EDWARD J. CUHACI AND ASSOCIATES ARCHITECTS INC.

NEW STITTSVILLE HIGH SCHOOL
700 COPE DRIVE, STITTSVILLE, ON

SERVICING AND STORMWATER MANAGEMENT REPORT

JULY 24, 2019

wsp

NEW STITTSVILLE HIGH SCHOOL 700 COPE DRIVE, STITTSVILLE, ON

SERVICING AND STORMWATER MANAGEMENT REPORT

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SITE PLAN APPLICATION

PROJECT NO.: 19M-00179-00
DATE: JULY 2019

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WSP Canada Group Ltd.

July 24, 2019

Edward J Cuhaci and Associates Architects Inc.
171 Slater Street
Ottawa, ON, K1P 5H7

Attention: Zofia Jurewicz, President

Subject: New Stittsville High School, 700 Cope Drive, Stittsville, ON - Servicing Report

Please find attached our servicing and stormwater management report, and accompanying civil engineering design drawings, prepared for your review and for site plan application.

Yours sincerely,

Ding Bang (Winston) Yang, P.Eng.
Project Engineer

WSP ref.: 19M-00179-00

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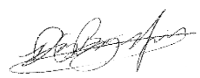
QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Issued for Site Plan Application			
Date	July 24, 2019			
Prepared by	Ding Bang (Winston) Yang			
Signature				
Checked by	James (Jim) Johnston			
Signature				
Project number	19M-00179-00			

SIGNATURES

PREPARED BY

Ding Bang (Winston) Yang, P.Eng
Project Engineer

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Senior Project Manager

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1 GENERAL

1.1 EXECUTIVE SUMMARY

WSP was retained by Edward J. Cuhaci and Associates Architects Inc. to provide servicing, grading and stormwater management design services for the proposed new Stittsville High School on a 6.56 ha site located at the south west corner of Robert Grant Avenue and Cope Drive, in the proposed CRT Lands Phase 1 subdivision development within the Fernbank Community. The construction of services and base course asphalt is complete on Cope Drive, on which the school property will front. All services for the school site will be available from Cope Drive. Phase 1 of the development is located to the north of the site. The future Phase 2 subdivision development is proposed along the south and west sides of the school site, but this is not anticipated to be developed in the near future. This report outlines findings and calculations pertaining to the servicing of the proposed building with a gross building area of 6,122 square metres.

The surrounding neighbourhood is being developed by CRT Development Inc. with the IBI Group providing engineering design services. Information regarding the proposed municipal services was provided by IBI, as described in Design Brief – CRT Lands Phase 1 Fernbank Community, Project: 27970-5.2.2, Revised July 2017. Excerpts from the Design Brief are provided in Appendix A of this report.

Currently the land proposed for the building abuts the arterial road Robert Grant Avenue which is located to the east of the subject site. The natural topography of the property in the vicinity of the arterial road slopes from west to east towards the road. Since there are two projects that were each designed by different engineers and abut and impact each other, IBI has discussed, reviewed and agreed with the roadway designers, Novatech Engineering, on the limits of runoff that can be accommodated by the arterial roadway drainage design. The significant limitation to development of the subject land adjacent to the Robert Grant Avenue is that no minor storm runoff in the 1:5 year event can cross the roadway sidewalk. The only minor runoff from the subject site that can be accommodated by the arterial road drainage system is from short sections of two side streets: Cope Drive to the north and a future street opposite Haliburton to the south. There will be some major storm runoff from the edges of the subject site along Robert Grant Avenue as well as the two side streets. Currently the land is vacant and primarily grass covered. The total study area was considered to be 6.56 ha in size. It is part of lot 27 & 28 10, Geographic Township of Goulbourn (City of Ottawa). Based on the topographic survey, the east half of the site is draining toward Robert Grant Avenue, and the west half of the site is draining toward Cope Drive and the future street to the south. The existing piped stormwater system within CRT phase 1 subdivision development conveys drainage to Stormwater Pond 5 then discharges to the existing Flewellyn Drain south of Fernbank Road.

As per the CRT Land Phase 1 Design Brief by IBI Group, the following criteria apply: runoff from all storm events up to and including the 1:100 year event must be restricted to a calculated rate based on an imperviousness ratio of 0.50, 5 year simulated flow of 822 l/s and the ICD restriction flow of 801.37 l/s. The subject site must provide sufficient storage to accommodate runoff from the 1:100 year event. Stormwater quality control is not required for this site. Design of a drainage and stormwater management system in this development must be prepared in accordance with the following documents:

- Sewer Design Guidelines, City of Ottawa, October 2012;
- Stormwater Management Planning and Design Manual, Ministry of the Environment, March 2003; and
- Stormwater Management Facility Design Guidelines, City of Ottawa, April 2012

This report was prepared utilizing servicing design criteria obtained from the City of Ottawa and outlines the design for water, sanitary wastewater, and stormwater facilities, including stormwater management.

