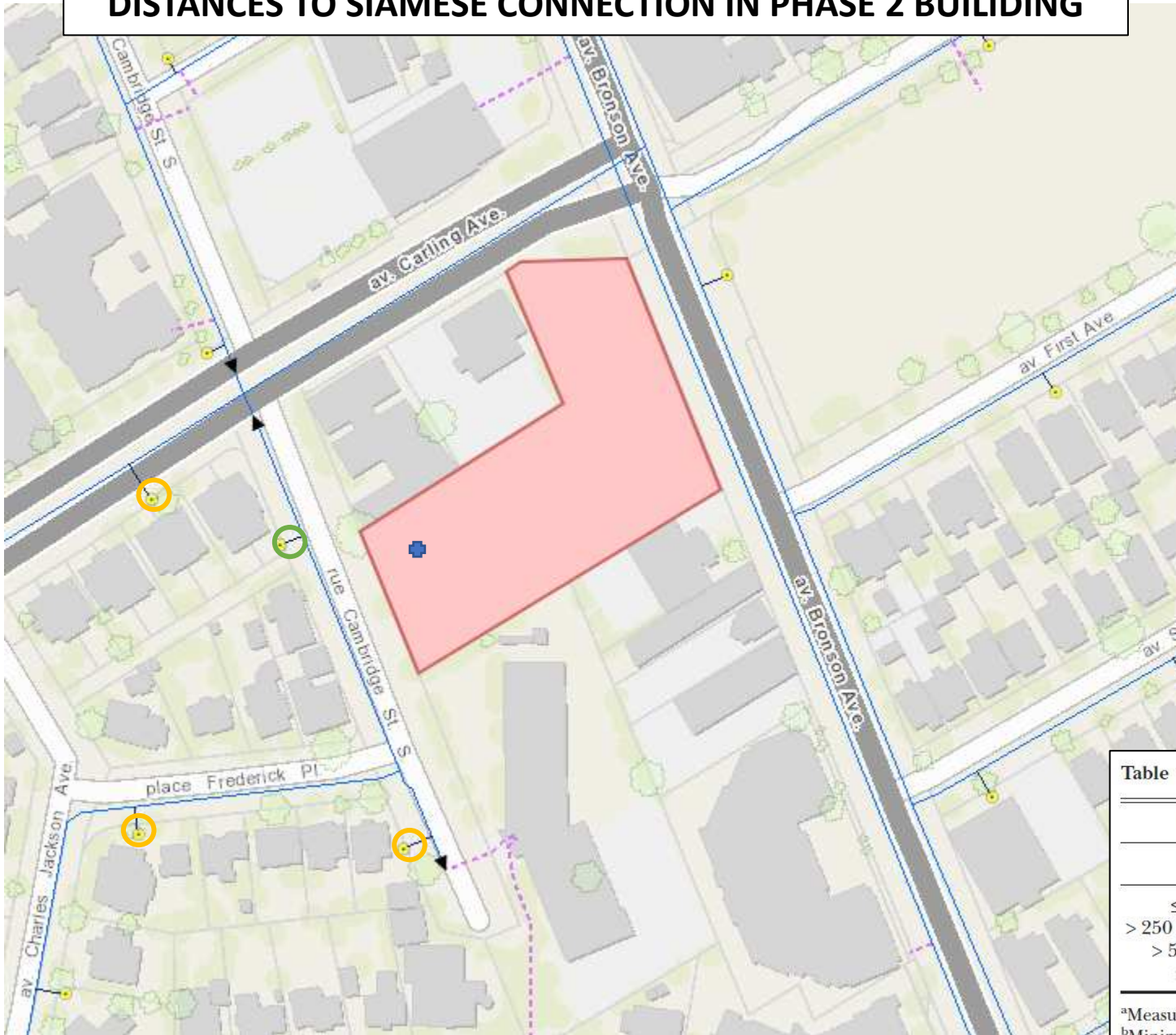


City of Ottawa – Water Distribution System

770-774 Bronson



**770-774 BRONSON AVENUE - FIRE HYDRANT LOCATIONS
DISTANCES TO SIAMESE CONNECTION IN PHASE 2 BUILDING**



LEGEND

- Hydrants within 75m ○
- Hydrants within 150m ○
- Approx. Siamese Connection Location ■

Using 2020 Fire Underwriters Survey Method
Total available fire flow for Phase 1 Building
 = (1x5678L/min)+(3x3785L/min)
 = 17,033L/min
 = **283.8L/s**

Required Fire Flow = 216.7L/s

Table 18.5.4.3 Maximum Fire Hydrant Fire Flow Capacity

Distance to Building ^a		Maximum Capacity ^b	
(ft)	(m)	(gpm)	(L/min)
≤ 250	≤ 76	1500	5678
> 250 and ≤ 500	> 76 and ≤ 152	1000	3785
> 500 and ≤ 1000	> 152 and ≤ 305	750	2839

^aMeasured in accordance with 18.5.1.4 and 18.5.1.5.
^bMinimum 20 psi (139.9 kPa) residual pressure.

**770-774 BRONSON AVENUE - FIRE HYDRANT LOCATIONS
DISTANCES TO SIAMESE CONNECTION IN PHASE 1 BUILDING**



LEGEND

- Hydrants within 75m ○
- Hydrants within 150m ○
- Approx. Siamese Connection +
- Location

Using 2020 Fire Underwriters Survey Method
Total available fire flow for Phase 1 Building
 = (1x5678L/min)+(2x3785L/min)
 = 13,248L/min
 = 220.8L/s

Required Fire Flow = 216.7L/s

Table 18.5.4.3 Maximum Fire Hydrant Fire Flow Capacity

Distance to Building ^a		Maximum Capacity ^b	
(ft)	(m)	(gpm)	(L/min)
≤ 250	≤ 76	1500	5678
> 250 and ≤ 500	> 76 and ≤ 152	1000	3785
> 500 and ≤ 1000	> 152 and ≤ 305	750	2839

^aMeasured in accordance with 18.5.1.4 and 18.5.1.5.
^bMinimum 20 psi (139.9 kPa) residual pressure.

Tamara Harb

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: June 2, 2023 12:45 PM
To: Tamara Harb
Cc: Virginia Johnson; Mohan Basnet; Maxime Longtin
Subject: RE: LRL200436_774 Bronson Avenue_Boundary Conditions Request
Attachments: 774 Bronson Avenue May 2023.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon.

Please find BC, below and attached:

The following are boundary conditions, HGL, for hydraulic analysis at 774 Bronson Avenue, (zone 1W) assumed to be connected to the 406 mm watermain on Carling Avenue and the 203 mm on Cambridge Avenue (see attached PDF for location).

Both Connections:

Min HGL: 106.3 m

Max HGL: 115.1 m

Max Day + FF (216.7 L/s): 108.6 m (Carling Connection)

Available fire flow at 20 psi: 128 L/s, assuming a ground elevation of 74.0 m (Cambridge Connection)

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.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji

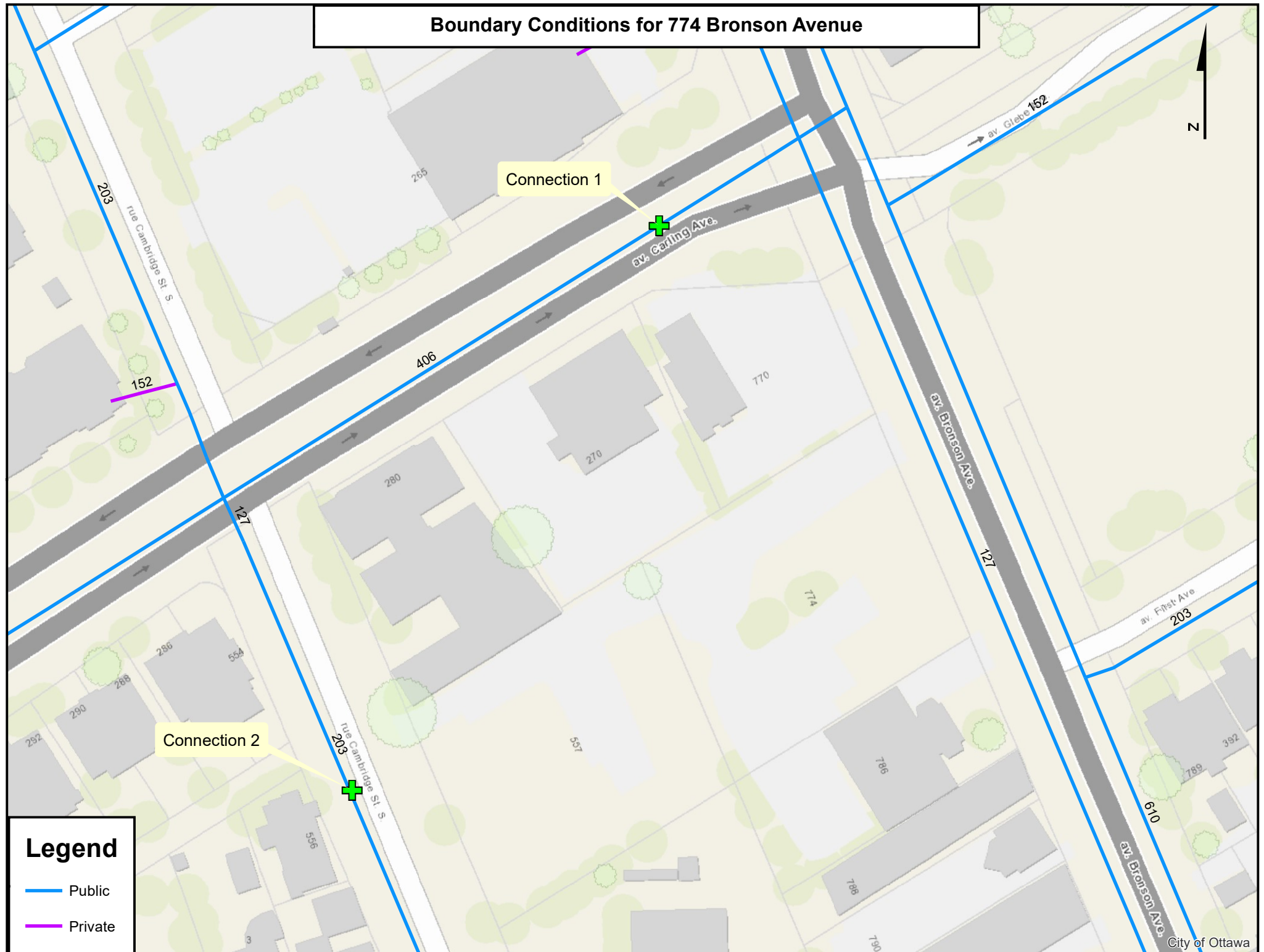
Pronouns: he/him | Pronom: il

Project Manager - Infrastructure Approvals

Gestionnaire de projet – Approbation des demandes d’infrastructures

Development Review Central Branch | Direction de l’examen des projets d’aménagement, Centrale

Boundary Conditions for 774 Bronson Avenue



Legend

- Public (Blue line)
- Private (Purple line)



Water Supply Calculations
 LRL File No. 200436
 Date 2023-05-05
 Prepared by Tamara Harb

Water Demand based on the City of Ottawa Design Guidelines-Water Distribution, 2010

Domestic Demand						
Unit Type	Persons Per Unit	Phase 2 Number of Units	Phase Number of Units	Phase 2 Population	Phase 1 Population	Combined Population
1 Bedroom Apartment	1.4	69	78	96.6	109.2	205.8
2 Bedroom Apartment	2.1	21	59	44.1	123.9	168
Type of Housing	Persons Per Bed	Beds	Beds	Population	Population	
Boarding*	1	0	184	0.0	184	184.0
Total				140.7	417.1	557.8

*Based on a daily demand of 200L/day per person as identified by Appendix 4-A of the Sewer design guidelines.

Combined Domestic Demand			
Average Water Consumption Rate	280	L/c/d	
Average Day Demand	156,184	L/d	1.81 L/s
Maximum Day Factor	2.5	(Based on City of Ottawa Guidelines - Table 4.2)	
Maximum Daily Demand	390,460	L/d	4.52 L/s
Peak Hour Factor	2.2	(Based on City of Ottawa Guidelines - Table 4.2)	
Maximum Hour Demand	343,605	L/d	3.98 L/s

COMBINED

Institutional / Commercial / Industrial Demand			
Property Type	Unit Rate	Units (m ²)	Demand (L/d)
Commercial Space	2.8 L/m ² /d	497	149.6
Amenities	2.8 L/m ² /d	1554	4351.2

**Estimated number of seats at 1 seat per 9.3 m²

Average Day Demand	4,501	L/d	0.05	L/s
Maximum Day Factor	1.5	(Design Guidelines-Water Distribution Table 4.2)		
Maximum Daily Demand	6,751	L/d	0.08	L/s
Peak Hour Factor	1.8	(Design Guidelines-Water Distribution Table 4.2)		
Maximum Hour Demand	8,102	L/d	0.09	L/s

COMBINED - TOTAL DEMAND				
Average Day Demand	160,685	L/d	1.86	L/s
Maximum Daily Demand	397,211	L/d	4.60	L/s
Maximum Hour Demand	351,706	L/d	4.07	L/s

Water Service Pipe Sizing

$Q = VA$

Where: V = velocity
 A = area of pipe
 Q = flow rate

Assuming a maximum velocity of 1.8m/s, the diameter of pipe is calculated as:

Minimum pipe diameter (d) = $(4Q/\pi V)^{1/2}$
 = 0.054 m
 = 54 mm

Proposed pipe diameter (d) = 150 mm
 = 6 Inches



Fire Flow Calculations

LRL File No. 200436
 Date May 5, 2023
 Method Fire Underwriters Survey (FUS)
 Prepared by Tamara Harb

Step	Task	Term	Options	Multiplier	Choose:	Value	Unit	Fire Flow	
Structural Framing Material									
1	Choose frame used for building	Coefficient C related to the type of construction	Wood Frame	1.5	Non-combustible construction	0.8			
			Ordinary Construction	1.0					
			Non-combustible construction	0.8					
			Fire resistive construction <2 hrs	0.7					
			Fire resistive construction >2 hrs	0.6					
Floor Space Area (A)									
2			Total area			11,750	m ²		
3	Obtain fire flow before reductions	Required fire flow	Fire Flow = 220 x C x A ^{0.5}					L/min	19,078
Reductions or surcharge due to factors affecting burning									
4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Non-combustible	-25%	Limited combustible	-15%	L/min	16,216	
			Limited combustible	-15%					
			Combustible	0%					
			Free burning	15%					
			Rapid burning	25%					
5	Choose reduction for sprinklers	Sprinkler reduction	Full automatic sprinklers	-30%	True	-30%	L/min	8,108	
			Water supply is standard for both the system and fire department hose lines	-10%	True	-10%			
			Fully supervised system	-10%	True	-10%			
6	Choose separation	Exposure distance between units	North side	10.1 to 20m	15%	L/min	12,568		
			East side	>30m	0%				
			South side	3.1 to 10m	20%				
			West side	3.1 to 10m	20%				
Net required fire flow									
7	Obtain fire flow, duration, and volume					Minimum required fire flow rate (rounded to nearest 1000)	L/min	13,000	
						Minimum required fire flow rate	L/s	216.7	
						Required duration of fire flow	hr	3.75	

APPENDIX C

Wastewater Collection Calculations





LRL File No. 200436
Project: Multi-Storey Mixed-Use Building
Location: 770-774 Bronson Avenue
Date: June 13, 2023

Sanitary Design Parameters
 Average Daily Flow = 280 L/p/day
 Commercial & Institutional Flow = 50000 L/ha/day
 Light Industrial Flow = 35000 L/ha/day
 Heavy Industrial Flow = 55000 L/ha/day
 Maximum Residential Peak Factor = 4.0
 Commercial & Institutional Peak Factor = 1.5

Industrial Peak Factor = as per Appendix 4-B = 7
 Extraneous Flow = 0.33L/s/gross ha

Pipe Design Parameters
 Minimum Velocity = 0.60 m/s
 Manning's n = 0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMMERCIAL		INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			TOTAL FLOW	PIPE					
STREET	FROM MH	TO MH	AREA (Ha)	POP.	CUMMULATIVE AREA (Ha)	POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (Ha)	ACCU. AREA (Ha)	AREA (Ha)	ACCU. AREA (Ha)	PEAK FACT.	AREA (Ha)	ACCU. AREA (Ha)	PEAK FLOW (l/s)	TOTAL AREA (Ha)	ACCU. AREA (Ha)	INFILT. FLOW (l/s)	LENGTH (m)	DIA. (mm)	SLOPE (%)	MATERIAL	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	
Bronson Avenue	Phase 1 Bldg.	EX 375mm COMB Sewer	0.184	417.1	0.18	417.1	4.0	5.41	0.205	0.205	0.00	0.00	7.0	0.0	0.0	0.18	0.46	0.46	0.15	5.74	10.0	250	2.00%	PVC	84.10	1.71
Cambridge Street	Phase 2 Bldg.	EX 250mm COMB Sewer	0.273	140.7	0.27	140.7	4.0	1.82	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	1.46	1.46	0.48	2.30	10.1	150	2.00%	PVC	21.54	1.22

NOTES Existing inverts and slopes are estimated. They are to be confirmed on-site.

Designed: T.H.	PROJECT: Multi-Storey Mixed-Use Building		
Checked: M.B.	LOCATION: 770-774 Bronson Avenue		
Dwg. Reference: C.401	File Ref.: 200463	Date: 2023-06-13	Sheet No. 1 of 1

APPENDIX D

Stormwater Management Calculations Watts Roof Drain Specification





LRL File No. 200436
Project: Mixed-Use Bldg
Location: 770-774 Bronson Ave
Date: June 6, 2023
Designed: Tamara Harb
Drawing Reference: C701/C702

Pre-Development Catchments

WATERSHED	Total Area (m ²)	Total Area (ha)	Combined C
EWS-01	2727.0	0.273	0.80
EWS-02	1836.0	0.184	0.80
TOTAL	4563.0	0.456	0.80

Post-Development Catchments

WATERSHED	PHASE 1		PHASE 2		Total Area (m ²)	Total Area (ha)	Combined C
	C = 0.20	C = 0.70	C = 0.90				
WS-01 (ROOF)	0.00	0.00	89.62		89.62	0.009	0.90
WS-02 (ROOF)	0.00	0.00	160.31		160.31	0.016	0.90
WS-03 (ROOF)	0.00	0.00	74.09		74.09	0.007	0.90
WS-04 (ROOF)	0.00	0.00	107.86		107.86	0.011	0.90
WS-05 (ROOF)	0.00	0.00	112.86		112.86	0.011	0.90
WS-06 (ROOF)	0.00	0.00	66.45		66.45	0.007	0.90
WS-07 (ROOF)	0.00	0.00	108.91		108.91	0.011	0.90
WS-08 (ROOF)	0.00	0.00	183.15		183.15	0.018	0.90
WS-09 (ROOF)	0.00	0.00	105.88		105.88	0.011	0.90
WS-10 (ROOF)	0.00	0.00	60.40		60.40	0.006	0.90
WS-11 (ROOF)	0.00	0.00	105.20		105.20	0.011	0.90
WS-12 (CONTROLLED)	75.18	0.00	773.03		848.21	0.085	0.84
WS-13 (UNCONTROLLED)	33.21	0.00	90.13		123.34	0.012	0.71
PHASE 1 TOTAL	108.39	0.00	2037.89		2146.28	0.215	0.86
WS-14 (ROOF)	0.00	0.00	135.90		135.90	0.014	0.90
WS-15 (ROOF)	0.00	0.00	193.87		193.87	0.019	0.90
WS-16 (ROOF)	0.00	0.00	139.66		139.66	0.014	0.90
WS-17 (ROOF)	0.00	0.00	163.21		163.21	0.016	0.90
WS-18 (ROOF)	0.00	0.00	157.75		157.75	0.016	0.90
WS-19 (CONTROLLED)	588.37	0.00	845.07		1433.44	0.143	0.61
WS-20 (UNCONTROLLED)	49.03	0.00	143.86		192.89	0.019	0.72
PHASE 2 TOTAL	637.4	0.0	1779.3		2416.7	0.242	0.72
PHASE 1 & 2 TOTAL	745.79	0.00	3817.21		4563.00	0.456	0.79



LRL File No. 200436
 Project: Multi-Storey Mixed-Use BLDG
 Location: 700-770 Bronson
 Date: June 2, 2023
 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 2 OUTLET - Cambridge Street S

Runoff Equation

Q = 2.78CIA (L/s)
 C = Runoff coefficient
 I = Rainfall intensity (mm/hr) = A / (Td + C)^B
 A = Area (ha)
 T_c = Time of concentration (min)

Pre-development Stormwater Management

I₂ = 732.95 / (Td + 6.199)^{0.81} a = 732.951 b = 0.81 C = 6.199

C = 0.40
 I = 76.8 mm/hr
 Tc = 10 min
 Total Area = 0.184 ha

2-Yr Allowable Release Rate = 15.68 L/s
 Proposed Sanitary Flow = 1.93 L/s
 Storm Allowable Release Rate = 13.75 L/s

<-2-Yr Release Rate

<- Note that the proposed Dry Weather Flow was used as infiltration will be accounted for through storm calculations
 <-Total Combined Release Rate - Proposed Sanitary Flow

Post-development Stormwater Management

	Total Site Area =	0.2417	ha	ΣR=	ΣR ₂₈₅	ΣR ₁₀₀
Controlled	WS-14 (ROOF)	0.014	ha	R=	0.90	1.00
	WS-15 (ROOF)	0.019	ha	R=	0.90	1.00
	WS-16 (ROOF)	0.014	ha	R=	0.90	1.00
	WS-17 (ROOF)	0.016	ha	R=	0.90	1.00
	WS-18 (ROOF)	0.016	ha	R=	0.90	1.00
	WS-19 (CONTROLLED)	0.143	ha	R=	0.61	0.77
	Total Controlled =	0.222	ha	ΣR=	0.71	0.89
Un-controlled	WS-20 (UNCONTROLLED)	0.019	ha	R=	0.72	0.90
Total Un-Controlled =	0.019	ha	ΣR=	0.72	0.90	

Post-development Stormwater Management (Uncontrolled Catchment WS-20)

100 Year Storm Event:

I₁₀₀ = 1735.688 / (Td + 6.014)^{0.820} a = 1735.688 b = 0.820 C = 6.014

Time (min)	Intensity (mm/hr)	Uncontrolled Runoff (L/s)	Controlled Release Rate Constant (L/s)	Total Release Rate (L/s)
10	178.6	8.64	0.00	8.64

Post-development Stormwater Management (WS-19)

100 Year Storm Event:

I₁₀₀ = 1735.688 / (Td + 6.014)^{0.820} a = 1735.688 b = 0.820 C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	54.49	31.71	1.64	0.00	1.64
15	142.9	43.61	37.77	1.64	0.00	1.64
20	120.0	36.61	41.96	1.64	0.00	1.64
25	103.8	31.69	45.08	1.64	0.00	1.64
30	91.9	28.04	47.52	1.64	0.00	1.64
35	82.6	25.20	49.48	1.64	0.00	1.64
40	75.1	22.93	51.11	1.64	0.00	1.64
45	69.1	21.07	52.47	1.64	0.00	1.64
50	64.0	19.52	53.64	1.64	0.00	1.64
60	55.9	17.06	55.51	1.64	0.00	1.64
70	49.8	15.20	56.94	1.64	0.00	1.64
80	45.0	13.73	58.04	1.64	0.00	1.64
90	41.1	12.55	58.90	1.64	0.00	1.64
100	37.9	11.57	59.57	1.64	0.00	1.64
110	35.2	10.74	60.09	1.64	0.00	1.64
120	32.9	10.04	60.48	1.64	0.00	1.64

Total Storage Required = 60.48 m³
 Available CISTERN Storage = 65.00 m³ refer to LRL Plan C.601



LRL File No. 200436
 Project: Multi-Storey Mixed-Use BLDG
 Location: 700-770 Bronson
 Date: June 2, 2023
 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 2 OUTLET - Cambridge Street S

Post-development Stormwater Management (WS-14 On Roof)

Associated with Roof Drain 18

100 Year Storm Event:

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **a = 1735.688** **b = 0.820** **C = 6.014**

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	6.75	3.67	0.63	0.00	0.63
15	142.9	5.40	4.29	0.63	0.00	0.63
20	120.0	4.53	4.68	0.63	0.00	0.63
25	103.8	3.92	4.94	0.63	0.00	0.63
30	91.9	3.47	5.11	0.63	0.00	0.63
35	82.6	3.12	5.23	0.63	0.00	0.63
40	75.1	2.84	5.30	0.63	0.00	0.63
45	69.1	2.61	5.34	0.63	0.00	0.63
50	64.0	2.42	5.36	0.63	0.00	0.63
60	55.9	2.11	5.33	0.63	0.00	0.63
70	49.8	1.88	5.25	0.63	0.00	0.63
80	45.0	1.70	5.13	0.63	0.00	0.63
90	41.1	1.55	4.99	0.63	0.00	0.63
100	37.9	1.43	4.81	0.63	0.00	0.63
110	35.2	1.33	4.62	0.63	0.00	0.63
120	32.9	1.24	4.41	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 5.36 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Effective Roof Surface = 121 m²
Available Roof Storage = 6.05 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required = 5.36 m³
Available Roof Storage = 6.05 m³ refer to LRL Plan C.601



$V = (l*w)*h/3 = Ah/3$

Post-development Stormwater Management (WS-15 On Roof)

Associated with Roof Drain 19

100 Year Storm Event:

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **a = 1735.688** **b = 0.820** **C = 6.014**

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	9.62	5.40	0.63	0.00	0.63
15	142.9	7.70	6.36	0.63	0.00	0.63
20	120.0	6.46	7.00	0.63	0.00	0.63
25	103.8	5.60	7.45	0.63	0.00	0.63
30	91.9	4.95	7.78	0.63	0.00	0.63
35	82.6	4.45	8.02	0.63	0.00	0.63
40	75.1	4.05	8.21	0.63	0.00	0.63
45	69.1	3.72	8.35	0.63	0.00	0.63
50	64.0	3.45	8.45	0.63	0.00	0.63
60	55.9	3.01	8.58	0.63	0.00	0.63
70	49.8	2.68	8.62	0.63	0.00	0.63
80	45.0	2.42	8.62	0.63	0.00	0.63
90	41.1	2.22	8.56	0.63	0.00	0.63
100	37.9	2.04	8.48	0.63	0.00	0.63
110	35.2	1.90	8.36	0.63	0.00	0.63
120	32.9	1.77	8.23	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 8.62 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Effective Roof Surface = 177 m²
Available Roof Storage = 8.87 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required = 8.62 m³
Available Roof Storage = 8.87 m³ refer to LRL Plan C.601



$V = (l*w)*h/3 = Ah/3$



LRL File No. 200436
 Project: Multi-Storey Mixed-Use BLDG
 Location: 700-770 Bronson
 Date: June 2, 2023
 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 2 OUTLET - Cambridge Street S

Post-development Stormwater Management (WS-16 On Roof)

Associated with Roof Drain 20

100 Year Storm Event:

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ $a = 1735.688$ $b = 0.820$ $C = 6.014$

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	6.93	3.78	0.63	0.00	0.63
15	142.9	5.55	4.43	0.63	0.00	0.63
20	120.0	4.66	4.83	0.63	0.00	0.63
25	103.8	4.03	5.10	0.63	0.00	0.63
30	91.9	3.57	5.29	0.63	0.00	0.63
35	82.6	3.21	5.41	0.63	0.00	0.63
40	75.1	2.92	5.49	0.63	0.00	0.63
45	69.1	2.68	5.54	0.63	0.00	0.63
50	64.0	2.48	5.56	0.63	0.00	0.63
60	55.9	2.17	5.54	0.63	0.00	0.63
70	49.8	1.93	5.47	0.63	0.00	0.63
80	45.0	1.75	5.36	0.63	0.00	0.63
90	41.1	1.60	5.22	0.63	0.00	0.63
100	37.9	1.47	5.05	0.63	0.00	0.63
110	35.2	1.37	4.86	0.63	0.00	0.63
120	32.9	1.28	4.66	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 5.56 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Effective Roof Surface = 127 m²
Available Roof Storage = 6.33 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required = 5.56 m³
Available Roof Storage = 6.33 m³ refer to LRL Plan C.601



$V = (L*w)*h/3 = Ah/3$

Post-development Stormwater Management (WS-17 On Roof)

Associated with Roof Drain 21

100 Year Storm Event:

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ $a = 1735.688$ $b = 0.820$ $C = 6.014$

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	8.10	4.29	0.95	0.00	0.95
15	142.9	6.48	4.98	0.95	0.00	0.95
20	120.0	5.44	5.39	0.95	0.00	0.95
25	103.8	4.71	5.64	0.95	0.00	0.95
30	91.9	4.17	5.79	0.95	0.00	0.95
35	82.6	3.75	5.87	0.95	0.00	0.95
40	75.1	3.41	5.90	0.95	0.00	0.95
45	69.1	3.13	5.89	0.95	0.00	0.95
50	64.0	2.90	5.86	0.95	0.00	0.95
60	55.9	2.54	5.71	0.95	0.00	0.95
70	49.8	2.26	5.50	0.95	0.00	0.95
80	45.0	2.04	5.24	0.95	0.00	0.95
90	41.1	1.87	4.94	0.95	0.00	0.95
100	37.9	1.72	4.62	0.95	0.00	0.95
110	35.2	1.60	4.27	0.95	0.00	0.95
120	32.9	1.49	3.91	0.95	0.00	0.95

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 5.90 m³
 Watts Roof Drain Discharge = 0.0063 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.95 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.95 L/s
 Effective Roof Surface = 132 m²
Available Roof Storage = 6.59 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = 1/4 open)

Total Storage Required = 5.90 m³
Available Roof Storage = 6.59 m³ refer to LRL Plan C.601



$V = (L*w)*h/3 = Ah/3$



LRL File No. 200436
 Project: Multi-Storey Mixed-Use BLDG
 Location: 700-770 Bronson
 Date: June 2, 2023
 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 2 OUTLET - Cambridge Street S

Post-development Stormwater Management (WS-18 On Roof)

Associated with Roof Drain 22

100 Year Storm Event:

$$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$$

$$a = 1735.688$$

$$b = 0.820$$

$$C = 6.014$$

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	7.83	4.32	0.63	0.00	0.63
15	142.9	6.27	5.07	0.63	0.00	0.63
20	120.0	5.26	5.56	0.63	0.00	0.63
25	103.8	4.55	5.89	0.63	0.00	0.63
30	91.9	4.03	6.12	0.63	0.00	0.63
35	82.6	3.62	6.28	0.63	0.00	0.63
40	75.1	3.30	6.40	0.63	0.00	0.63
45	69.1	3.03	6.48	0.63	0.00	0.63
50	64.0	2.80	6.52	0.63	0.00	0.63
60	55.9	2.45	6.56	0.63	0.00	0.63
70	49.8	2.18	6.52	0.63	0.00	0.63
80	45.0	1.97	6.45	0.63	0.00	0.63
90	41.1	1.80	6.33	0.63	0.00	0.63
100	37.9	1.66	6.19	0.63	0.00	0.63
110	35.2	1.54	6.03	0.63	0.00	0.63
120	32.9	1.44	5.85	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) =	6.56	m ³
Watts Roof Drain Discharge =	0.0042	L/s/mm
Proposed Head =	150	mm
Control Flow/Drain =	0.63	L/s
Number of Roof Drains =	1	
Total Flow from Roof Drain =	0.63	L/s
Effective Roof Surface =	145	m ²
Available Roof Storage =	7.27	m³
Roof Drain Model =	Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)	

*An Emergency overflow scupper is provided above this height.



$$V = (1/3) * W * h/3 = Ah/3$$

Total Storage Required =	6.56	m³
Available Roof Storage =	7.27	m³

refer to LRL Plan C.601

Summary of Release Rates and Storage Volumes For PHASE 2

Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m3)	Total Available Storage (m3)
WS-14 (ROOF)	R.D.18	0.014	0.63	5.36	6.05
WS-15 (ROOF)	R.D.19	0.019	0.63	8.62	8.87
WS-16 (ROOF)	R.D.20	0.014	0.63	5.56	6.33
WS-17 (ROOF)	R.D.21	0.016	0.95	5.90	6.59
WS-18 (ROOF)	R.D.22	0.016	0.63	6.56	7.27
WS-19 (CONTROLLED)	*Cistern	0.143	1.64	60.48	65.00
WS-20 (UNCONTROLLED)		0.019	8.64	0.00	0.00
TOTAL		0.242	13.75	92.48	100.11

* Flow from R.D.23/24, Phase 2 Trench Drain, A.D.1/2, CB



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 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 1 OUTLET - Bronson Avenue

Runoff Equation

Q = 2.78CIA (L/s)
 C = Runoff coefficient
 I = Rainfall intensity (mm/hr)
 A = Area (ha)
 T_c = Time of concentration (min)

$$= A / (T_d + C)^B$$

Pre-development Stormwater Management

$I_2 = 732.95 / (T_d + 6.199)^{0.81}$ a = 732.951 b = 0.81 C = 6.199

C = 0.40
 I = 76.8 mm/hr
 T_c = 10 min
 Total Area = 0.273 ha

2-Yr Allowable Release Rate = 23.29 L/s
 Proposed Sanitary Flow = 5.62 L/s

<-2-Yr Release Rate
 <- Note that the proposed Dry Weather Flow was used as infiltration will be accounted for through storm calculations
 <-Total Allowable Release Rate - Proposed Sanitary Flow

Allotted Storm Allowable Release Rate = 17.67 L/s

Post-development Stormwater Management

	Total Site Area =	0.215	ha	ΣR=	ΣR _{2&5}	ΣR ₁₀₀
Controlled	WS-01 (ROOF)	0.009	ha	R=	0.90	1.00
	WS-02 (ROOF)	0.016	ha	R=	0.90	1.00
	WS-03 (ROOF)	0.007	ha	R=	0.90	1.00
	WS-04 (ROOF)	0.011	ha	R=	0.90	1.00
	WS-05 (ROOF)	0.011	ha	R=	0.90	1.00
	WS-06 (ROOF)	0.007	ha	R=	0.90	1.00
	WS-07 (ROOF)	0.011	ha	R=	0.90	1.00
	WS-08 (ROOF)	0.018	ha	R=	0.90	1.00
	WS-09 (ROOF)	0.011	ha	R=	0.90	1.00
	WS-10 (ROOF)	0.006	ha	R=	0.90	1.00
	WS-11 (ROOF)	0.011	ha	R=	0.90	1.00
	WS-12 (CONTROLLED)	0.085	ha	R=	0.84	1.00
	Total Controlled =	0.202	ha	ΣR=	0.83	1.00
Uncontrolled	WS-13 (UNCONTROLLED)	0.012	ha	R=	0.71	0.89
		Total Un-Controlled =	0.012	ha	ΣR=	0.71

Post-development Stormwater Management (Uncontrolled Catchment WS-13)

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$ a = 1735.688 b = 0.820 C = 6.014

Time (min)	Intensity (mm/hr)	Uncontrolled Runoff (L/s)	Controlled Release Rate Constant (L/s)	Total Release Rate (L/s)
10	178.6	5.45	0.00	5.45

Post-development Stormwater Management (WS-12 Controlled)

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$ a = 1735.688 b = 0.820 C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required		Controlled Release Rate Constant (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)			
10	178.6	42.10	22.09	5.29	0.00	5.29
15	142.9	33.69	25.56	5.29	0.00	5.29
20	120.0	28.28	27.59	5.29	0.00	5.29
25	103.8	24.49	28.80	5.29	0.00	5.29
30	91.9	21.66	29.47	5.29	0.00	5.29
35	82.6	19.47	29.78	5.29	0.00	5.29
40	75.1	17.72	29.83	5.29	0.00	5.29
45	69.1	16.28	29.68	5.29	0.00	5.29
50	64.0	15.08	29.37	5.29	0.00	5.29
60	55.9	13.18	28.40	5.29	0.00	5.29
70	49.8	11.74	27.09	5.29	0.00	5.29
80	45.0	10.61	25.53	5.29	0.00	5.29
90	41.1	9.69	23.78	5.29	0.00	5.29
100	37.9	8.94	21.89	5.29	0.00	5.29
110	35.2	8.30	19.87	5.29	0.00	5.29
120	32.9	7.76	17.76	5.29	0.00	5.29

Total Storage Required = 29.83 m³
 Available CISTERN Storage = 30.00 m³ refer to LRL Plan C.601



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Post-development Stormwater Management (WS-01 On Roof)

Associated with Roof Drain 1

100 Year Storm Event:

$$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	4.45	2.29	0.63	0.00	0.63
15	142.9	3.56	2.64	0.63	0.00	0.63
20	120.0	2.99	2.83	0.63	0.00	0.63
25	103.8	2.59	2.94	0.63	0.00	0.63
30	91.9	2.29	2.99	0.63	0.00	0.63
35	82.6	2.06	3.00	0.63	0.00	0.63
40	75.1	1.87	2.98	0.63	0.00	0.63
45	69.1	1.72	2.94	0.63	0.00	0.63
50	64.0	1.59	2.89	0.63	0.00	0.63
60	55.9	1.39	2.75	0.63	0.00	0.63
70	49.8	1.24	2.56	0.63	0.00	0.63
80	45.0	1.12	2.36	0.63	0.00	0.63
90	41.1	1.02	2.13	0.63	0.00	0.63
100	37.9	0.94	1.89	0.63	0.00	0.63
110	35.2	0.88	1.63	0.63	0.00	0.63
120	32.9	0.82	1.36	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 3.00 m³
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 78 m²
Available Roof Storage = 3.89 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required =	3.00	m ³
Available Roof Storage =	3.89	m ³

refer to LRL Plan C.601



$$V = (L*W)*h/3 = Ah/3$$

Post-development Stormwater Management (WS-02 On Roof)

Associated with Roof Drain 2

100 Year Storm Event:

$$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	7.96	4.40	0.63	0.00	0.63
15	142.9	6.37	5.16	0.63	0.00	0.63
20	120.0	5.35	5.66	0.63	0.00	0.63
25	103.8	4.63	6.00	0.63	0.00	0.63
30	91.9	4.09	6.24	0.63	0.00	0.63
35	82.6	3.68	6.41	0.63	0.00	0.63
40	75.1	3.35	6.53	0.63	0.00	0.63
45	69.1	3.08	6.61	0.63	0.00	0.63
50	64.0	2.85	6.66	0.63	0.00	0.63
60	55.9	2.49	6.70	0.63	0.00	0.63
70	49.8	2.22	6.67	0.63	0.00	0.63
80	45.0	2.01	6.60	0.63	0.00	0.63
90	41.1	1.83	6.49	0.63	0.00	0.63
100	37.9	1.69	6.36	0.63	0.00	0.63
110	35.2	1.57	6.20	0.63	0.00	0.63
120	32.9	1.47	6.02	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 6.70 m³
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 140 m²
Available Roof Storage = 7.00 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required =	6.70	m ³
Available Roof Storage =	7.00	m ³

refer to LRL Plan C.601



$$V = (L*W)*h/3 = Ah/3$$



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Post-development Stormwater Management (WS-03 On Roof)