The format of this report matches that of the servicing study checklist found in Section 4 of the City of Ottawa's Servicing Study Guidelines for Development Applications, November 2009.

The following municipal services are available at the north property line as recorded from drawings received from IBI Group: Cope Drive:

- 1200 mm storm sewer, 200mm sanitary sewer and 203mm watermain.

It is proposed that:

- On-site stormwater management systems, employing surface storage and roof storage will be provided to attenuate flow rates leaving the school site. Existing drainage patterns, previously established controlled flow rates and storm sewers will be maintained.

1.2 DATE AND REVISION NUMBER

This version of the report is the initial issue, dated July 24, 2019.

1.3 LOCATION MAP AND PLAN

The proposed institutional development is located at 700 Cope Drive, Stittsville, Ontario at the location shown in Figure 1-1 below.

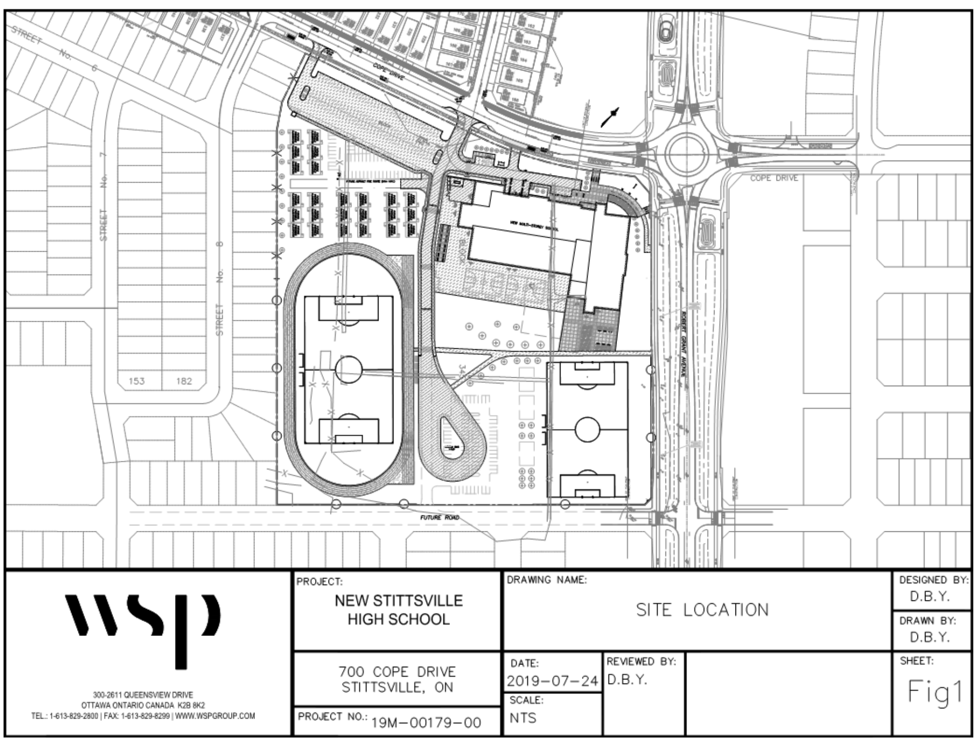

Figure 1-1 Site Location

1.4 ADHERENCE TO ZONING AND RELATED REQUIREMENTS

The proposed property use will be in conformance with zoning and related requirements prior to approval and construction, and is understood to be in conformance with current zoning.

1.5 PRE-CONSULTATION MEETINGS

A pre-consultation meeting was held with the City of Ottawa on March 6, 2019. Notes from this meeting are provided in Appendix A.

1.6 HIGHER LEVEL STUDIES

The review for servicing has been undertaken in conformance with, and utilizing information from, the following documents:

- Ottawa Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa including:
  - Technical Bulletin ISDTB-2012-4 (20 June 2012)
  - Technical Bulletin ISDTB-2014-01 (05 February 2014)
  - Technical Bulletin PIEDTB-2016-01 (September 6, 2018)
  - Technical Bulletin ISDTB-2018-01 (21 March 2018)
  - Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
  - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
  - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Brief – CRT Land Phase 1 Fernbank Community, IBI Group, Project 27970-5.2.2, Revised July 2017. (Includes water, sanitary and storm servicing.)
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 1999.

1.7 STATEMENT OF OBJECTIVES AND SERVICING CRITERIA

The objective of the site servicing is to meet the requirements for the proposed modification of the site while adhering to the stipulations of the applicable higher-level studies and City of Ottawa servicing design guidelines.