Associated with Roof Drain 3

100 Year Storm Event:

$$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	3.68	1.83	0.63	0.00	0.63
15	142.9	2.94	2.08	0.63	0.00	0.63
20	120.0	2.47	2.21	0.63	0.00	0.63
25	103.8	2.14	2.26	0.63	0.00	0.63
30	91.9	1.89	2.27	0.63	0.00	0.63
35	82.6	1.70	2.25	0.63	0.00	0.63
40	75.1	1.55	2.20	0.63	0.00	0.63
45	69.1	1.42	2.14	0.63	0.00	0.63
50	64.0	1.32	2.06	0.63	0.00	0.63
60	55.9	1.15	1.88	0.63	0.00	0.63
70	49.8	1.03	1.66	0.63	0.00	0.63
80	45.0	0.93	1.42	0.63	0.00	0.63
90	41.1	0.85	1.17	0.63	0.00	0.63
100	37.9	0.78	0.90	0.63	0.00	0.63
110	35.2	0.73	0.63	0.63	0.00	0.63
120	32.9	0.68	0.34	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 2.27 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 67 m²
Available Roof Storage = 3.36 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required = 2.27 m³
Available Roof Storage = 3.36 m³

refer to LRL Plan C.601

$$V = (l*w)*h/3 = Ah/3$$

Post-development Stormwater Management (WS-04 On Roof)

Associated with Roof Drain 4

100 Year Storm Event:

$$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	5.35	2.83	0.63	0.00	0.63
15	142.9	4.28	3.29	0.63	0.00	0.63
20	120.0	3.60	3.56	0.63	0.00	0.63
25	103.8	3.11	3.73	0.63	0.00	0.63
30	91.9	2.75	3.82	0.63	0.00	0.63
35	82.6	2.48	3.88	0.63	0.00	0.63
40	75.1	2.25	3.90	0.63	0.00	0.63
45	69.1	2.07	3.89	0.63	0.00	0.63
50	64.0	1.92	3.86	0.63	0.00	0.63
60	55.9	1.68	3.77	0.63	0.00	0.63
70	49.8	1.49	3.62	0.63	0.00	0.63
80	45.0	1.35	3.45	0.63	0.00	0.63
90	41.1	1.23	3.25	0.63	0.00	0.63
100	37.9	1.14	3.04	0.63	0.00	0.63
110	35.2	1.06	2.81	0.63	0.00	0.63
120	32.9	0.99	2.57	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 3.90 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 81 m²
Available Roof Storage = 4.03 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required = 3.90 m³
Available Roof Storage = 4.03 m³

refer to LRL Plan C.601

$$V = (l*w)*h/3 = Ah/3$$



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Post-development Stormwater Management (WS-05 On Roof)

Associated with Roof Drain 5

100 Year Storm Event:

$$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	5.60	2.98	0.63	0.00	0.63
15	142.9	4.48	3.47	0.63	0.00	0.63
20	120.0	3.76	3.76	0.63	0.00	0.63
25	103.8	3.26	3.94	0.63	0.00	0.63
30	91.9	2.88	4.05	0.63	0.00	0.63
35	82.6	2.59	4.12	0.63	0.00	0.63
40	75.1	2.36	4.15	0.63	0.00	0.63
45	69.1	2.17	4.15	0.63	0.00	0.63
50	64.0	2.01	4.13	0.63	0.00	0.63
60	55.9	1.75	4.05	0.63	0.00	0.63
70	49.8	1.56	3.92	0.63	0.00	0.63
80	45.0	1.41	3.75	0.63	0.00	0.63
90	41.1	1.29	3.56	0.63	0.00	0.63
100	37.9	1.19	3.36	0.63	0.00	0.63
110	35.2	1.10	3.13	0.63	0.00	0.63
120	32.9	1.03	2.89	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 4.15 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 97 m²
Available Roof Storage = 4.83 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required =	4.15	m ³
Available Roof Storage =	4.83	m ³

refer to LRL Plan C.601

$$V = (I * w) * h / 3 = Ah / 3$$

Post-development Stormwater Management (WS-06 On Roof)

Associated with Roof Drain 7

100 Year Storm Event:

$$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	3.30	1.60	0.63	0.00	0.63
15	142.9	2.64	1.81	0.63	0.00	0.63
20	120.0	2.22	1.90	0.63	0.00	0.63
25	103.8	1.92	1.93	0.63	0.00	0.63
30	91.9	1.70	1.92	0.63	0.00	0.63
35	82.6	1.53	1.88	0.63	0.00	0.63
40	75.1	1.39	1.82	0.63	0.00	0.63
45	69.1	1.28	1.74	0.63	0.00	0.63
50	64.0	1.18	1.65	0.63	0.00	0.63
60	55.9	1.03	1.45	0.63	0.00	0.63
70	49.8	0.92	1.22	0.63	0.00	0.63
80	45.0	0.83	0.97	0.63	0.00	0.63
90	41.1	0.76	0.70	0.63	0.00	0.63
100	37.9	0.70	0.42	0.63	0.00	0.63
110	35.2	0.65	0.13	0.63	0.00	0.63
120	32.9	0.61	0.00	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 1.93 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 61 m²
Available Roof Storage = 3.03 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required =	1.93	m ³
Available Roof Storage =	3.03	m ³

refer to LRL Plan C.601

$$V = (I * w) * h / 3 = Ah / 3$$



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Post-development Stormwater Management (WS-07 On Roof)

Associated with Roof Drain 8

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	5.41	2.87	0.63	0.00	0.63
15	142.9	4.33	3.33	0.63	0.00	0.63
20	120.0	3.63	3.60	0.63	0.00	0.63
25	103.8	3.14	3.77	0.63	0.00	0.63
30	91.9	2.78	3.87	0.63	0.00	0.63
35	82.6	2.50	3.93	0.63	0.00	0.63
40	75.1	2.28	3.95	0.63	0.00	0.63
45	69.1	2.09	3.94	0.63	0.00	0.63
50	64.0	1.94	3.92	0.63	0.00	0.63
60	55.9	1.69	3.82	0.63	0.00	0.63
70	49.8	1.51	3.69	0.63	0.00	0.63
80	45.0	1.36	3.51	0.63	0.00	0.63
90	41.1	1.24	3.32	0.63	0.00	0.63
100	37.9	1.15	3.11	0.63	0.00	0.63
110	35.2	1.07	2.88	0.63	0.00	0.63
120	32.9	1.00	2.63	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 3.95 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 100 m²
Available Roof Storage = 4.98 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required =	3.95	m ³
Available Roof Storage =	4.98	m ³

refer to LRL Plan C.601

$V = (1/3) * w * h^3 = Ah/3$

Post-development Stormwater Management (WS-08 On Roof)

Associated with Roof Drain 9

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	9.09	5.08	0.63	0.00	0.63
15	142.9	7.28	5.98	0.63	0.00	0.63
20	120.0	6.11	6.57	0.63	0.00	0.63
25	103.8	5.29	6.99	0.63	0.00	0.63
30	91.9	4.68	7.29	0.63	0.00	0.63
35	82.6	4.20	7.51	0.63	0.00	0.63
40	75.1	3.83	7.67	0.63	0.00	0.63
45	69.1	3.52	7.79	0.63	0.00	0.63
50	64.0	3.26	7.88	0.63	0.00	0.63
60	55.9	2.85	7.98	0.63	0.00	0.63
70	49.8	2.54	8.00	0.63	0.00	0.63
80	45.0	2.29	7.97	0.63	0.00	0.63
90	41.1	2.09	7.90	0.63	0.00	0.63
100	37.9	1.93	7.80	0.63	0.00	0.63
110	35.2	1.79	7.67	0.63	0.00	0.63
120	32.9	1.67	7.52	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 8.00 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 168 m²
Available Roof Storage = 8.41 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

*An Emergency overflow scupper is provided above this height.



Total Storage Required =	8.00	m ³
Available Roof Storage =	8.41	m ³

refer to LRL Plan C.601

$V = (1/3) * w * h^3 = Ah/3$



LRL File No. 200436
 Project: Multi-Storey Mixed-Use BLDG
 Location: 700-770 Bronson
 Date: June 2, 2023
 Designed: Tamara Harb
 Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 1 OUTLET - Bronson Avenue

Post-development Stormwater Management (WS-09 On Roof)

Associated with Roof Drain 10

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$ $a = 1735.688$ $b = 0.820$ $C = 6.014$

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	5.26	2.78	0.63	0.00	0.63
15	142.9	4.21	3.22	0.63	0.00	0.63
20	120.0	3.53	3.48	0.63	0.00	0.63
25	103.8	3.06	3.64	0.63	0.00	0.63
30	91.9	2.70	3.73	0.63	0.00	0.63
35	82.6	2.43	3.78	0.63	0.00	0.63
40	75.1	2.21	3.80	0.63	0.00	0.63
45	69.1	2.03	3.79	0.63	0.00	0.63
50	64.0	1.88	3.76	0.63	0.00	0.63
60	55.9	1.65	3.65	0.63	0.00	0.63
70	49.8	1.47	3.51	0.63	0.00	0.63
80	45.0	1.32	3.33	0.63	0.00	0.63
90	41.1	1.21	3.13	0.63	0.00	0.63
100	37.9	1.12	2.91	0.63	0.00	0.63
110	35.2	1.04	2.68	0.63	0.00	0.63
120	32.9	0.97	2.44	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 3.80 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 97 m²
Available Roof Storage = 4.87 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required = 3.80 m³
Available Roof Storage = 4.87 m³ refer to LRL Plan C.601



$V = (l*w)*h/3 = Ah/3$

Post-development Stormwater Management (WS-10 On Roof)

Associated with Roof Drain 11

100 Year Storm Event:

$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$ $a = 1735.688$ $b = 0.820$ $C = 6.014$

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	3.00	1.42	0.63	0.00	0.63
15	142.9	2.40	1.59	0.63	0.00	0.63
20	120.0	2.01	1.66	0.63	0.00	0.63
25	103.8	1.74	1.67	0.63	0.00	0.63
30	91.9	1.54	1.64	0.63	0.00	0.63
35	82.6	1.39	1.59	0.63	0.00	0.63
40	75.1	1.26	1.52	0.63	0.00	0.63
45	69.1	1.16	1.43	0.63	0.00	0.63
50	64.0	1.07	1.33	0.63	0.00	0.63
60	55.9	0.94	1.11	0.63	0.00	0.63
70	49.8	0.84	0.87	0.63	0.00	0.63
80	45.0	0.76	0.60	0.63	0.00	0.63
90	41.1	0.69	0.33	0.63	0.00	0.63
100	37.9	0.64	0.04	0.63	0.00	0.63
110	35.2	0.59	0.00	0.63	0.00	0.63
120	32.9	0.55	0.00	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) = 1.67 m³
 Watts Roof Drain Discharge = 0.0042 L/s/mm
 Proposed Head = 150 mm *An Emergency overflow scupper is provided above this height.
 Control Flow/Drain = 0.63 L/s
 Number of Roof Drains = 1
 Total Flow from Roof Drain = 0.63 L/s
 Available Roof Surface = 55 m²
Available Roof Storage = 2.74 m³
 Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)

Total Storage Required = 1.67 m³
Available Roof Storage = 2.74 m³ refer to LRL Plan C.601



$V = (l*w)*h/3 = Ah/3$



LRL File No. 200436
Project: Multi-Storey Mixed-Use BLDG
Location: 700-770 Bronson
Date: June 2, 2023
Designed: Tamara Harb
Drawing Ref.: C.601

Stormwater Management
 Design Sheet 100-Year post to 2-Year pre

PHASE 1 OUTLET - Bronson Avenue

Post-development Stormwater Management (WS-11 On Roof)

Associated with Roof Drain 12

100 Year Storm Event:

$$I_{100} = 1735.688 / (T_d + 6.014)^{0.820}$$

a = 1735.688

b = 0.820

C = 6.014

Time (min)	Intensity (mm/hr)	Storage Required			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate Constant (L/s)		
10	178.6	5.22	2.76	0.63	0.00	0.63
15	142.9	4.18	3.19	0.63	0.00	0.63
20	120.0	3.51	3.45	0.63	0.00	0.63
25	103.8	3.04	3.61	0.63	0.00	0.63
30	91.9	2.69	3.70	0.63	0.00	0.63
35	82.6	2.42	3.75	0.63	0.00	0.63
40	75.1	2.20	3.76	0.63	0.00	0.63
45	69.1	2.02	3.75	0.63	0.00	0.63
50	64.0	1.87	3.72	0.63	0.00	0.63
60	55.9	1.63	3.62	0.63	0.00	0.63
70	49.8	1.46	3.47	0.63	0.00	0.63
80	45.0	1.32	3.29	0.63	0.00	0.63
90	41.1	1.20	3.09	0.63	0.00	0.63
100	37.9	1.11	2.87	0.63	0.00	0.63
110	35.2	1.03	2.64	0.63	0.00	0.63
120	32.9	0.96	2.39	0.63	0.00	0.63

Summary of Roof Storage

Maximum Required Roof Storage (100 Year) =	3.76	m ³	
Watts Roof Drain Discharge =	0.0042	L/s/mm	
Proposed Head =	150	mm	*An Emergency overflow scupper is provided above this height.
Control Flow/Drain =	0.63	L/s	
Number of Roof Drains =	1		
Total Flow from Roof Drain =	0.63	L/s	
Available Roof Surface =	93	m ²	
Available Roof Storage =	4.63	m³	
Roof Drain Model = Watts Roof Drain with Adjustable Flow Setting (Watts RD-100-A-ADJ Weir Opening = Closed)			

Total Storage Required =	3.76	m³
Available Roof Storage =	4.63	m³

refer to LRL Plan C.601



$$V = (1/3) * W * h^3 = Ah/3$$

Summary of Release Rates and Storage Volumes For PHASE 1

Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m3)	Total Available Storage (m3)
WS-01 (ROOF)	R.D.1	0.009	0.63	3.00	3.89
WS-02 (ROOF)	R.D.2	0.016	0.63	6.70	7.00
WS-03 (ROOF)	R.D.3	0.007	0.63	2.27	3.36
WS-04 (ROOF)	R.D.4	0.011	0.63	3.90	4.03
WS-05 (ROOF)	R.D.5	0.011	0.63	4.15	4.83
WS-06 (ROOF)	R.D.7	0.007	0.63	1.93	3.03
WS-07 (ROOF)	R.D.8	0.011	0.63	3.95	4.98
WS-08 (ROOF)	R.D.9	0.018	0.63	8.00	8.41
WS-09 (ROOF)	R.D.10	0.011	0.63	3.80	4.87
WS-10 (ROOF)	R.D.11	0.006	0.63	1.67	2.74
WS-11 (ROOF)	R.D.12	0.011	0.63	3.76	4.63
WS-12 (CONTROLLED)	*Cistern	0.085	5.29	29.83	30.00
WS-13 (UNCONTROLLED)		0.012	5.45	0.00	0.00
TOTAL		0.215	17.67	72.96	81.78

* Flow from uncontrolled R.D.6/13/14/15/16/17, Phase 1 Trench Drain, A.D.3/4/5, CB

LRL Associates Ltd.
Storm Design Sheet



LRL File No. 200436
Project: Mixed-Use Bldg
Location: 770-774 Bronson Ave
Date: June 2, 2023
Designed: Tamara Harb
Drawing Reference: C.401

Storm Design Parameters

Rational Method Q = 2.78CIA

Q = Peak flow in litres per second (L/s)
 A = Drainage area in hectares (ha)
 C = Runoff coefficient
 I = Rainfall intensity (mm/hr)

Runoff Coefficient (C)
 Grass 0.20
 Gravel 0.80
 Asphalt / rooftop 0.90

Ottawa Macdonald-Cartier International Airport IDF curve
 equation (2 year event, intensity in mm/hr)
 $I_2 = 732.95 / (Td + 6.199)^{0.81}$
 Min. velocity = 0.80 m/s
 Manning's "n" = 0.013

LOCATION			AREA (ha)			FLOW						STORM SEWER							
WATERSHED / STREET	From	To	C = 0.20	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Controlled Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q _{FULL})
PHASE 1	BLDG	PROP MH1	0.008	0.000	0.195	0.492	0.49	10.00	76.8	37.75	12.23	250	PVC	2.00%	10.0	84.1	1.71	0.10	0.15
PHASE 2	BLDG	EX. STM	0.005	0.000	0.093	0.236	0.24	10.00	76.8	18.16	5.11	250	PVC	2.00%	10.1	84.1	1.71	0.10	0.06

ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

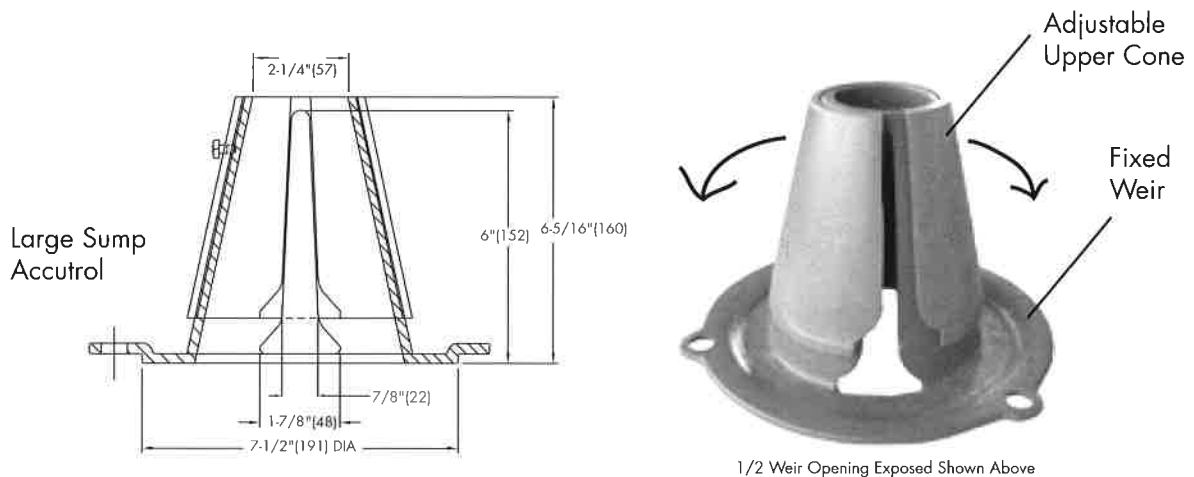
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.

Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2" of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3" of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
 [5 gpm(per inch of head) x 2 inches of head] + 2-1/2 gpm(for the third inch of head) = 12-1/2 gpm.


TABLE 1. Adjustable Accutrol Flow Rate Settings

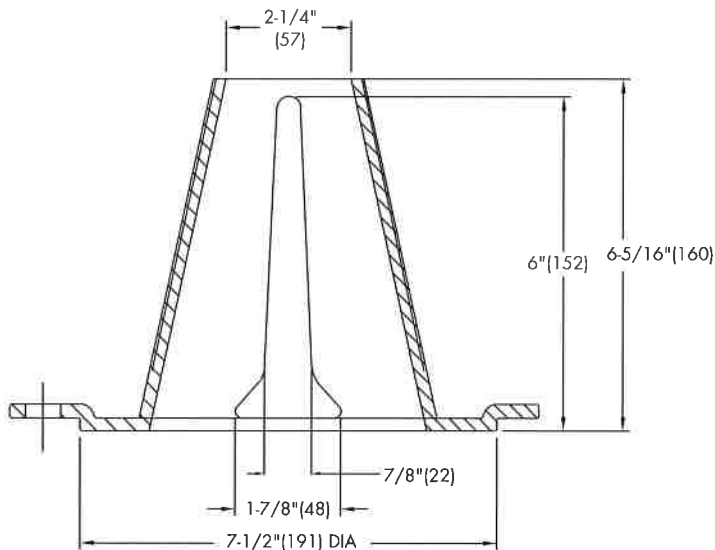
Weir Opening Exposed	Head of Water					
	1"	2"	3"	4"	5"	6"
Flow Rate (gallons per minute)						
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	10	10	10	10	10

Job Name _____ Model No. _____
 Job Location _____ Contractor _____
 Engineer _____ Representative _____

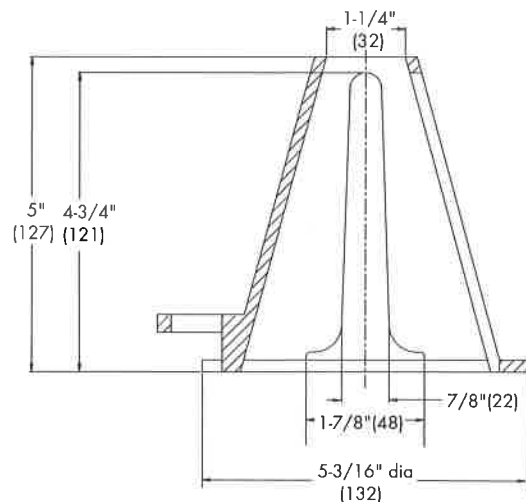
ACCUTROL WEIR FLOW CONTROL

SPECIFICATION: Watts Drainage Products epoxy coated cast iron Accutrol Weir is designed with parabolic openings which limit the flow of rain water off a roof. Each weir slot controls flow to 5 gpm per inch of head to a maximum of 30 gpm at 6" head (for large sump), 25 gpm at 5" head (for small sump). The Accutrol Weir is secured to the flashing clamp of the roof drain. The Accutrol Weir is available with 1 to 4 slots for the large sump drain and up to 3 slots for the small sump drain.

For Large Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-100-A2" for two slot weir)
For Small Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-200-A1" for one slot weir)



LARGE SUMP ACCUTROL WEIR



SMALL SUMP ACCUTROL WEIR

Job Name _____ Model No. _____

Job Location _____ Contractor _____

Engineer _____ Representative _____

APPENDIX E

Civil Engineering Drawings



EROSION AND SEDIMENT CONTROL MEASURES:

**** CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES ****

CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTIONS OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. PRIOR TO START OF CONSTRUCTION:

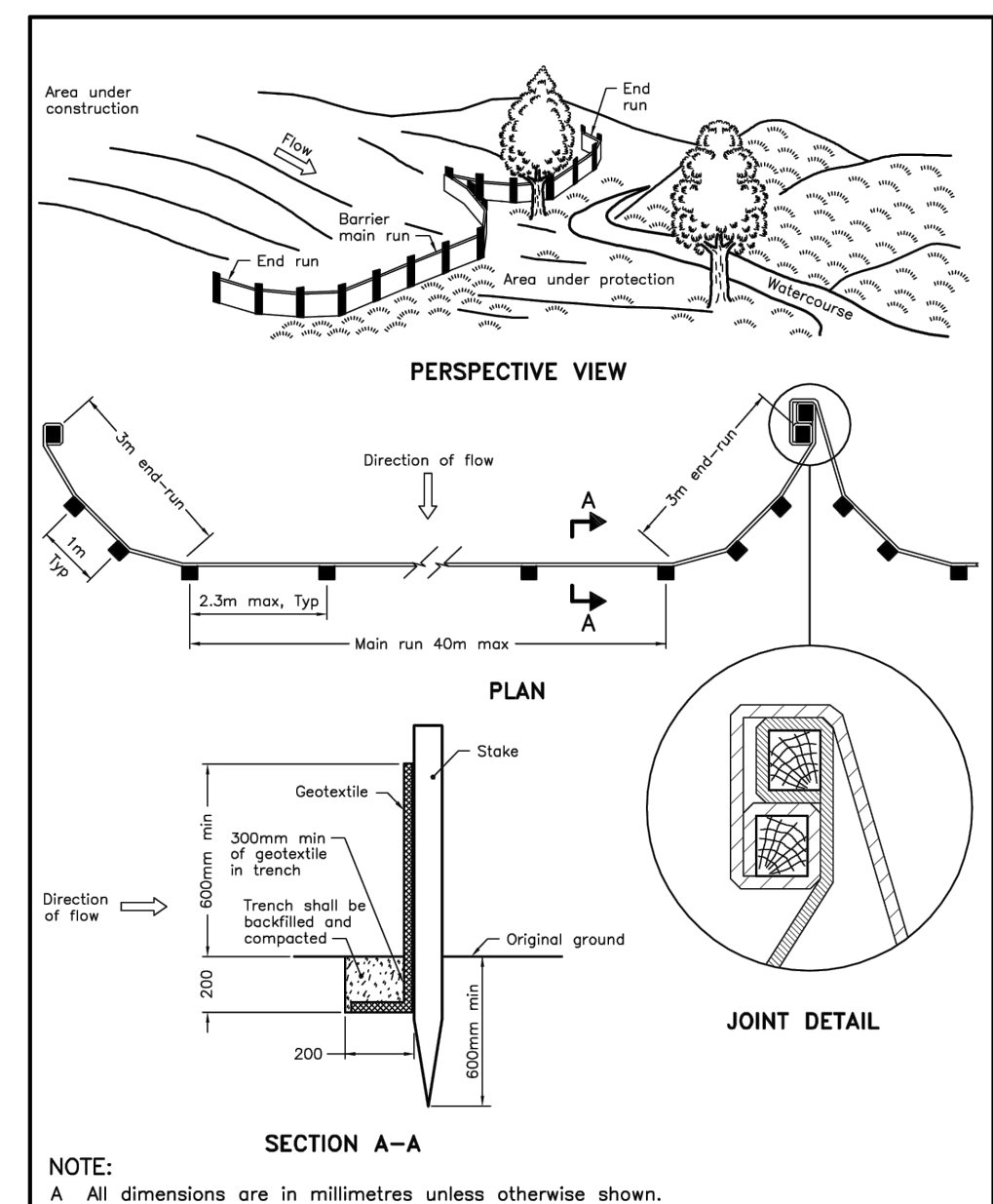
- PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL, AND CONSTRUCTION:
- INSTALL SILT FENCE IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED (SEE PLAN FOR LOCATION).
- INSTALL GEOSOCK INSERTS WITH AN OVERFLOW IN ALL THE DOWNSTREAM CATCHBASINS AND MANHOLES
- INSTALL SILT SOCK FILTERS IN ALL CONCRETE CATCH BASINS STRUCTURES
- INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.

2. DURING CONSTRUCTION:

- WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY TO SEPTEMBER ONLY.
- MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- PROTECT DISTURBED AREAS FROM RUNOFF.
- PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED WITHIN 30 DAYS.
- INSPECT SILT FENCES, FILTER CLOTHS AND CATCH BASIN SUMPS WEEKLY AND AFTER EVERY MAJOR STORM EVENT.
- CLEAN AND REPAIR WHEN NECESSARY.
- CONSTRUCT SWALES AS PER DETAIL.
- PLAN TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION
- EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES
- DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS).
- CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED).
- ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
- NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THIS CONSULTING ENGINEER AND THE CITY DEPARTMENT OF PUBLIC WORKS.
- CONTRACTOR RESPONSIBLE FOR CITY ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
- PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PREVENT MUD TRACKING ONTO PAVED SURFACES. GRAVEL BED SHALL BE A MINIMUM OF 15m LONG, 4M WIDE AND 0.3m DEEP AND SHALL CONSIST OF COARSE (50mm CRUSHED-RUN LIMESTONE) MATERIAL. MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.
- DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPPED.
- ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
- TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ADJACENT PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.

3. AFTER CONSTRUCTION:

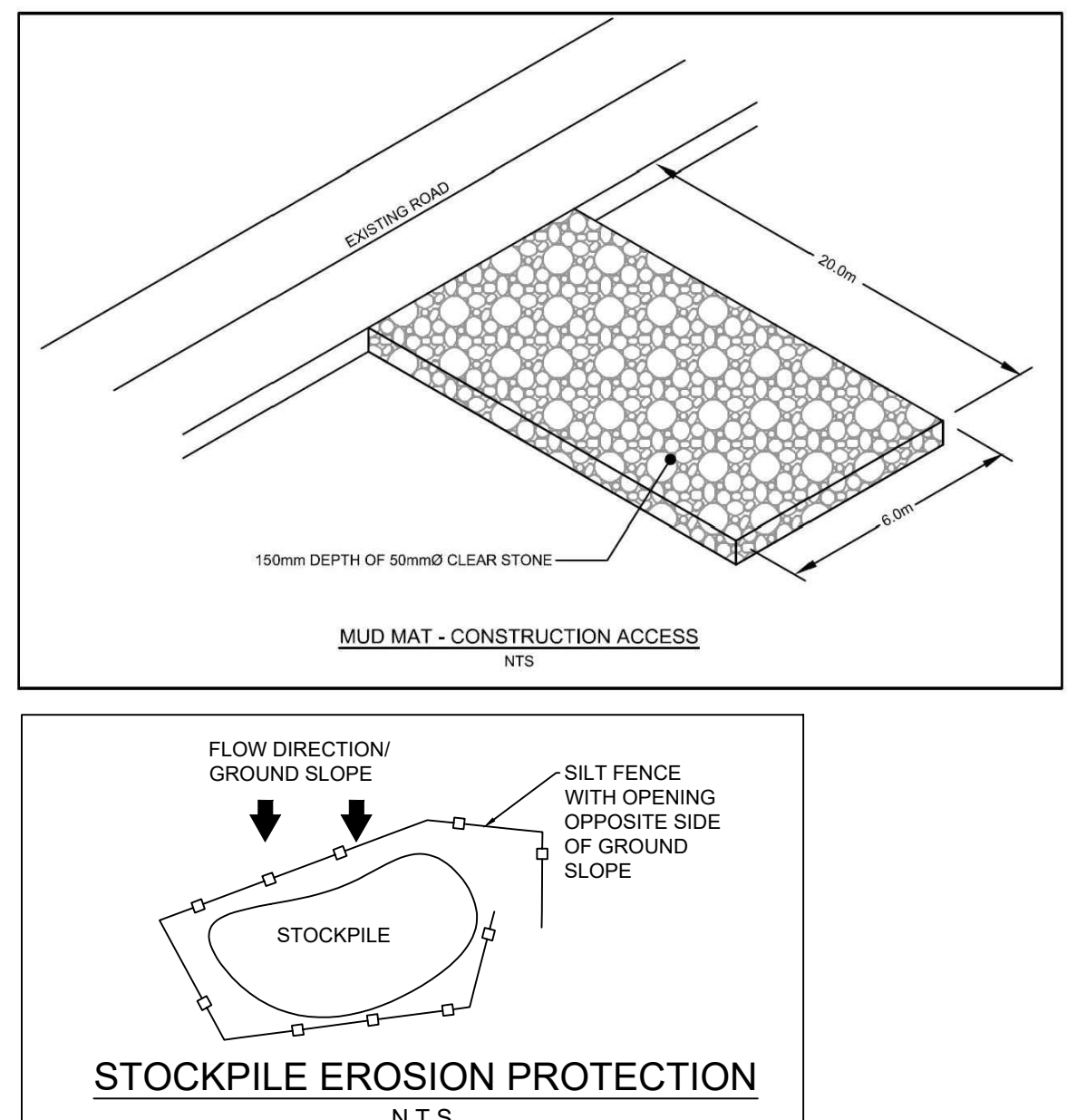
- PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
- REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED.
- INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.



ONTARIO PROVINCIAL STANDARD DRAWING Nov 2015 Rev 2

LIGHT-DUTY SILT FENCE BARRIER

OPSD 219.110



LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED FENCE
- PROPOSED DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
- PROPOSED RIP RAP
- PROPOSED ELEVATION
- PROPOSED HIGH POINT ELEVATION
- PROPOSED DEPRESSED CURB
- PROPOSED BOTTOM OF CURB / ASPHALT ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED EXPOSED BOTTOM OF RETAINING WALL
- PROPOSED TOP OF RETAINING WALL
- MATCH INTO EXISTING ELEVATION
- EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- PROPOSED 100mmØ PERFORATED SUBDRAIN
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING GAS LINE
- EXISTING MANHOLE
- EXISTING CATCHBASIN
- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- PROPOSED MANHOLE
- PROPOSED AREA DRAIN
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WATERSHED NAME
- RUNOFF COEFFICIENT
- AREA IN HECTARES

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE THE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CAD FILES OR OTHER ELECTRONIC MEDIA AND COPIES THEREOF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS ISSUED FOR CONSTRUCTION, THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATE THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY IRL ASSOCIATES LTD. (IRL) WITHOUT OBTAINING IRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES. THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST IRL AND TO RELEASE IRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS IRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO IRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF IRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH IRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

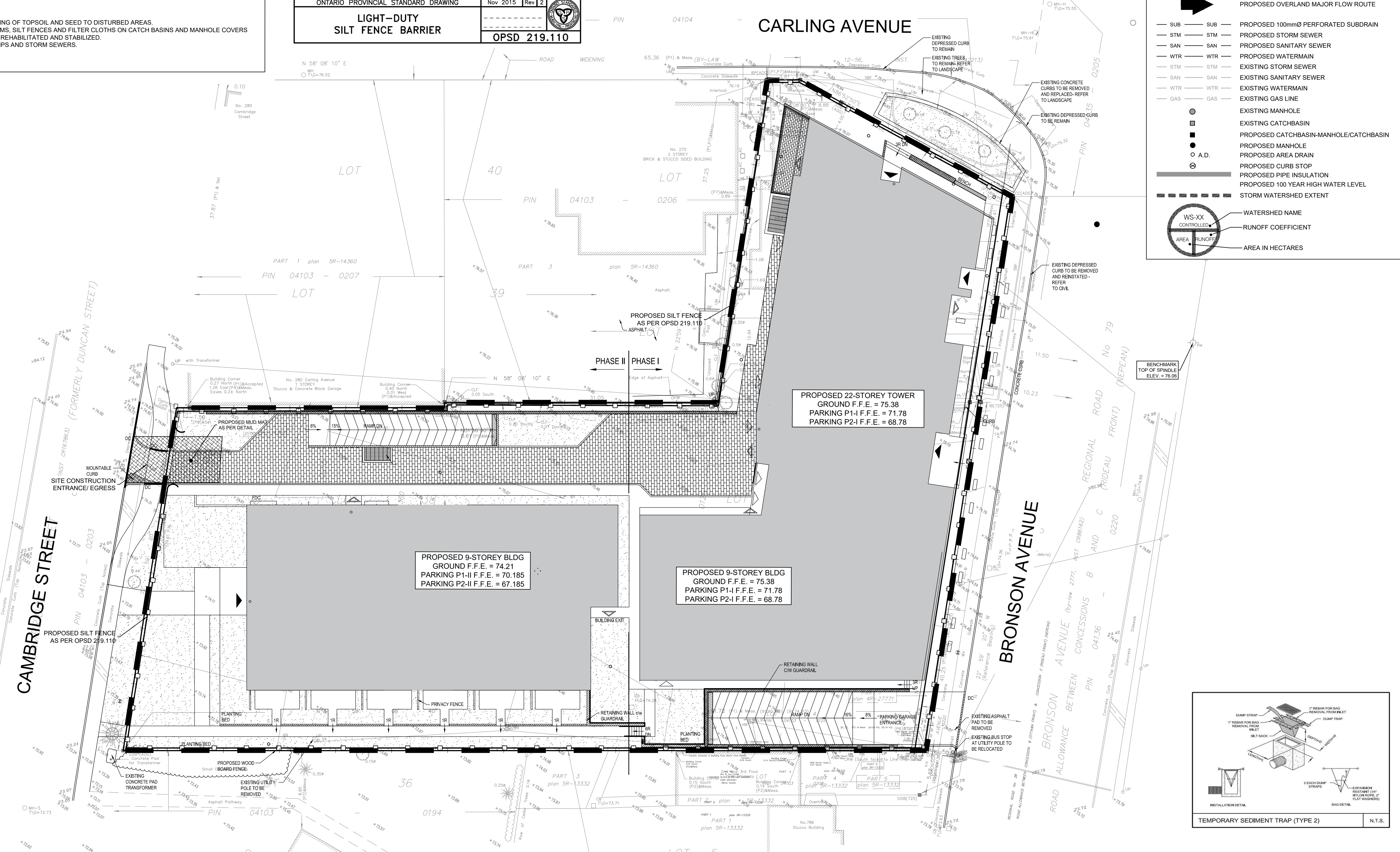
GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN WRITING THE LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND MODIFICATIONS, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES, AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

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SCALE: 1:250

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IRL
ENGINEERING | INGÉNIERIE
M. BASNET
100501996
23/06/14
PROVINCE OF ONTARIO

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LRJ
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT: **KATASA GROUP**
69 Rue Jean-Proulx unit #301
Gatineau, QC, J8V 1W2

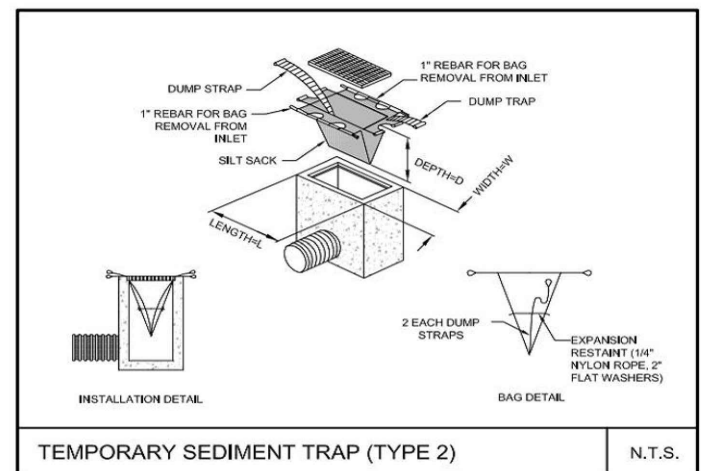
DESIGNED BY: T.H. DRAWN BY: T.H. APPROVED BY: M.B.