1.8 AVAILABLE EXISTING AND PROPOSED INFRASTRUCTURE

Sanitary and storm sewers, and a watermain will be located within the intersection of Cope Drive and Embankment Street along the frontage of the site. The sanitary sewer will extend from the intersection of Cope Drive and Embankment Street to the proposed High School. The storm sewer will be provided along the full length of the site, and flows from south to north. Water, sanitary and storm sewer stubs have already been provided to the property boundary during the time of construction of Cope Drive. The works provided by the subdivision developer have already included the water valve and box at the property line, and all work within the right of way, excluding the driveway entrances. Ultimately, the storm flows from the Cope Drive storm sewer (servicing the school site) are intended to be directed to a permanent stormwater management pond 5 that will provide quality and quantity treatment for some of the remaining undeveloped phases of the CRT subdivision, and including the school site. Quality control is not required on the school site, but quantity control is required to restrict the discharge for all events up to a 100 year event to the 5 year flow rate provided by IBI.

Site access for vehicles will be provided from Cope Drive. The driveways being provided are two-way entrances at the west end and central area of the site, and an exit only driveway at the east end.

1.9 ENVIRONMENTALLY SIGNIFICANT AREAS, WATERCOURSES AND MUNICIPAL DRAINS

There are no watercourses, municipal drains or environmentally significant areas on the site, but currently there are areas of environment significance on adjacent properties. The status of these areas will be changing as the area is developed. The building program proposed for the site is not subject to any restrictions associated with the surrounding lands.

1.10 CONCEPT LEVEL MASTER GRADING PLAN

The existing and proposed grading are shown on Drawings C03 to C06 - Grading Plans. Existing grading was identified in a topographic survey and is noted in the background of Drawings C03 to C06. Due to the existing grade difference east of the building, the detailed grading plans confirm the feasibility of the proposed stormwater management, drainage, soil removal and fills. The proposed depths of fill will be reviewed by the geotechnical engineer. The preliminary geotechnical investigation was completed in the summer of 2018 by EXP Services Inc, and final draft will be included in the site plan application package later. The grading along the site boundaries bordering CRT lands have been coordinated with CRT's engineering consultant. The site topographic survey, provides evidence of direction of overland flow of the site. No changes will be made to grades at the development perimeter.

1.11 IMPACTS ON PRIVATE SERVICES

There are no existing domestic private services (septic system and well) located on the site. There are no neighbouring properties using private services.

1.12 DEVELOPMENT PHASING

No development phasing has been detailed for the site. The site plan does indicate possible future development of portable classrooms, parking lots and school building expansion. The impervious area associated with the future development has been taken into account in the stormwater management calculations. The future hard surfaces take up a greater area than the interim condition, and therefore were conservatively used in the calculation of runoff. Historically, the School Board has experienced substantial growth at their school sites in developing areas, and inclusion of larger amounts of potential impervious area is considered reasonable. Grading has been designed to accommodate the future development without additional significant excavation and fill activities.

1.13 GEOTECHNICAL SUTDY

A preliminary geotechnical investigation report has been prepared by EXP Services Inc. (Report OTT-00245378-E0, June 20, 2018), and its recommendations has been taken into account in developing the engineering specifications.

1.14 DRAWING REQUIREMENT

The engineering plans submitted for site plan approval will be in compliance with City requirements.

2 WATER DISTRIBUTION

2.1 CONSISTENCY WITH MASTER SERVICING STUDY AND AVAILABILITY OF PUBLIC INFRASTRUCTURE

There is an existing 203mm diameter municipal watermain from the intersection of Cope Drive and Embankment Street providing water to the property. The new high school will be protected with a supervised automatic fire protection sprinkler system, and will require a 203mm diameter water service. Two new private fire hydrants will be added to the private site, one is on the north side of the proposed building within 45m of the Siamese connection. The other is on the west of the site, in the middle of the future portable classrooms. No changes are required to the existing City water distribution system to allow servicing for this property.

2.2 SYSTEM CONSTRAINTS AND BOUNDARY CONDITIONS

Boundary conditions have been provided by the City of Ottawa at two locations along the Trans Canada Trail 400mm watermain during the development of the CRT land subdivision. A fire flow of 225 l/s (13,500 l/min) was estimated for this institutional development from the hydraulic model provided by IBI Group. The IBI hydraulic modelling indicated the hydraulic pressure for different scenario conditions were shown below, based on fire flows and domestic demands estimated by IBI Group for the proposed institutional land.

Table 2-1: Boundary Conditions (IBI Design Brief)

BOUNDARY CONDITIONS		
SCENARIO	Head (m) @ Connection 1	Head (m) @ Connection 2
Basic Day (MAX HGL)	161.1	161.4
Peak Hour (MIN HGL)	154.7	154.8
Max Day + Fire Flow (ICI)	150.6	150.9

Table 2-2: IBI Hydraulic Modelling Results

Hydraulic Modelling Results @ CLA-38	
SCENARIO	Hydraulic Pressure (kPa)
Basic Day (MAX HGL)	517.4
Peak Hour (MIN HGL)	449.6
Max Day + Fire Flow (ICI)	243.4

2.3 CONFIRMATION OF ADEQUATE DOMESTIC SUPPLY AND PRESSURE

Water demands are based on Table 4.2 of the Ottawa Design Guidelines – Water Distribution. As previously noted, the development is considered as institutional development, consisting of classroom, gymnasium and kitchen. A water demand calculation sheet is included in Appendix B, and the total water demands are summarized as follows:

	WSP (2018 Bulletin)	IBI Group
Average Day	2.23 l/s	3.78 l/s
Maximum Day	3.19 l/s	5.67 l/s
Peak Hour	5.74 l/s	10.20 l/s

The 2010 City of Ottawa Water Distribution Guidelines stated that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in the guidelines are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

Water pressure at municipal connections check:

Min. HGL @ Connection 1 – Pavement elevation = 154.7m – 108.24m = 46.46m = 455.50 kPa

Min. HGL @ Connection 2 – Pavement elevation = 154.8m – 108.24m = 46.56m = 456.48 kPa

Water pressure at building connection (at average day) check:

Max. HGL @ Connection 1 – Finished floor elevation = 161.1m – 108.16 = 52.94m = 519.03 kPa

Max. HGL @ Connection 2 – Finished floor elevation = 161.4m – 108.16 = 53.24m = 521.97 kPa

Water pressure at building connection (at max. hour demand) check:

Min. HGL @ Connection 1 – Finished floor elevation = 154.7m-108.16m = 46.54m = 456.28 kPa

Min. HGL @ Connection 2 – Finished floor elevation = 154.8m-108.16m = 46.64m = 457.27 kPa

Water pressure at building connection (at max. day + fire demand):

(Max Day + Fire) HGL @ Connection 1 - Finished floor elevation = 150.6m-108.16m = 44.44m = 435.70 kPa

(Max Day + Fire) HGL @ Connection 2 - Finished floor elevation = 150.9m-108.16m = 42.74m = 419.03 kPa

The minimum water pressure inside the building at the connection is determined with the minimum HGL condition, resulting in a pressure of 456.28 and 457.27 kPa which exceed the minimum requirement of 276 kPa per the guidelines.

2.4 CONFIRMATION OF ADEQUATE FIRE FLOW PROTECTION

The fire flow rate has been calculated using the Fire Underwriters Survey (FUS) method. The method takes into account the type of building construction, the building occupancy, the use of sprinklers and the exposures to adjacent structures. Assuming fire resistive construction and a fully supervised sprinkler system, a fire flow demand of 10,000 l/min for the new high school including future expansion has been calculated. The fire flow rate of 10,000 l/min (166.7 l/s) is calculated for the future portable classrooms. Copy of the FUS calculations are included in Appendix B.

The demand of 10,000 l/min can be delivered through three fire hydrants, two public and one private. The existing two public hydrants are located at the north-west corner of the intersection of Cope Drive and Embankment Street and Cope Drive west of the intersection, are within 170 m of the building, and are rated at 3800 l/min each. The new private hydrant located at the north side of the proposed building is within 35 m of the building, and is rated at 5700 l/min. The three hydrants have a combined total of 13,300 l/min.

The demand of 10,000 l/min from the future portable classrooms can also be met through the combination of three hydrants, one private hydrant at the future portable classrooms area and two existing public hydrants along Cope Drive. The three hydrants have a combined total of 13,300 l/min.

The proposed building on site will be serviced by a single 203 mm service off the 203 mm private watermain extended from the Cope Drive and Embankment Street intersection. The service will run into the water entry room. The proposed building will be fully sprinklered and fire protection will be provided with the fire department Siamese connection within 45 m of the proposed private fire hydrant at the entrance from Cope Drive. The Siamese connection is located on the north side of the building. Another 203 mm private watermain will be extended from the 200x200 tee connection and then routed to the private hydrant located in the middle of future portable classrooms area.

The boundary condition for Maximum Day and Fire Flow results in a pressure of 453.70 and 419.03 kPa at the ground floor level. In the guidelines, a minimum residual pressure of 140 kPa must be maintained in the distribution system for a fire flow and maximum day event. As a pressure of 453.70 and 419.03 kPa is achieved, the fire flow requirement is exceeded.

2.5 CHECK OF HIGH PRESSURE

High pressure is not a concern. The maximum water pressure inside the building at the connection is determined with the maximum HGL condition, resulting in a pressure of 519.03 and 521.97 kPa which is less than the 552 kPa threshold in the guideline in which pressure control is required. Based on this result, pressure control is not required for this building.

2.6 PHASING CONSTRAINTS

No development phasing has been detailed for the site. The site plan does indicate possible future development of portable classrooms, parking lots and school building expansion. The projected occupancy load with the future development has been taken into account in the fire demand and water demand calculations. No phasing constraints exist.

2.7 RELIABILITY REQUIREMENTS

A shut off valve is provided for the building water service at the study boundary from the intersection of Cope Drive and Embankment Street. Water can be supplied to the service stub from both the Cope Drive and Embankment Street from the east, west and north and can be isolated.

2.8 NEED FOR PRESSURE ZONE BOUNDARY MODIFICATION

There is no need for a pressure zone boundary modification.