PROJECT: **770-774 BRONSON AVENUE**

DRAWING TITLE: **EROSION AND SEDIMENT CONTROL PLAN**

PROJECT NO: 200436 DATE: JUNE 2023

C101



D07-12-21-0108

Summary of Release Rates and Storage Volumes For PHASE 1					
Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m3)	Total Available Storage (m3)
WS-01 (ROOF)	R.D.1	0.009	0.63	3.00	3.89
WS-02 (ROOF)	R.D.2	0.016	0.63	6.70	7.00
WS-03 (ROOF)	R.D.3	0.007	0.63	2.27	3.36
WS-04 (ROOF)	R.D.4	0.011	0.63	3.90	4.03
WS-05 (ROOF)	R.D.5	0.011	0.63	4.15	4.83
WS-06 (ROOF)	R.D.7	0.007	0.63	1.93	3.03
WS-07 (ROOF)	R.D.8	0.011	0.63	3.95	4.98
WS-08 (ROOF)	R.D.9	0.018	0.63	8.00	8.41
WS-09 (ROOF)	R.D.10	0.011	0.63	3.80	4.87
WS-10 (ROOF)	R.D.11	0.006	0.63	1.67	2.74
WS-11 (ROOF)	R.D.12	0.011	0.63	3.76	4.63
WS-12 (CONTROLLED)	*Cistern	0.085	5.29	29.83	30.00
WS-13 (UNCONTROLLED)		0.012	5.45	0.00	0.00
TOTAL		0.215	17.67	72.96	81.78

* Flow from uncontrolled R.D.6/13/14/15/16/17, Phase 1 Trench Drain, A.D.3/4/5, CB

Summary of Release Rates and Storage Volumes For PHASE 2					
Catchment Area	Outlet	Drainage Area (ha)	100-year Release Rate (L/s)	100-Year Required Storage (m3)	Total Available Storage (m3)
WS-14 (ROOF)	R.D.18	0.014	0.63	5.36	6.05
WS-15 (ROOF)	R.D.19	0.019	0.63	8.62	8.87
WS-16 (ROOF)	R.D.20	0.014	0.63	5.56	6.33
WS-17 (ROOF)	R.D.21	0.016	0.95	5.90	6.59
WS-18 (ROOF)	R.D.22	0.016	0.63	6.56	7.27
WS-19 (CONTROLLED)	*Cistern	0.143	1.64	60.48	65.00
WS-20 (UNCONTROLLED)		0.019	8.64	0.00	0.00
TOTAL		0.242	13.75	92.48	100.11

* Flow from R.D.23/24, Phase 2 Trench Drain, A.D.1/2, CB

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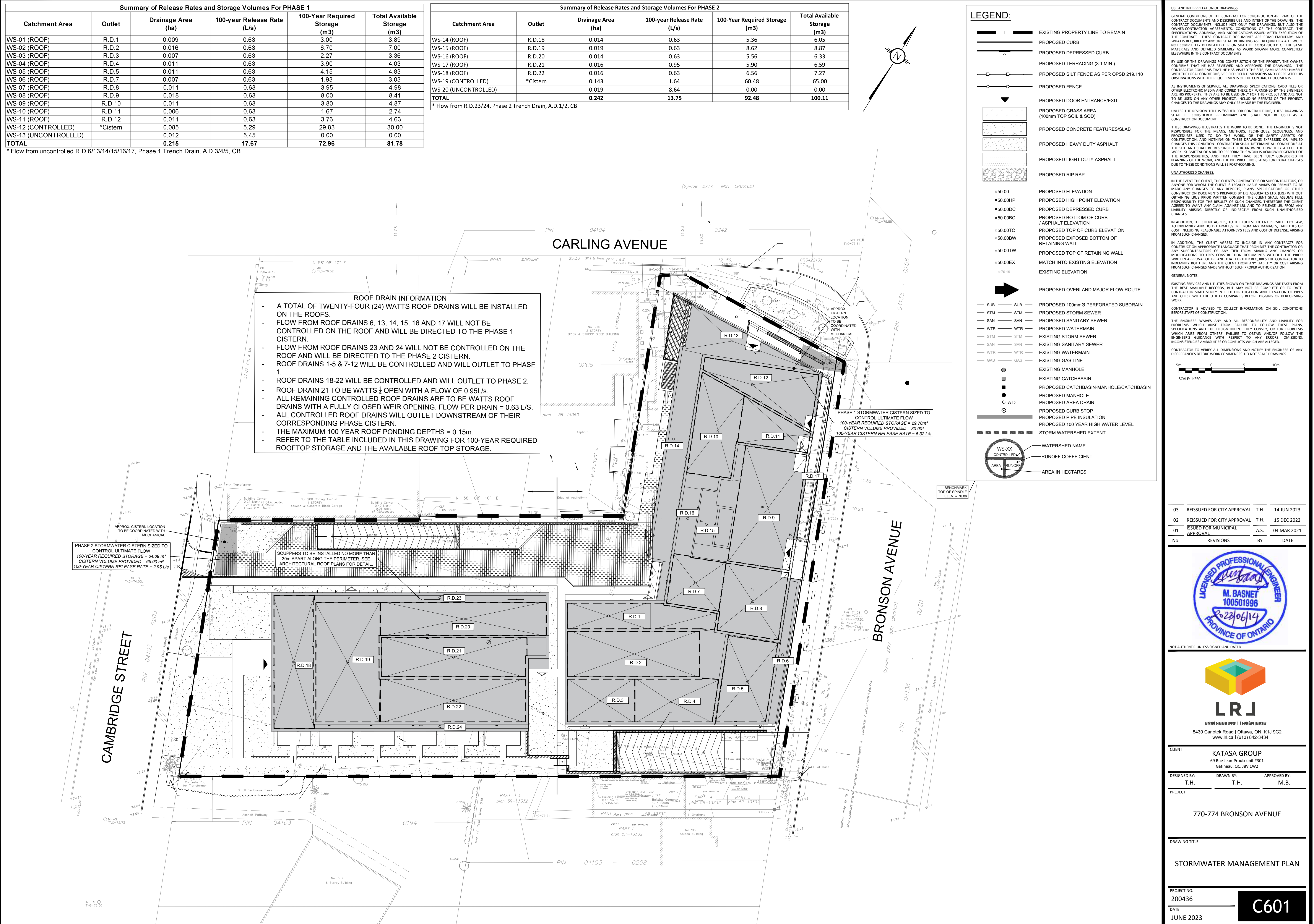
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ROOF DRAIN INFORMATION

- A TOTAL OF TWENTY-FOUR (24) WATTS ROOF DRAINS WILL BE INSTALLED ON THE ROOFS.
- FLOW FROM ROOF DRAINS 6, 13, 14, 15, 16 AND 17 WILL NOT BE CONTROLLED ON THE ROOF AND WILL BE DIRECTED TO THE PHASE 1 CISTERN.
- FLOW FROM ROOF DRAINS 23 AND 24 WILL NOT BE CONTROLLED ON THE ROOF AND WILL BE DIRECTED TO THE PHASE 2 CISTERN.
- ROOF DRAINS 1-5 & 7-12 WILL BE CONTROLLED AND WILL OUTLET TO PHASE 1.
- ROOF DRAINS 18-22 WILL BE CONTROLLED AND WILL OUTLET TO PHASE 2.
- ROOF DRAIN 21 TO BE WATTS OPEN WITH A FLOW OF 0.95L/s.
- ALL REMAINING CONTROLLED ROOF DRAINS ARE TO BE WATTS ROOF DRAINS WITH A FULLY CLOSED WEIR OPENING. FLOW PER DRAIN = 0.63 L/S.
- ALL CONTROLLED ROOF DRAINS WILL OUTLET DOWNSTREAM OF THEIR CORRESPONDING PHASE CISTERN.
- THE MAXIMUM 100 YEAR ROOF PONDING DEPTHS = 0.15m.
- REFER TO THE TABLE INCLUDED IN THIS DRAWING FOR 100-YEAR REQUIRED ROOFTOP STORAGE AND THE AVAILABLE ROOF TOP STORAGE.

PHASE 2 STORMWATER CISTERN SIZED TO CONTROL ULTIMATE FLOW
100-YEAR REQUIRED STORAGE = 64.09 m³
CISTERN VOLUME PROVIDED = 65.00 m³
100-YEAR CISTERN RELEASE RATE = 2.95 L/s

SCUPPERS TO BE INSTALLED NO MORE THAN 30m APART ALONG THE PERIMETER. SEE ARCHITECTURAL ROOF PLANS FOR DETAIL.



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CLIENT: **KATASA GROUP**
69 Rue Jean-Proulx unit #301
Gatineau, QC, J8V 1W2

DESIGNED BY: T.H. DRAWN BY: T.H. APPROVED BY: M.B.
PROJECT: **770-774 BRONSON AVENUE**

DRAWING TITLE: **STORMWATER MANAGEMENT PLAN**

PROJECT NO: **200436**
DATE: **JUNE 2023**
C601

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DESIGNED BY:	DRAWN BY:	APPROVED BY:
T.H.	T.H.	M.B.

PROJECT
770-774 BRONSON AVENUE

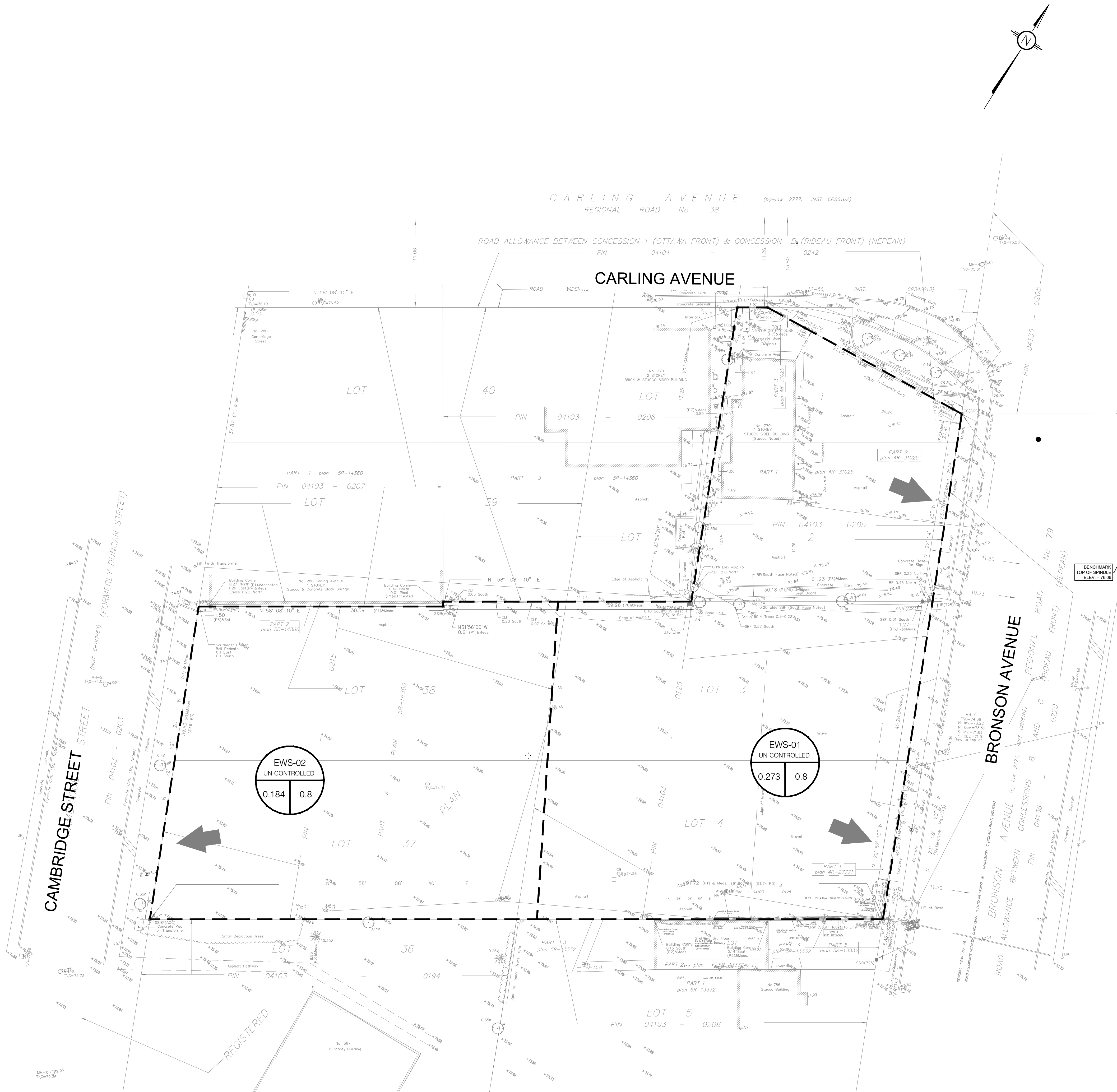
DRAWING TITLE
PRE-DEVELOPMENT WATERSHED PLAN

PROJECT NO.
200436

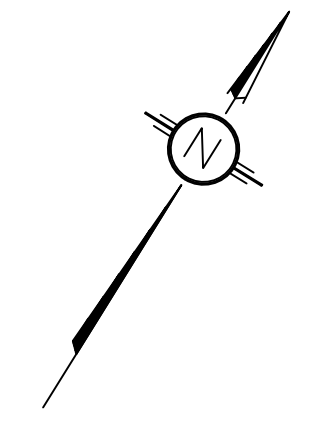
DATE
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C701

#18887



D07-12-21-0108



LEGEND:

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SCALE: 1:250

5m 0 5 10m

No.	REVISIONS	BY	DATE
03	REISSUED FOR CITY APPROVAL	T.H.	14 JUN 2023
02	REISSUED FOR CITY APPROVAL	T.H.	15 DEC 2022
01	ISSUED FOR MUNICIPAL APPROVAL	A.S.	04 MAR 2021



LRJ
ENGINEERING | INGÉNIÉRIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lri.ca | (613) 842-3434

CLIENT: **KATASA GROUP**
69 Rue Jean-Proulx unit #301
Gatineau, QC, J8V 1W2

DESIGNED BY: T.H. DRAWN BY: T.H. APPROVED BY: M.B.