2.9 CAPABILITY OF MAJOR INFRASTRUCTURE TO SUPPLY SUFFICIENT WATER

The current infrastructure is capable of meeting the domestic demand based on City requirements and fire demand as determined by FUS requirements for the proposed building.

2.10 DESCRIPTION OF PROPOSED WATER DISTRIBUTION NETWORK

A 203 mm water service is proposed to be provided into the proposed high school. Two new private hydrants are required. A new private hydrant is located within 45 metres of the fire department connection on the north side of the building as per OBC requirements. Another new private hydrant will be located in the middle of the future portable classrooms area, within 90 metres of each proposed portable.

2.11 OFF-SITE REQUIREMENTS

No off-site improvements to watermains, feedermains, pumping stations, or other water infrastructure are required to maintain existing conditions and service the adjacent developments.

2.12 CALCULATION OF WATER DEMANDS

Water demands were calculated as described in Sections 2.3 and 2.4 above.

2.13 MODEL SCHEMATIC

The water works consist only a single building service, a model schematic is not required for this development.

3 WASTEWATER DISPOSAL

3.1 DESIGN CRITERIA

In accordance with the City of Ottawa's Sewer Design Guidelines, the following design criteria have been utilized in order to predict wastewater flows generated by the subject site and complete the sewer design;

• Minimum Velocity	0.6 m/s
• Maximum Velocity	3.0 m/s
• Manning Roughness Coefficient	0.013
• Total est. hectares institutional use	6.56
• Average sanitary flow for institutional use	28,000 L/Ha/day
• Commercial/Institutional Peaking Factor	1.5
• Infiltration Allowance (Total)	0.33 L/Ha/s
• Minimum Sewer Slopes – 200 mm diameter	0.32%

The area of 6.56 ha represents the lot area of the new building and immediate surrounding area to the sides of the new building. This is the sanitary collection area that is being considered to contribute to the new 200mm sanitary service extending from the existing 200mm sanitary sewer stub provided at the south side of the Cope Drive and Embankment intersection to the new building.

3.2 CONSISTENCY WITH MASTER SERVICING STUDY

The outlet for the sanitary service from the proposed building is the 200 mm diameter municipal sewer on Cope Drive.

The Ottawa Sewer Design Guidelines provide estimates of sewage flows based on institutional development.

The criteria to determine anticipated actual peak flow based on site used as described in Ottawa Sewer Design Guidelines Appendix 4-A are as follows;

- Institutional 28000 L/Ha/day = 0.324 L/Ha/s
- Peak flow = (0.324 L/Ha/s x 6.56 ha x 1.5 peaking factor) + 0.33 l/Ha/s x 6.56 ha = 5.35 L/s

The on-site sanitary sewer network has been designed in accordance with 5.35 L/s as described above.

3.3 REVIEW OF SOIL CONDITIONS

There are no specific local subsurface conditions that suggest the need for a higher extraneous flow allowance.

3.4 DESCRIPTION OF EXISTING SANITARY SEWER

The outlet sanitary sewer is the existing 200 mm diameter sewer on Cope Drive. This local sewer will outlet to a 1500 mm diameter sanitary trunk sewer located in Abbott Street and the Trans Canada Trails, then discharge to the Hazeldean Pump Station.

3.5 VERIFICATION OF AVAILABLE CAPACITY IN DOWNSTREAM SEWER

The capacity of the downstream 200 mm diameter sewer at 0.35% slope is 19.42 l/s, which is adequate for the flow assumptions from the proposed site as noted above. This existing sewer was designed by IBI Group to service the proposed 6.56 ha of institutional land.

3.6 CALCULATIONS FOR NEW SANITARY SEWER

The 200 mm diameter sanitary service from the sanitary manhole 100 to the building will have a slope of 1.0 %, and a capacity of 32.80 l/s, with a velocity of 1.04 m/s. The 200 mm diameter sanitary service from the sanitary manhole 100 to the sanitary manhole 101 will have a slope of 0.35%, and a capacity of 19.42 l/s with a velocity of 0.62 m/s. The 200 mm diameter sanitary service from the sanitary manhole 101 to the sanitary monitoring manhole 102 will have a slope of 2.00 %, and a capacity of 46.43 l/s, with a velocity of 1.48 m/s. The servicing pipe capacity exceeds the estimated peak sanitary flow rate of 5.35 L/s for the proposed development site.

3.7 DESCRIPTION OF PROPOSED SEWER NETWORK

The proposed sanitary sewer network on site will consist of a 200 mm diameter building service, and three new 1200 mm diameter manholes.

3.8 ENVIRONMENTAL CONSTRAINTS

There are no previously identified environmental constraints that impact the sanitary servicing design in order to preserve the physical condition of watercourses, vegetation, or soil cover, or to manage water quantity or quality.

3.9 PUMPING REQUIREMENTS

The proposed development will have no impact on existing pumping stations and will not require new pumping facilities.

3.10 FORCE-MAINS

No force-mains are required specifically for this development.