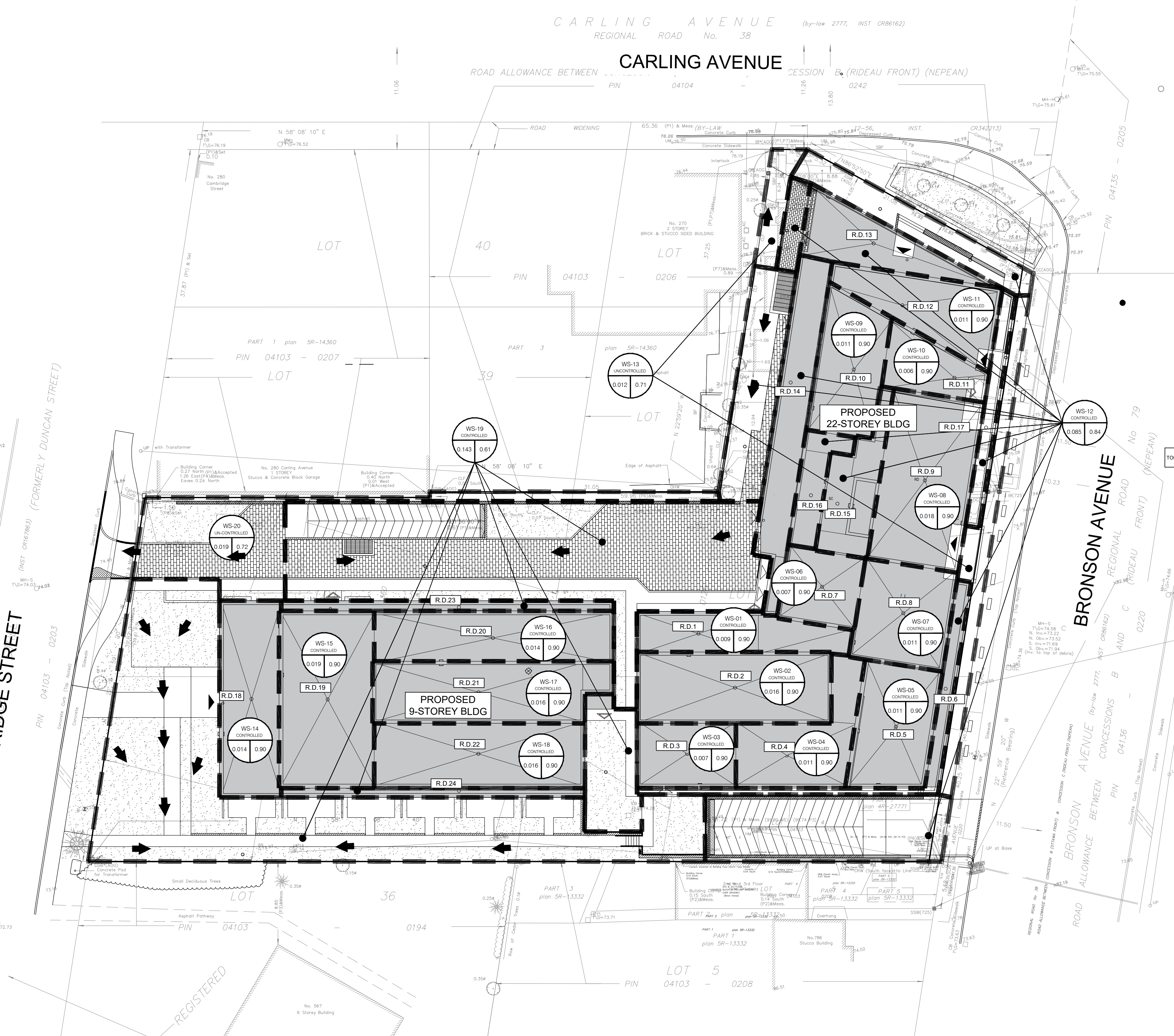
PROJECT: **770-774 BRONSON AVENUE**

DRAWING TITLE: **POST-DEVELOPMENT WATERSHED PLAN**

PROJECT NO.: **200436**
DATE: **JUNE 2023**

C702

#18887



CAMBRIDGE STREET

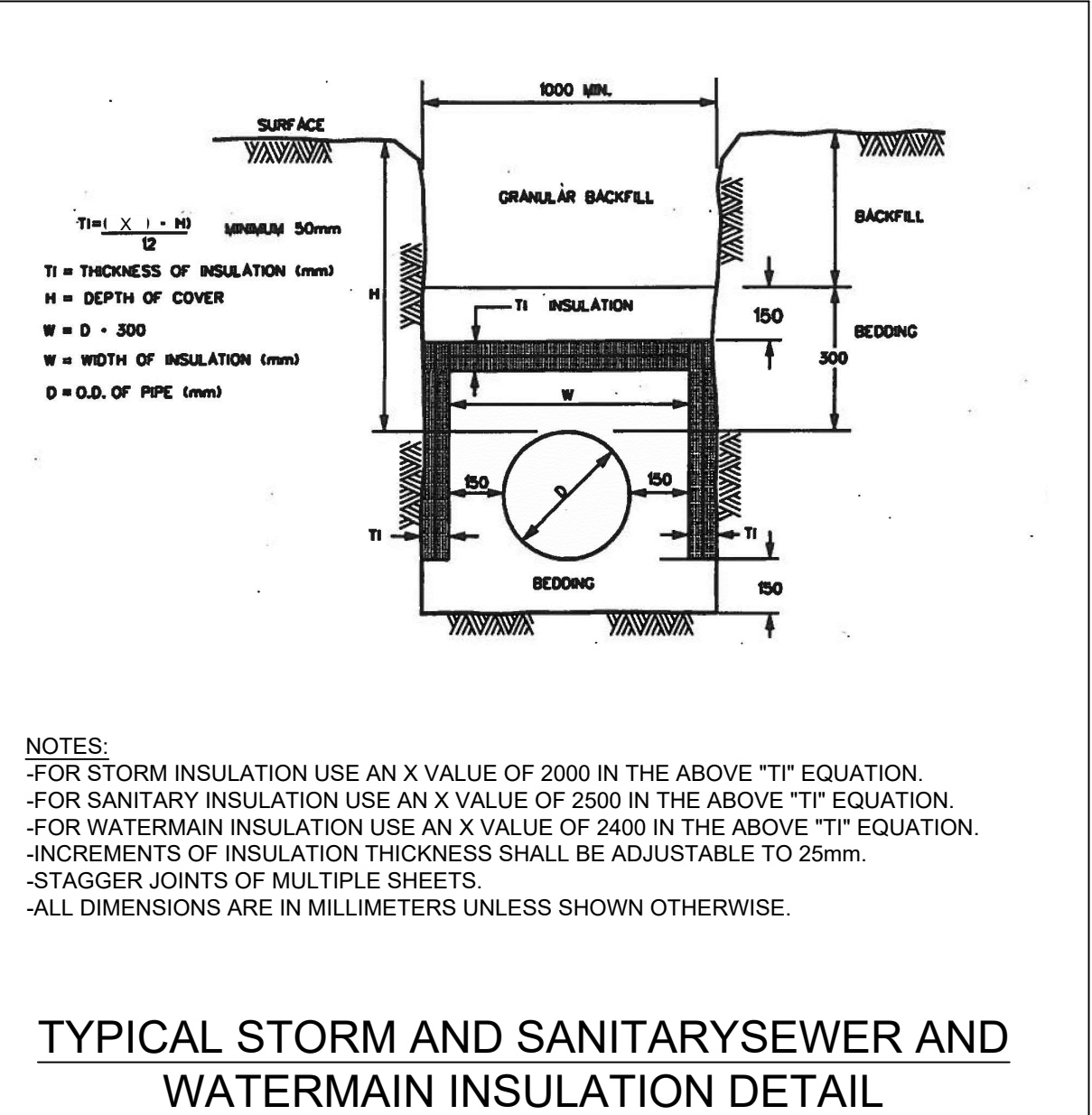
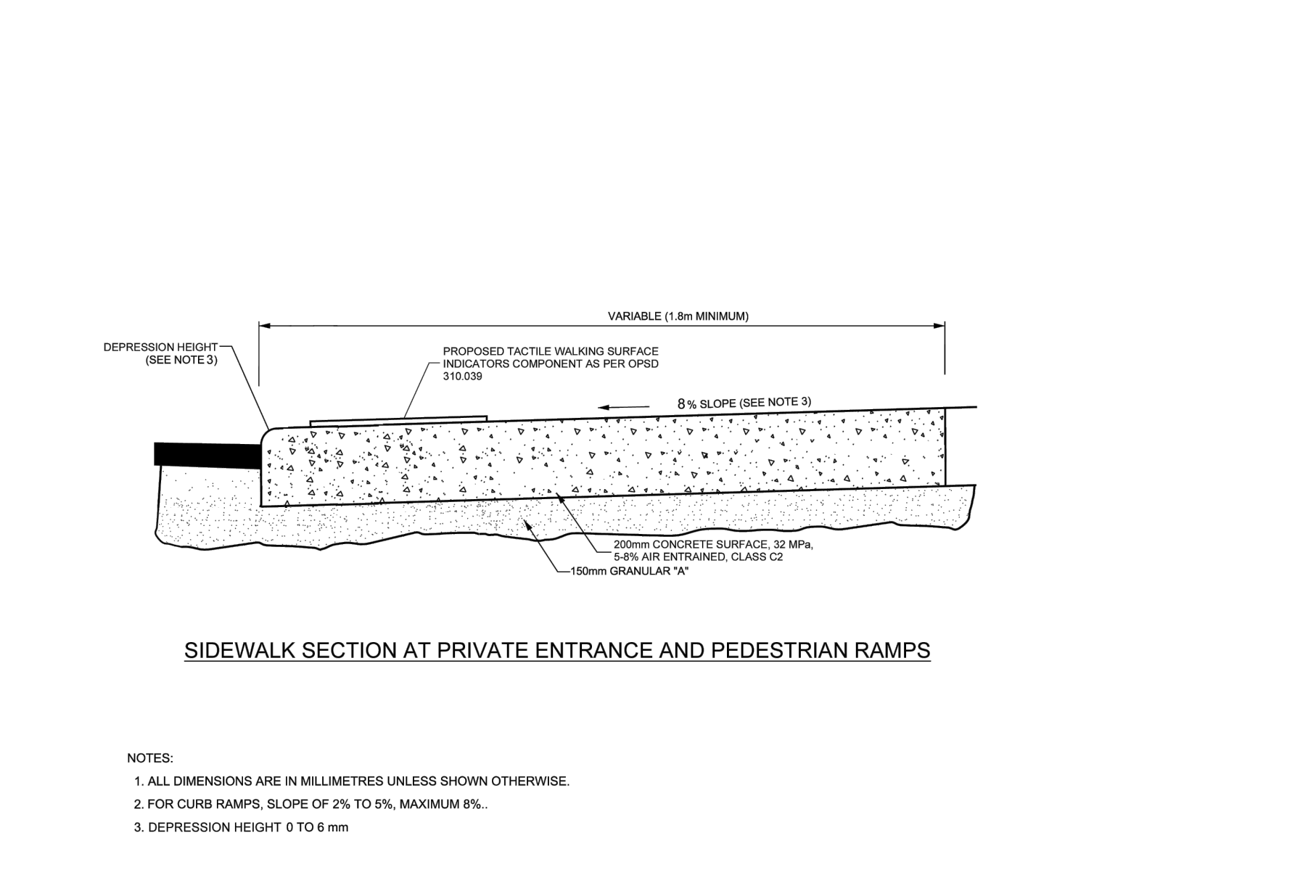
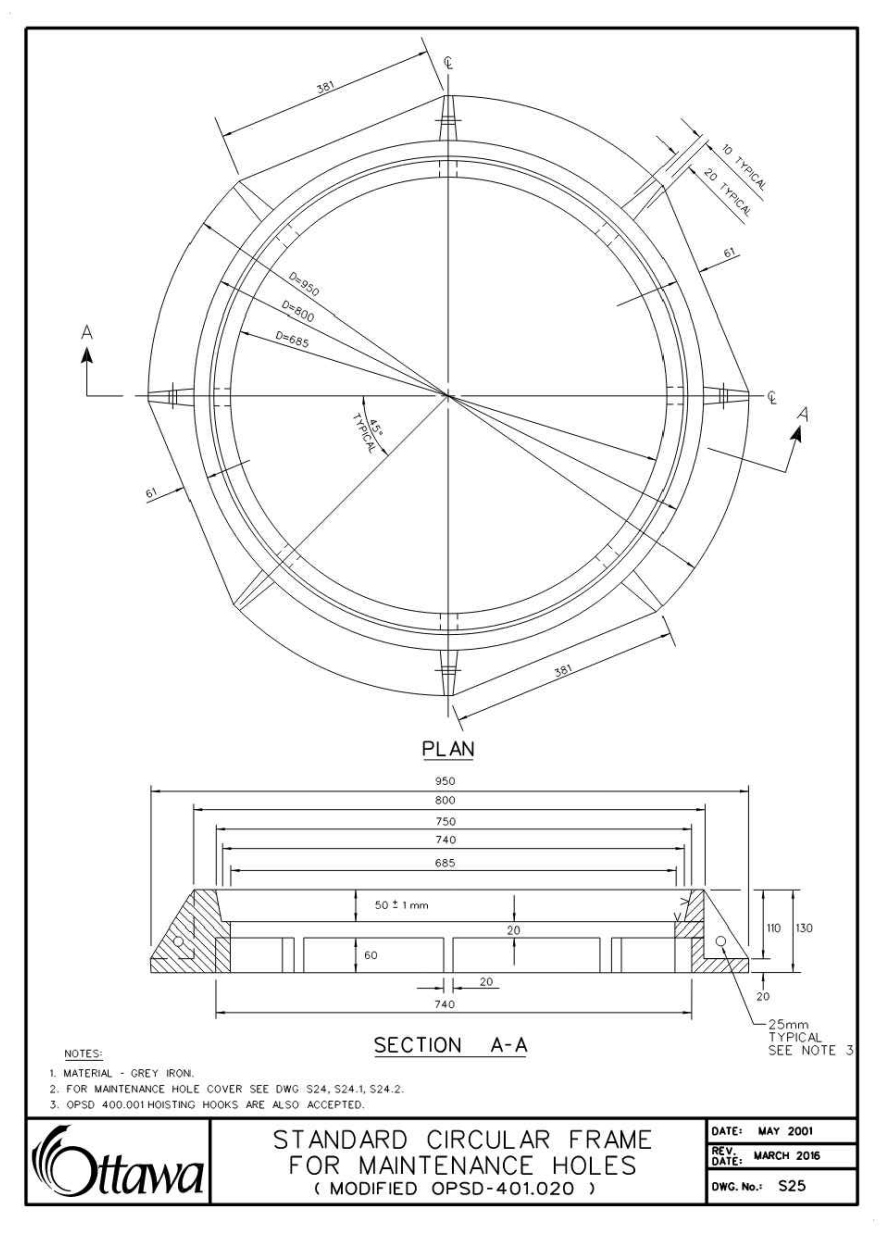
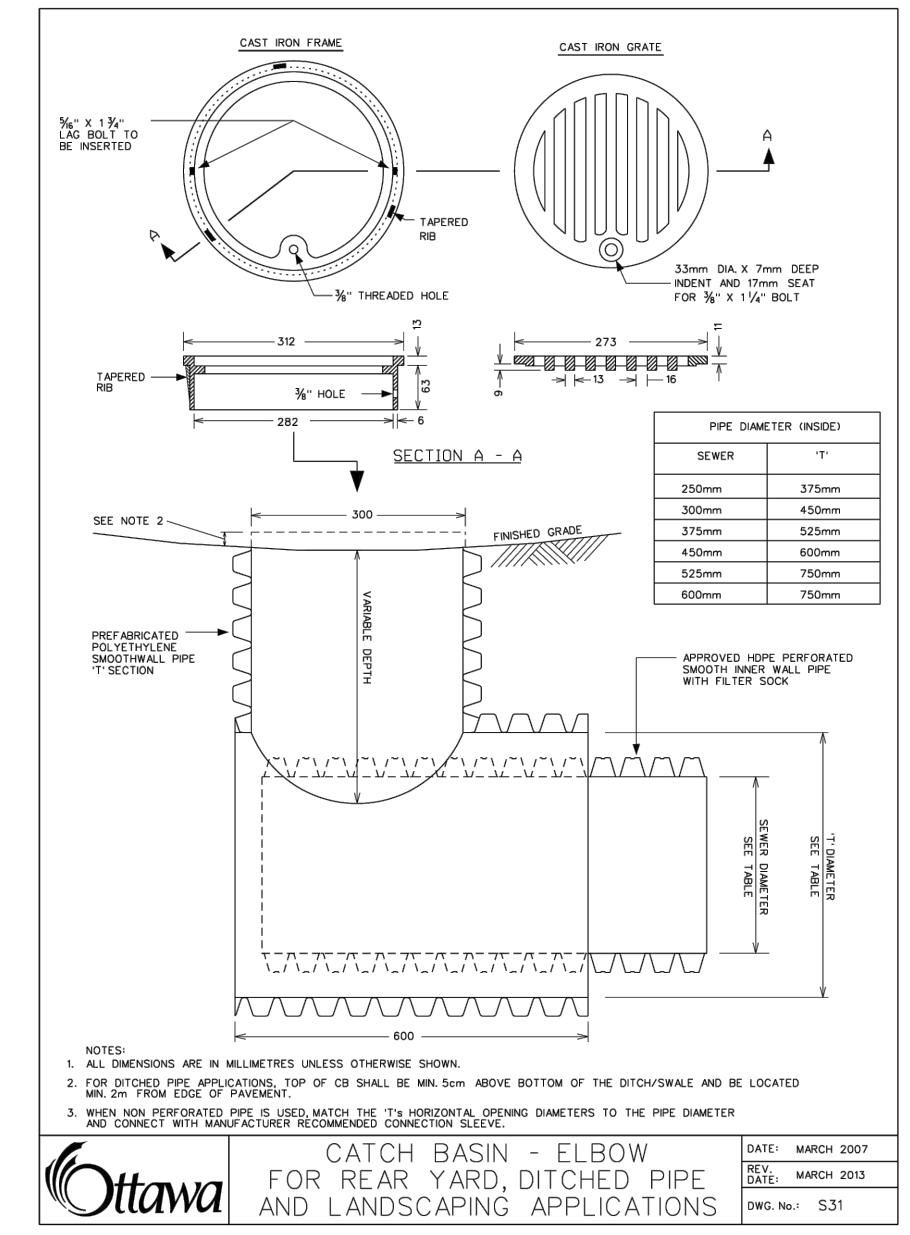
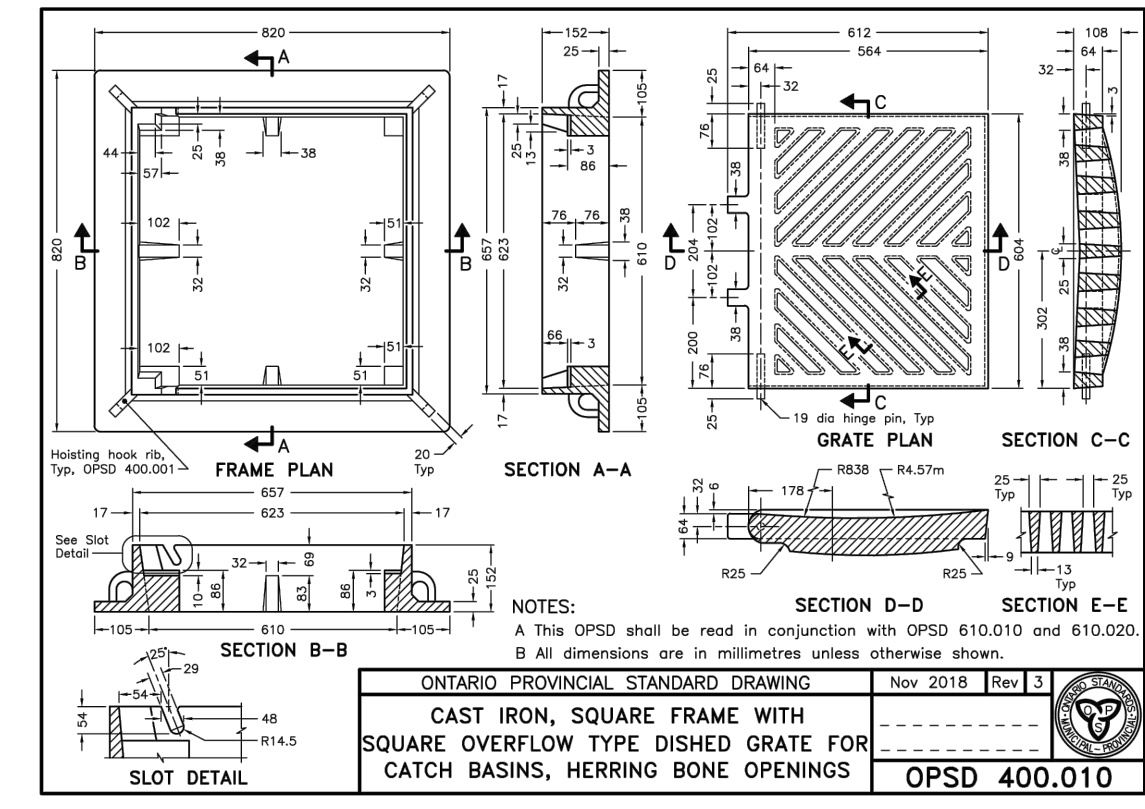
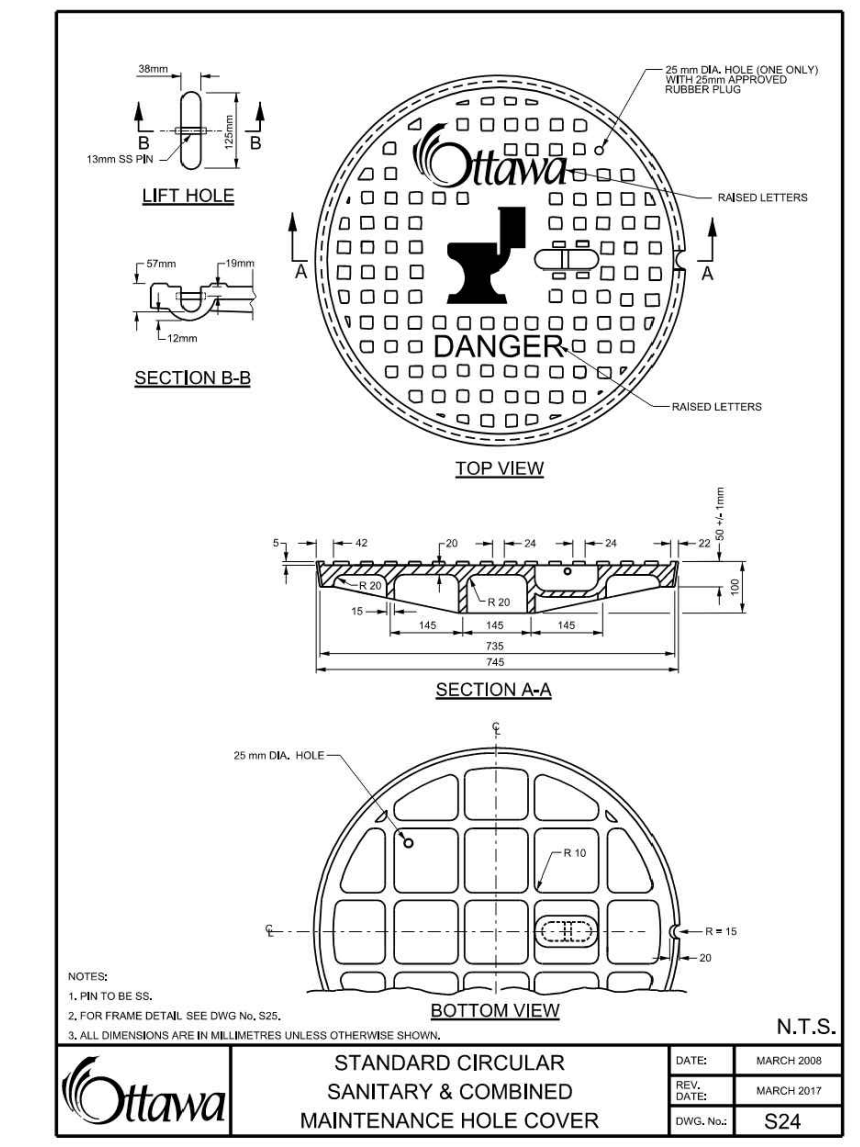
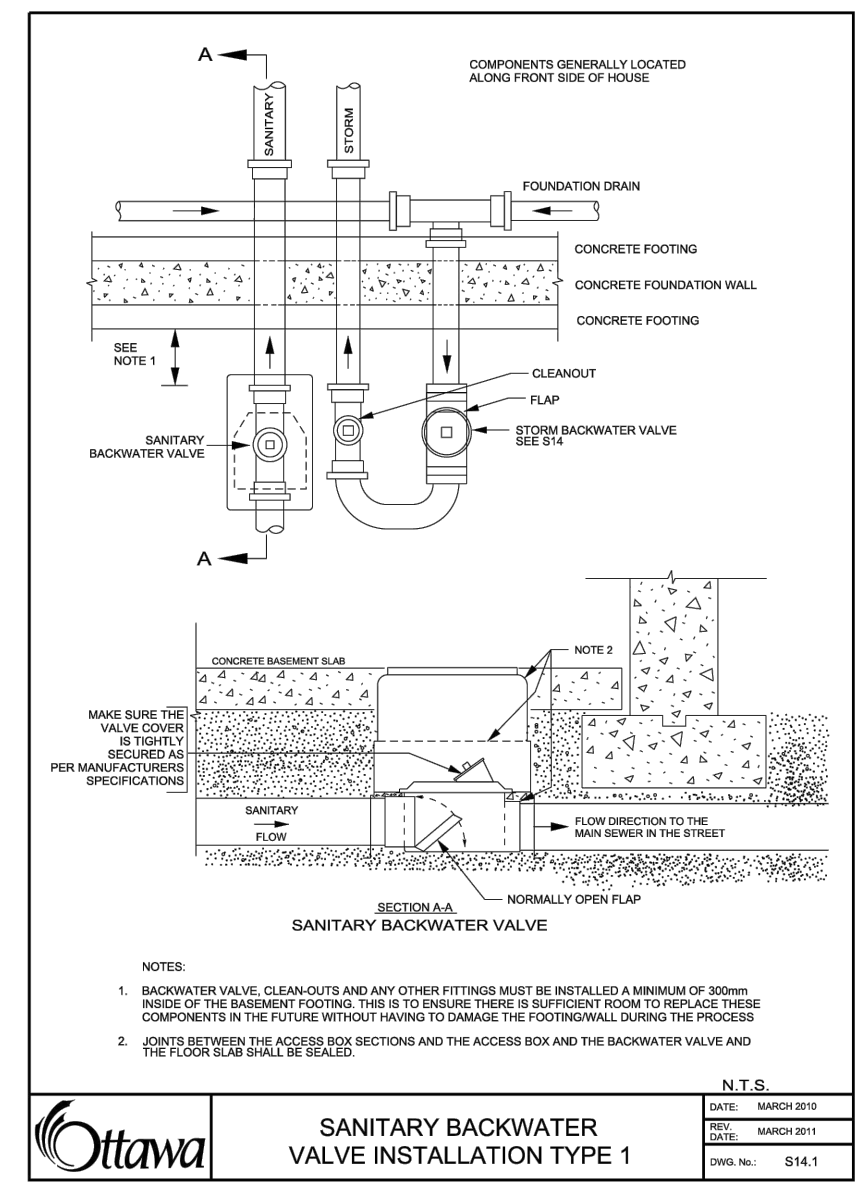
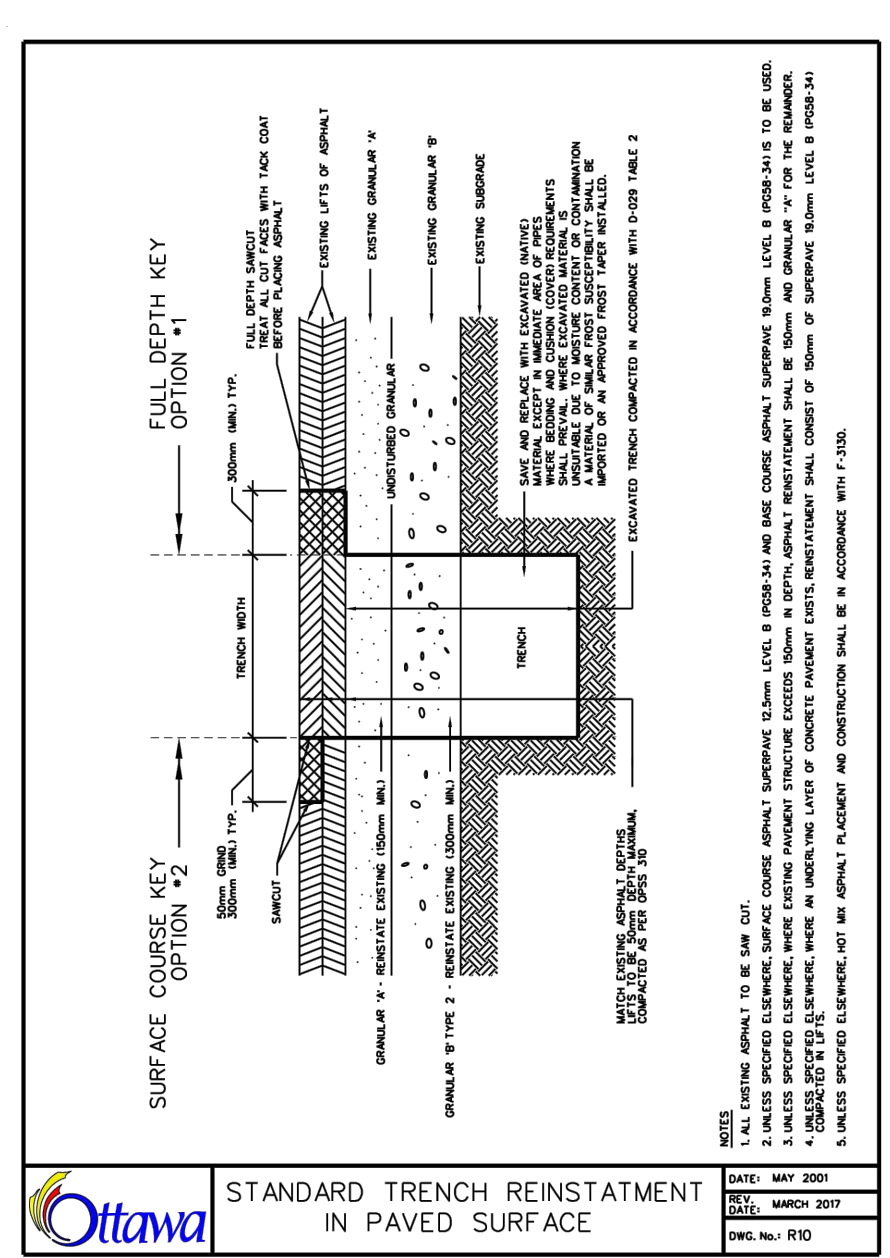
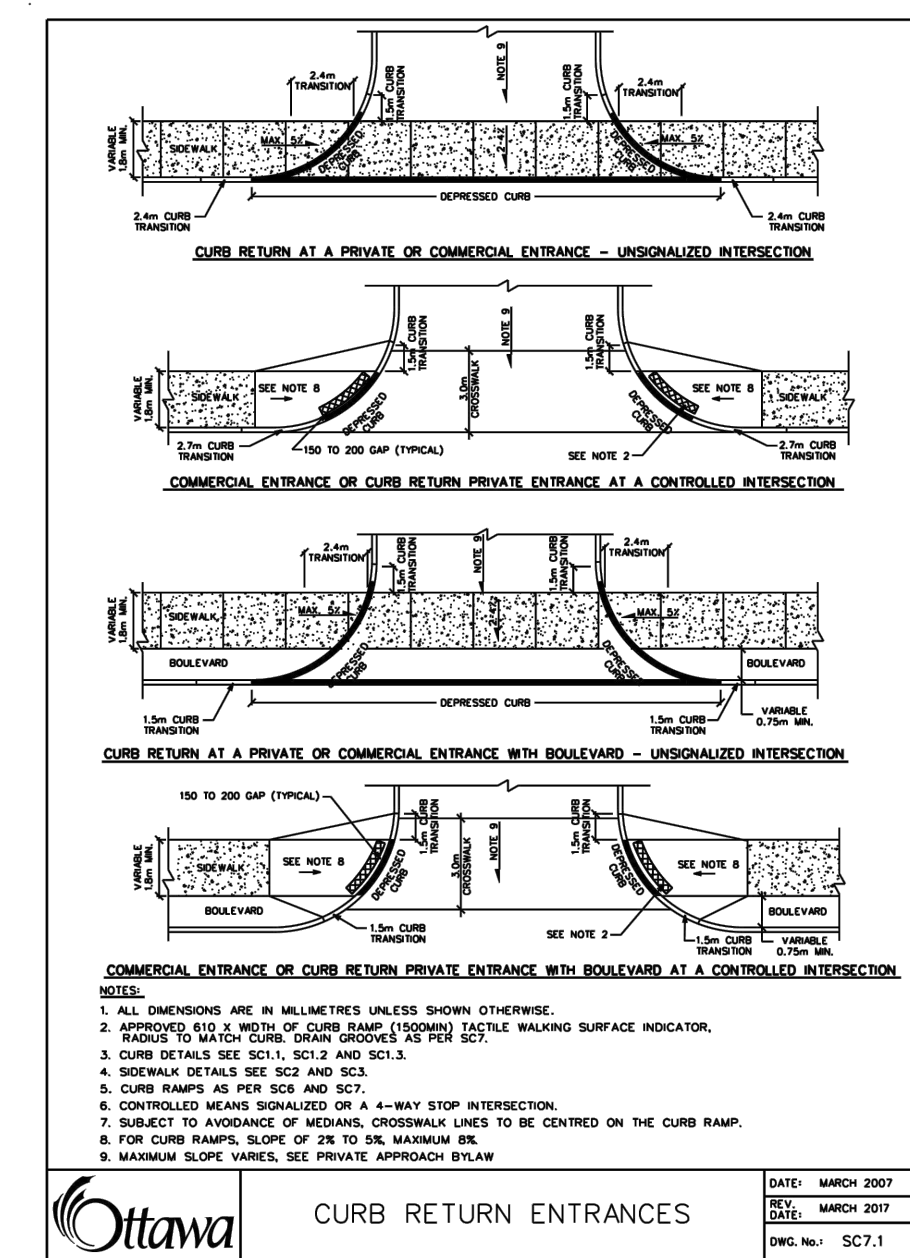
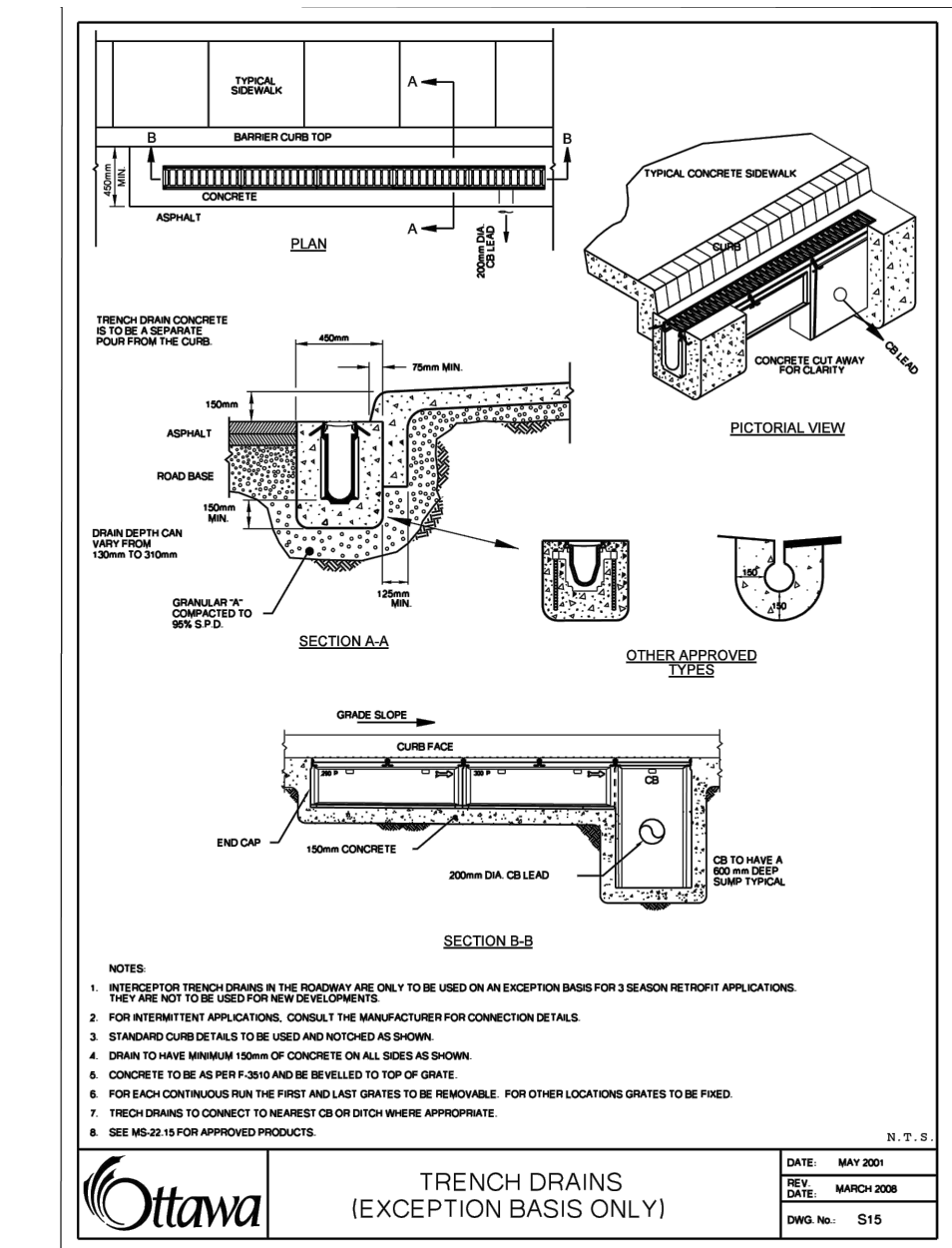
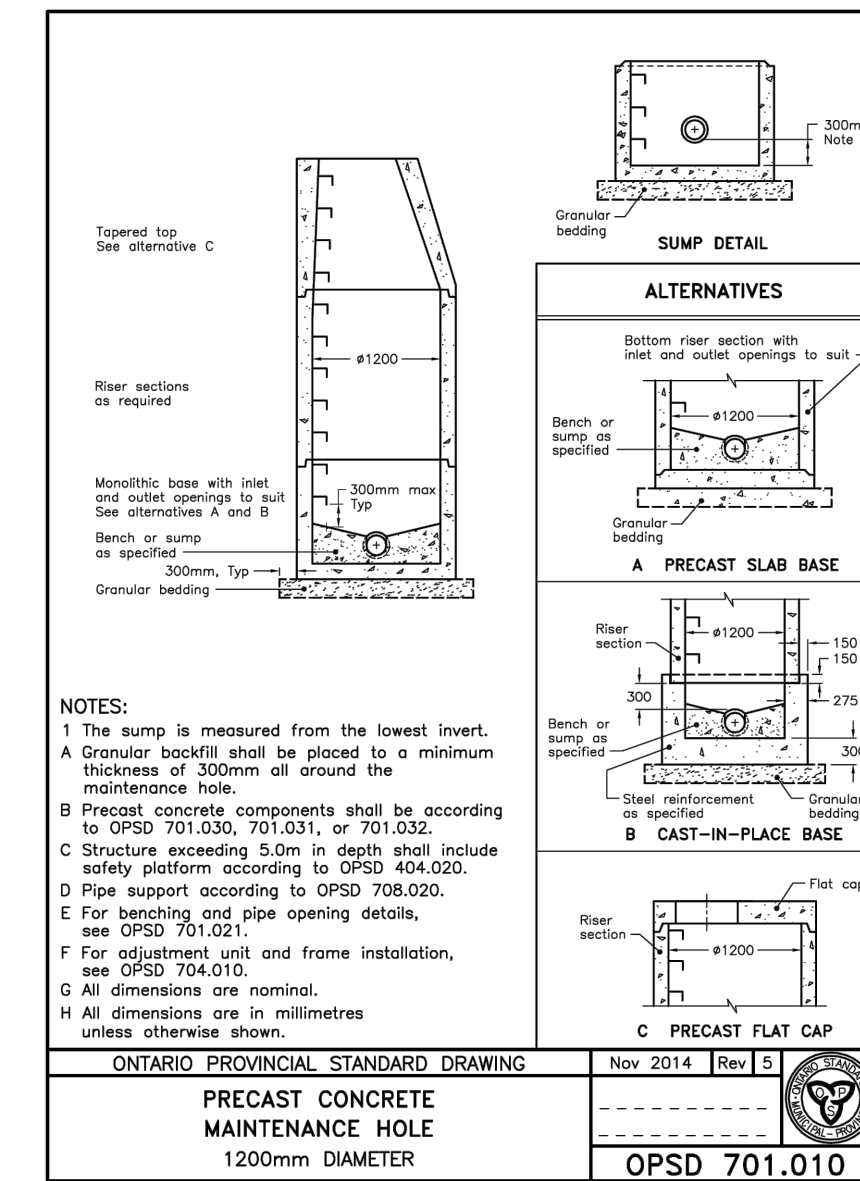
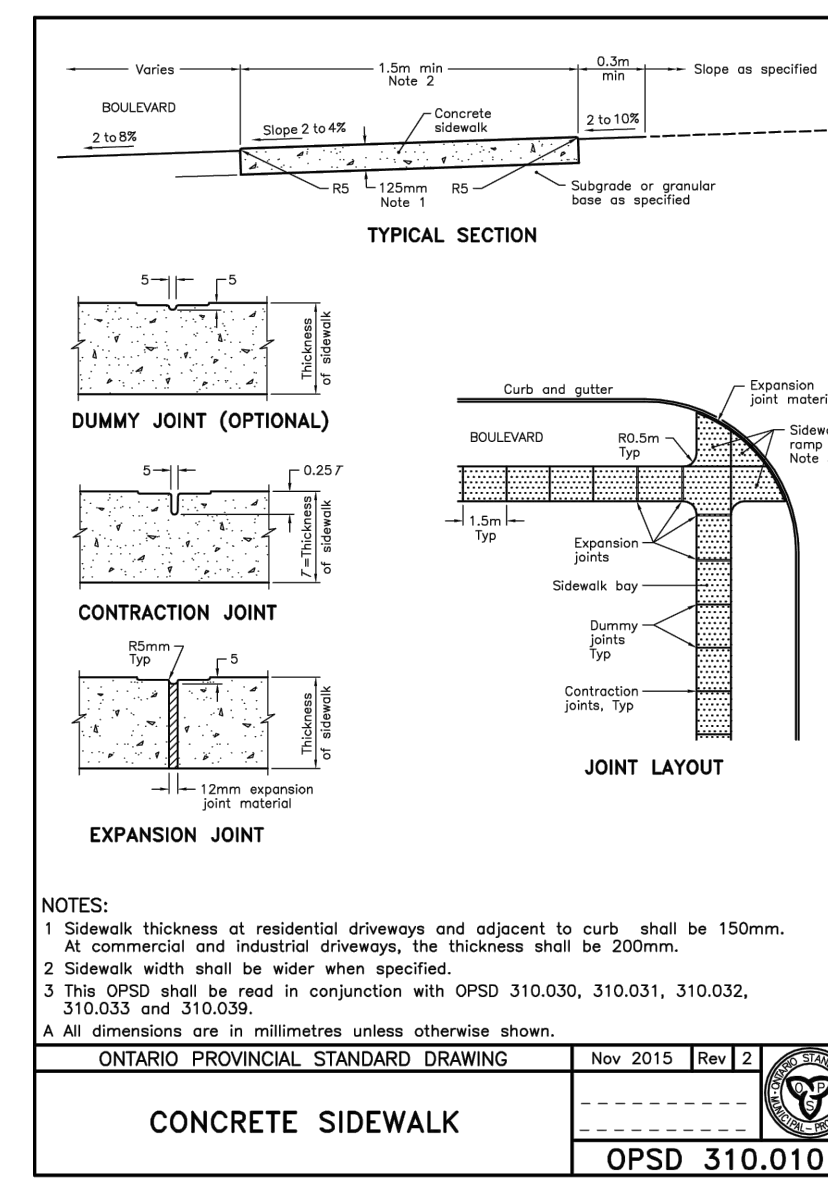
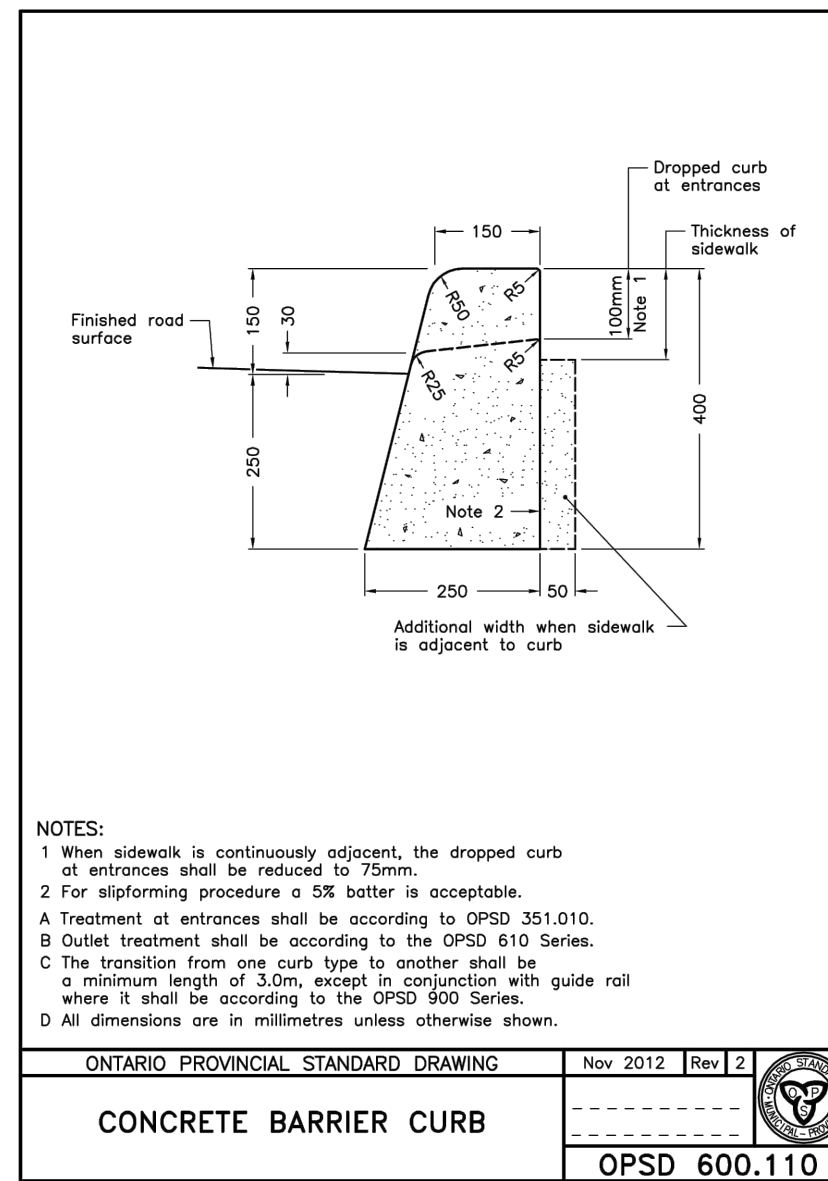
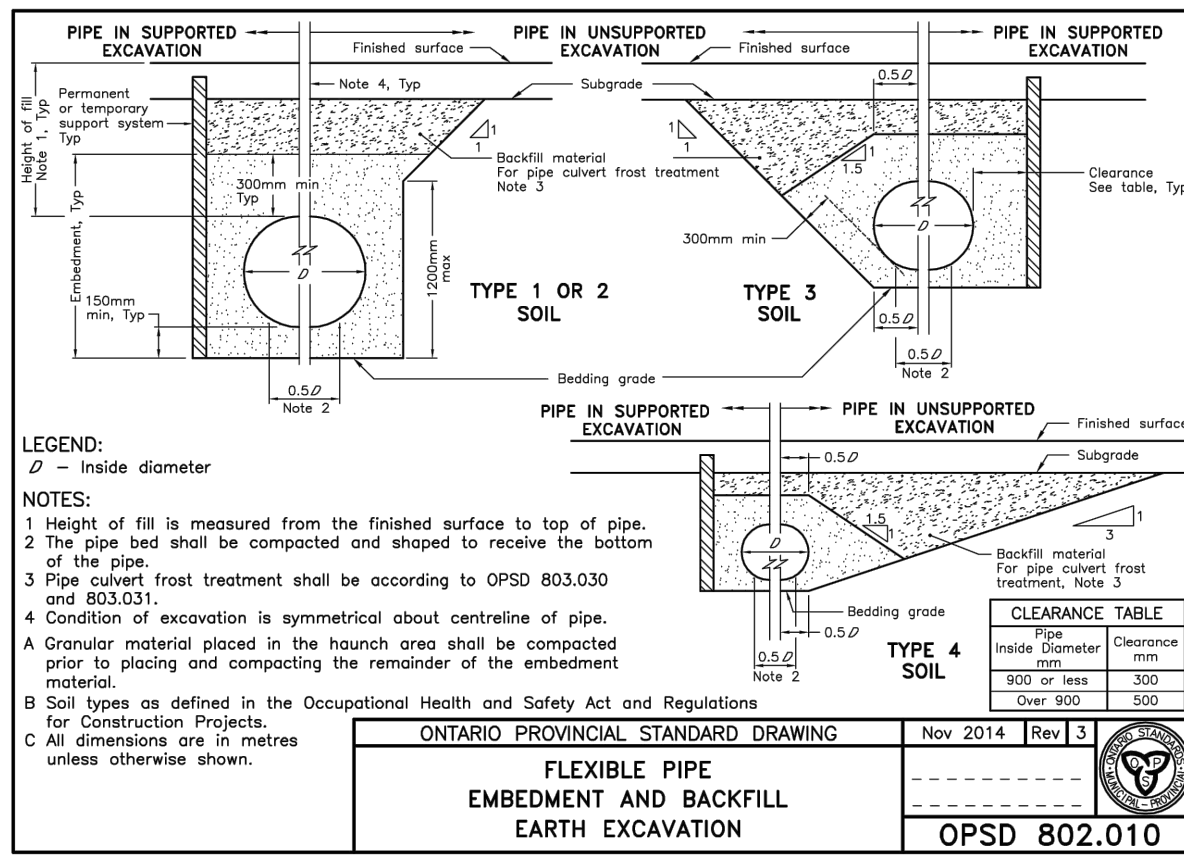
CARLING AVENUE
REGIONAL ROAD No. 38