3.11 EMERGENCY OVERFLOWS FROM SANITARY PUMPING STATIONS

No pumping stations are required for this site, except as required internally for the plumbing design to service the lower area of the building.

3.12 SPECIAL CONSIDERATIONS

There is no known need for special considerations for sanitary sewer design related to existing site conditions.

4 SITE STORM SERVICING

4.1 EXISTING CONDITION

The subjected property is located within the Fernbank Community Development area west of Robert Grant Avenue and South of Cope Drive. Most runoff from the institutional land is ultimately directed to a 1500 mm diameter trunk storm sewer which runs east to west along Cope Drive. The 1500 mm diameter storm sewer ultimately outlets to the stormwater management facility Pond 5. The available drainage outlet from the school site is the existing 1200 mm diameter concrete storm sewer, located in the south side of the Cope Drive and Embankment Street intersection.

Based on the IBI Design Brief, drainage released from the site to the City storm sewer is limited to 801.37 l/s. Flow exceeding this amount up to the 100 year storm have to be retained on the site. Drainage in excess of the minor system capacity currently flows overland to the Cope Drive. But as per the IBI Design Brief, it will be allowed to have some major storm runoff from the edges of the school site along Robert Grant Avenue as well as the two side streets; Cope Drive and the future street opposite Haliburton to Robert Grant Avenue.

4.2 ANALYSIS OF AVAILABLE CAPACITY IN PUBLIC INFRASTRUCTURE

The receiving 1200 mm diameter storm sewer has been designed with the capacity to accept 801.37 l/s from the school site. Using the Rational Method, with coefficient of 0.25 for pervious areas, 0.75 for gravel areas and 0.9 for impervious areas, and a 10 minute time of concentration, results in an estimated 2 year flow of 395.14 l/s from this area. Capacity in the minor system is not a concern.

4.3 DRAINAGE DRAWING

Drawings C07 to C10 show the receiving storm sewer and site storm sewer network. Drawings C03 to C06 provide proposed grading and drainage, and include existing grading information. Drawing C011 provides a post-construction drainage sub-area plan, including both site and roof information. Site sub-area information is also provided on the storm sewer design sheet attached in Appendix C.

4.4 WATER QUANTITY CONTROL OBJECTIVE

The water quantity objective for the site is to limit the flow release to 801.37 l/s. Excess flows above this limit for the school site up to those generated by the 100 year storm event from drainage on the school site are temporarily stored on site.

No provision is required on the school's site to accommodate any flow from the adjacent lands. All flows exceeding the defined minor system capacity and on-site storage capability will enter the major system, with overflow to the City right of way, on the east and north boundaries of the site.

4.5 WATER QUALITY CONTROL OBJECTIVE

The site is not required to achieve water quality objectives. Water quality objectives are achieved through downstream works as noted in the IBI Design Brief.

4.6 DESIGN CRITERIA

The stormwater system was designed following the principles of dual drainage, making accommodation for both major and minor flow.

Some of the key criteria include the following:

• Design Storm (minor system)	1:2 year return (Ottawa)
• Rational Method Sewer Sizing	
• Initial Time of Concentration	10 minutes
• Runoff Coefficients	
Landscaped Areas	C = 0.25
Gravel Areas	C = 0.75
Asphalt/Concrete	C = 0.90
Traditional Roof	C = 0.90
• Pipe Velocities	0.80 m/s to 6.0 m/s
• Minimum Pipe Size	250 mm diameter (200 mm CB Leads and service pipes)

4.7 PROPOSED MINOR SYSTEM

The detailed design for this site will maintain the existing storm sewer network to Cope Drive and Embankment intersection of the development site. The drainage system consists of a series of manholes, catchbasins and storm sewers leading to the outlet manhole STMH100 at the north of the site. All drainage areas on the site are collected in the site piped drainage system, with the exception of a narrow strip of land along the east boundary and at the northeast corner, with a total area of 0.287 ha. The grades at the property line in these areas are too low to allow for outlet to the site storm sewer system, and the use of retaining walls in the vicinity of the site boundaries has been prohibited. Minor flows from these areas are therefore being managed with a proposed infiltration trench. Major flows are allowed to be released to the right of way. This area will remain primarily as pervious surfaces, and will generate minimal flows. Grading of these areas will be consistent with existing conditions, and will not generate additional flows to these off-site areas.

Using the above noted criteria, the existing on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated post development storm sewer drainage area plan are included in Appendix C.

4.8 STORMWATER MANAGEMENT

The subject site will be limited to a release rate of 801.37 l/s established by IBI Group, this will be achieved through an inlet control device at the downstream of CBMH101 and surface storage.

Flows generated that are in excess of the site's allowable release rate will be stored on site in surface storage areas or by the use of roof top storage and gradually released into the minor system so as not to exceed the site's allocation.

The maximum surface retention depth of the developed areas will be limited to 250mm during a 1:100 year event. Maximum ponding levels are 300mm prior to spill over. The maximum ponding elevation is 107.80m, which is well below the building ground floor level of 108.16m.