CARLING AVENUE

BRONSON AVENUE

REGISTERED

D07-12-21-0108



USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED UNLESS SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE DIMENSIONS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CAD FILES OR OTHER ELECTRONIC MEDIA AND COPIES THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS ISSUED FOR CONSTRUCTION, THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATE THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBSTITUTION OF A BID TO PERFORM THIS WORK IS A RECOGNITION OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY IRL ASSOCIATES LTD. (IRL) WITHOUT OBTAINING IRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES. THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST IRL AND TO RELEASE IRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS IRL FROM ANY DAMAGES, LIABILITIES OR COSTS, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

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Licensed Professional Engineer

M. BASNET
100501996
22/06/14
PROVINCE OF ONTARIO

LRJ
ENGINEERING | INGENIERIE

5430 Canotek Road | Ottawa, ON, K1J 9G2
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CLIENT: **KATASA GROUP**
69 Rue Jean-Proulx Unit #301
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DESIGNED BY: T.H. DRAWN BY: T.H. APPROVED BY: M.B.

PROJECT: **770-774 BRONSON AVENUE**

DRAWING TITLE: **CONSTRUCTION DETAIL PLAN**

PROJECT NO: 200436
DATE: JUNE 2023

C901

DRAWINGS/FIGURES

**Proposed Site Plan
Legal Survey
As-builts**

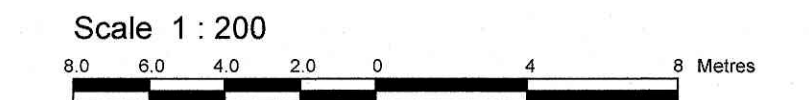


CARLING AVENUE
REGIONAL ROAD No. 38

TOPOGRAPHICAL PLAN OF SURVEY OF

ALL OF LOTS 3, 4, 37
AND PART OF LOTS 1, 2, 38
REGISTERED PLAN 28
CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebek Ltd.



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

Surveyor's Certificate
I CERTIFY THAT:
1. This survey and plan are correct and in accordance with the Survey Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 21st day of August, 2020.

August 21, 2020
Date
Andrew J. Broxham
Ontario Land Surveyor

Notes & Legend

Denotes	
—	Survey Monument Planted
—	Survey Monument Found
SIB	Standard Iron Bar
SSIB	Short Standard Iron Bar
IB	Iron Bar
CP	Concrete Pin
CC	Cut Cross
—	Survey Monument 0.3 Long
(WIT)	Witness
(AOS)	Annis, O'Sullivan, Vollebek Ltd.
Meas.	Measured
(P1)	Plan 5R-14360
(P2)	Plan 5R-13332
(P3)	(1952) Plan March 23, 2015
(P4)	(AOC) Plan September 6, 2013
(P5)	Registered Plan 28
(P6)	Plan 4R-27771
(P7)	Plan 4R-31025
—	Fire Hydrant
—	Overhead Wires
—	Catch Basin
—	Wood Pole
+55.00	Location of Elevations
+55.00	Location of Elevations (Top of Curb)
+55.00	Location of Elevations (Top of Wall)
T/G	Top of Grade
C/L	Centreline
Invt.	Invert
Obv.	Obvert
—	Overhead Wires
—	Utility Pole
—	Anchor
—	Property Line
—	Terminal Box
—	Bell Terminal Box
—	Water Valve
—	Maintenance Hole (Sanitary)
—	Maintenance Hole (Hydro)
—	Traffic Signal Post
—	Maintenance Hole (Unidentified)
—	Concrete Retaining Wall
—	Stone Retaining Wall
—	Chain Link Fence
—	Board Fence
—	Security Board Fence
—	Deciduous Tree
—	Coniferous Tree
—	Underground Services (Unidentified) Per (ADG) Plan March 23, 2015
—	Underground Services Marker Per (ADG) Plan March 23, 2015
—	Underground Power Per (ADG) Plan March 23, 2015
—	Underground Gas Per (ADG) Plan March 23, 2015
—	Monitoring Well
—	Gas Meter
—	Air Conditioner
—	Sign
—	Hydro Meter

Bearings are grid bearings, derived from the westerly limit of Ersson Avenue, shown to be N22°59'20"W on Plan 4R-27771 and are referred to the Central Meridian of MTN Zone 9 (79°30' West Longitude) NAD-83 (original).

ASSOCIATION OF ONTARIO
LAND SURVEYORS
PLAN SUBMISSION FORM
2136291

THIS PLAN IS NOT VALID UNLESS
IT IS AN EMBOSSSED ORIGINAL
COPY ISSUED BY THE SURVEYOR
In accordance with
Regulation 1026, Section 29 (3)

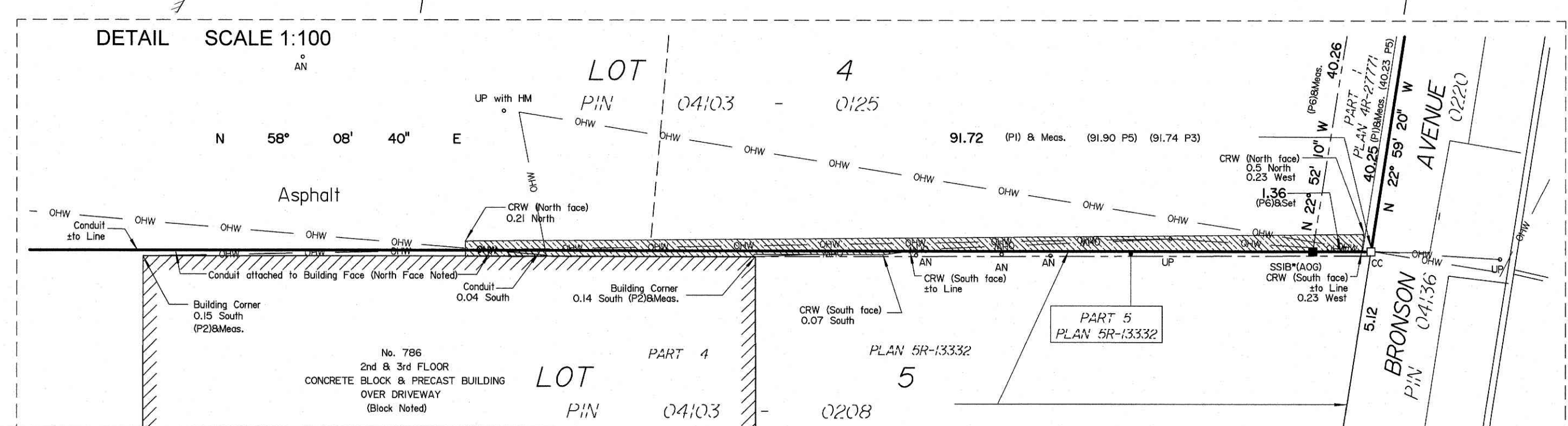
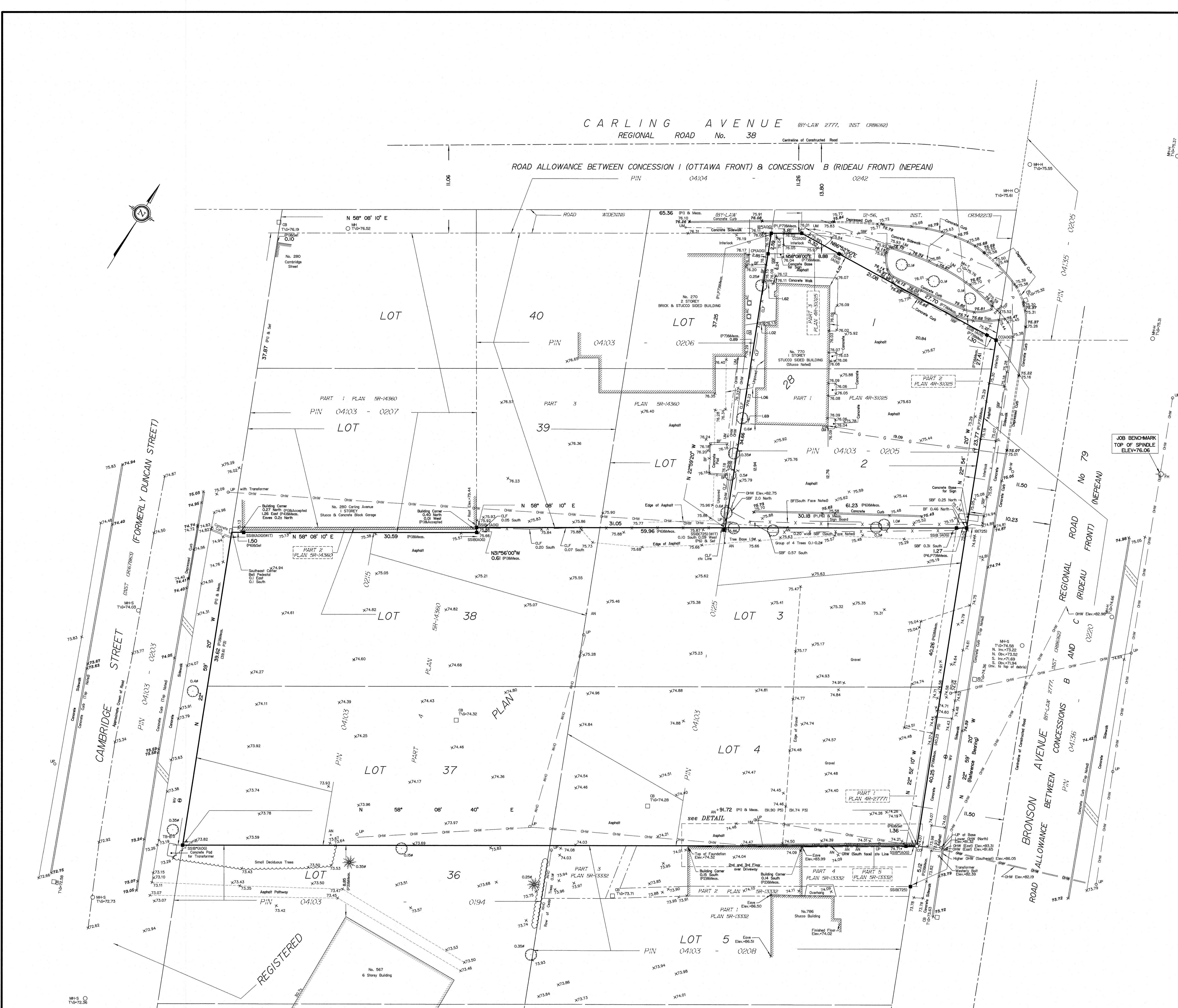
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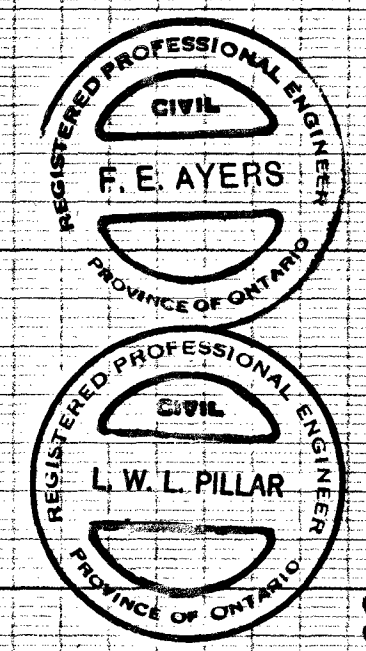
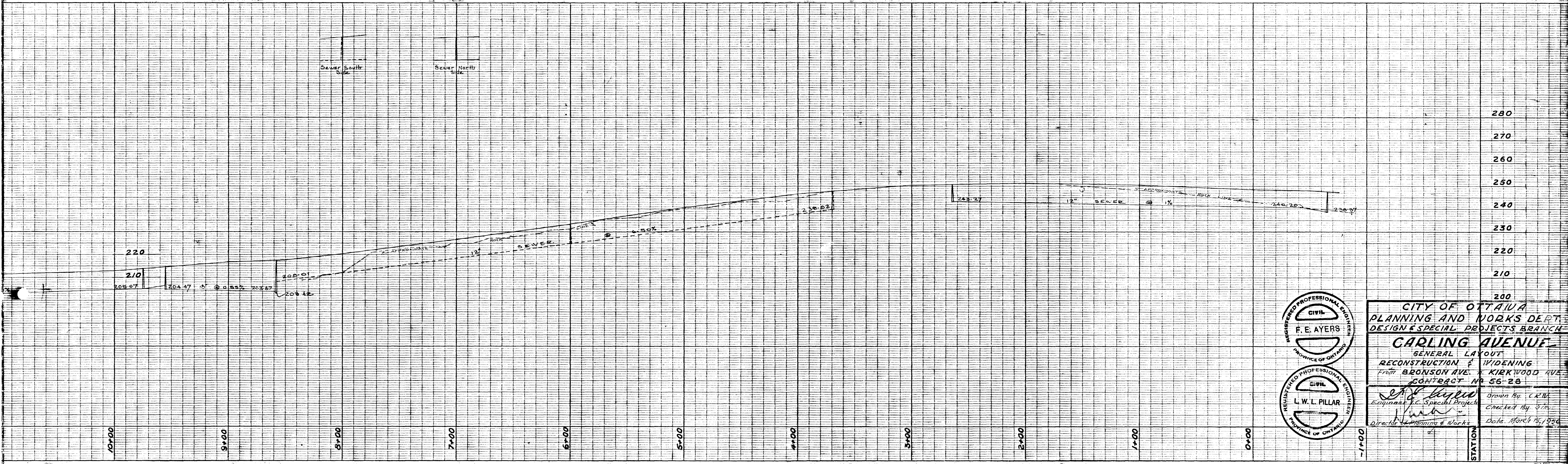
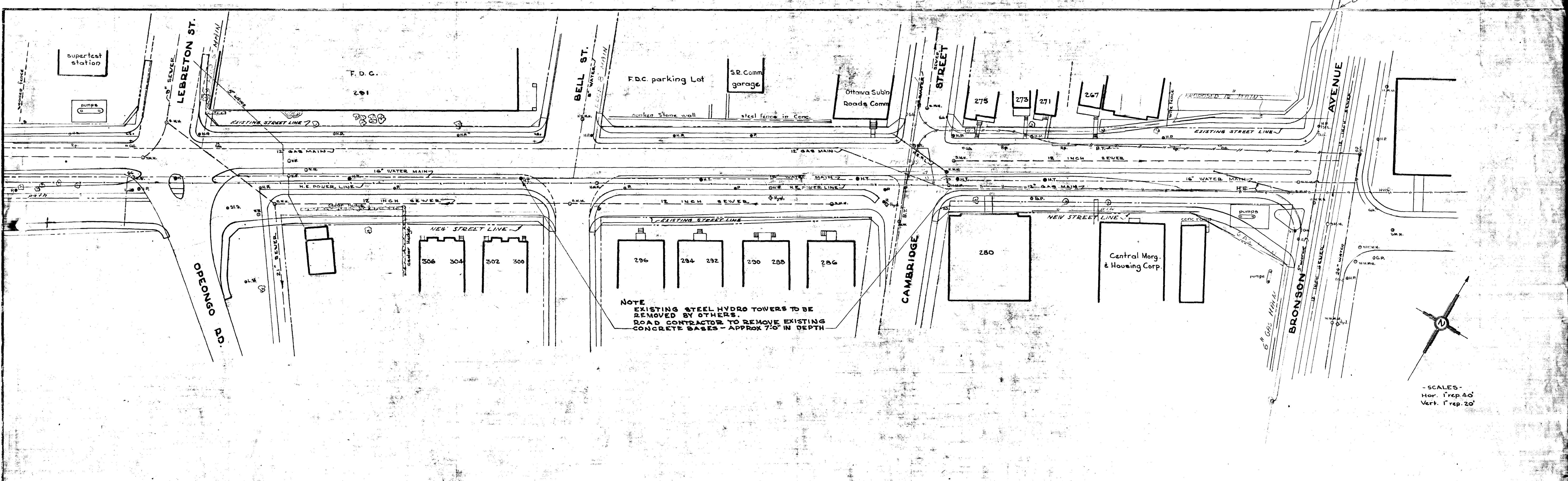
ELEVATION NOTES
1. Elevations shown are referred to geoidetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that its relative elevation and description agrees with the information shown on this drawing.

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

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ANNIS, O'SULLIVAN, VOLLEBEK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S8
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Email: info@annis.com

Ontario
Land Surveyors





CITY OF OTTAWA
 PLANNING AND WORKS DEPT.
 DESIGN & SPECIAL PROJECTS BRANCH
CARLING AVENUE
 GENERAL LAYOUT
 RECONSTRUCTION & WIDENING
 From BRONSON AVE. to KIRKWOOD AVE.
 CONTRACT NO. 56-23

Drawn By: C.K.M.
 Checked By: S.M.
 Date: March 15, 1956