No surface ponding will occur during a 2 year event, and only minimal ponding will occur during a 5 year event.

Overland flow routes will be provided in the grading to permit emergency overland flow from the site. The overflow routes will eliminate any increase in ponding depth for events exceeding 100 years.

At certain locations within the site, the opportunity to store runoff is limited due to grading constraints and building geometry. These locations are located at the perimeter of the site where it is necessary to tie into public boulevards, and it is not always feasible to capture or store stormwater runoff. The "uncontrolled area - 0.287 hectares (including driveways) along the north frontage on Cope Drive have a weighted average C value of 0.46. Based on 1:100 year storm uncontrolled flows, the uncontrolled areas generate 75.50 L/s runoff (refer to Section 4.9 for calculation).

The site grading and ponding has been designed to control water generated during the 1:100-year event, with no overflow leaving the site at this control level. Please refer to the SWM Calculations in Appendix C.

4.9 INLET CONTROLS

According the IBI Design Brief, the maximum allowable release rate for the 6.56 Ha site is 801.37 L/s.
As noted in Section 4.8, a small portion of the site will be left to discharge to the right of way at an uncontrolled rate.

Q **(uncontrolled)** $= 2.78 \times C \times I_{100yr} \times A$ where:

C = 0.46 (Weighted average post-development C)

I_{100yr} = Intensity of 100-year storm event (mm/hr)

= 1735.688/((Tc+6.014)^(0.82)); where T_c = 10 minutes

A = Area = 0.287 Ha

Therefore, the uncontrolled release to the right of way can be determined as:

= 75.50 L/s

The maximum allowable release rate from the remainder of the site can then be determined as:

Q **(max allowable)** = **Q** **(total allowable)** – **Q** **(uncontrolled)**

= 801.37 L/s – 75.50 L/s

= 725.87 L/s

Based on the flow allowance at the outlet location, CBMH101, one inlet control devices (ICD) was chosen in the design. The design of the inlet control device is unique to the associated drainage areas and is determined based on a number of factors, including hydraulic head and allowable release rate. The inlet control device will be designed according to the manufacturer's design charts. The restrictions will cause the on-site catchbasins and manholes to surcharge, generating surface ponding in the parking and landscaped areas. Ponding locations and elevations are summarized on the grading plan C03 to C06.

4.10 ON-SITE DETENTION

Any excess storm water up to the 100-year event is to be stored on-site in order to not surcharge the downstream municipal storm sewer system. Detention will be provided in parking and landscape areas and building rooftops, where feasible. As previously noted, the volume of storage is dependent on the characteristics of each individual drainage area. It should be noted that greater than 0.30 m of vertical separation has been provided from all maximum ponding elevations to lowest building openings.

The following Table summarizes the on site storage requirements during the 1:100-year events.

Table 4-1: On-Site Storage Requirements

Total Area (Ha)	Controlled/ Uncontrolled	Runoff Coefficient		Outlet Location	Total Storage Provided (m³)	100-Year Controlled	
		2 & 5 Year	100 Year			Restricted Flow (L/s)	Required Storage (m³)
6.344	Controlled	0.54	0.62	CBMH101	2260.59	720.80	738.99
0.287	Uncontrolled	0.46	0.53	R.O.W. (Robert Grant Ave)	0	75.50	0
TOTAL					**2260.59**	**796.30**	**738.99**

In all instances the required storage is met with surface ponds which retain the stormwater and discharge at the restricted flow rate to the sewer system. Refer to the grading plan for storage information.

The following Table summarizes the inlet control devices to be utilized on the site. ICD pre-set flow curves can be found in Appendix C.

Table 4-2: ICD Type

Structure ID	PROPOSED ICD			
	100-YR Head	Flow (L/s)	Type	OUTLET DIA.
CBMH101	3.49	720.80	430 mm Dia. Circular ICD	825 mm Dia. CONC.

As demonstrated above, the site uses new inlet control device to restrict the 100 year storm event to the criteria approved by the City of Ottawa. Restricted stormwater will be contained onsite by utilizing surface ponding storage. In the 100 year event, there will be no overflow off-site from restricted areas.

The sum of restrictions on the site and uncontrolled flows is 796.30 L/s, which is less than the maximum allowable release of 801.37 L/s noted in Section 4.9.

4.11 WATERCOURSES

The minor flow will be ultimately directed to the Flewellyn Drain, south of Fernbank Road.

4.12 PRE AND POST DEVELOPMENT PEAK FLOW RATES

Pre and post development peak flow rates for the impacted areas of the site have been noted in storm sewer design sheet.

4.13 DIVERSION OF DRAINAGE CATCHMENT AREAS

There will be no diversion of existing drainage catchment areas arising from the proposed work described in this report.

4.14 DOWNSTREAM CAPACITY WHERE QUANTITY CONTROL IS NOT PROPOSED

This checklist item is not applicable to this development as quantity control is provided.

4.15 IMPACTS TO RECEIVING WATERCOURSES

No significant negative impact is anticipated to downstream receiving watercourses due to proposed quantity and quality control measures, the separation of the site from the eventual receiving watercourse as a result of discharge through City owned sewers, and the planned stormwater management pond 5 on the north side of Fernbank Road.

4.16 MUNICIPAL DRAINS AND RELATED APPROVALS

There are no municipal drains on the site or associated with the drainage from the site.

4.17 MEANS OF CONVEYANCE AND STORAGE CAPACITY

The means of flow conveyance and storage capacity are described in Sections 4.7, 4.8, 4.9 and 4.10 above.

4.18 HYDRAULIC ANALYSIS

Hydraulic calculations for the site storm sewers are provided in the storm sewer design sheet.

4.19 IDENTIFICATION OF FLOODPLAINS

There are no designated floodplains on the site of this development.

4.20 FILL CONSTRAINTS

There are no known fill constraints applicable to this site related to any floodplain. The site is generally being raised higher relative to existing conditions. No fill constraints related to soil conditions are anticipated, as confirmed in the geotechnical report.

5 SEDIMENT AND EROSION CONTROL

5.1 GENERAL

During construction, existing storm sewer system can be exposed to sediment loadings. A number of construction techniques designed to reduce unnecessary construction sediment loadings will be used including;

- Filter cloths will remain on open surface structures such as manholes and catchbasins until these structures are commissioned and put into use;
- Installation of silt fence, where applicable, around the perimeter of the proposed work area.
- The installation of straw bales within existing drainage features surround the site;
- Bulkhead barriers will be installed in the outlet pipes;

During construction of the services, any trench dewatering using pumps will be fitted with a "filter sock." Thus, any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filter sock as needed including sediment removal and disposal.

All catchbasins, and to a lesser degree, manholes, convey surface water to sewers. Consequently, until the surrounding surface has been completed, these structures will be covered to prevent sediment from entering the minor storm sewer system. These measures will stay in place and be maintained during construction and build-out until it is appropriate to remove them.

During construction of any development both imported and native soils are placed in stockpiles. Mitigative measures and proper management to prevent these materials entering the sewer system are needed.

During construction of the deeper watermains and sewers, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally placed before any catchbasins are installed.

Refer to the Erosion and Sedimentation Control Plan C12 provided in Appendix D.

6 APPROVAL AND PERMIT REQUIREMENTS

6.1 GENERAL

The proposed development is subject to site plan approval and building permit approval.

No approvals related to municipal drains are required.

No permits or approvals are anticipated to be required from the Ontario Ministry of Transportation, National Capital Commission, Parks Canada, Public Works and Government Services Canada, or any other provincial or federal regulatory agency.

7 CONCLUSION CHECKLIST

7.1 CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the proposed development can meet all provided servicing constraints and associated requirements. It is recommended that this report be submitted to the City of Ottawa in support of the application for site plan approval.

7.2 COMMENTS RECEIVED FROM REVIEW AGENCIES

Comments received from the City of Ottawa are provided in Appendix A.

APPENDIX

A

- PRE-CONSULTATION MEETING NOTES
- DESIGN BRIEF BY IBI GROUP

Pre-Consultation Meeting Notes
Ottawa Carleton District School Board High School, 700 Cope Drive

Location: Room 4102E, City Hall
Date: February 20, 2019, 2pm

Attendee	Role	Organization
Kathy Rygus	Planner	City of Ottawa
Eric Surprenant	Project Manager (Engineer)	
Julie Candow	Project Manager (Engineer)	
Mark Young	Urban Designer	
Rosanna Baggs	Transportation Engineer	
Bess Nakashima	Planning Assistant	
Dan Bradley	Supervisor of Design	Ottawa Carleton District School Board
Miro Vala	Manager of Facilities	
Jim Lennox	Landscape Architect	James B. Lennox and Associates
Jim Johnson	Engineer	WSP Engineering
Jerzy Jurewicz	Senior Project Architect	Edwards Cuhaci and Associates

Synopsis of Project

OCDSB is proposing a high school on subject property at 700 Cope Drive. The school will be built to accommodate aproximately1300 students. The first year will begin by offering grades 7, 8 and 9 with upper grades added each year. Parts of the school will be 4 storeys in height. There will be room for future portables, outdoor social spaces and two playing fields. Parking and drop-of areas are separated and screened by landscaping. The students will use a combination of school buses and OC Transpo.

Planning

1. This is a preconsultation for a new site plan, manager-approved with public consultation. Please be aware that the site plan control application categories and fees are changing as of June 1, 2019.
2. Please consult with the Ward Councillor prior to submission.

Design

1. Although the project is not subject to the Urban Design Review Panel, we expect a high level of quality in the design. We are pleased with the concept.

2. Consider grading of the site, which may be challenging. Try to minimize grade difference along the east (Robert Grant) side. Reduce grade difference as much a possible while not making it appealing for parents to drop-of on Robert Grant.
3. Consider a pedestrian walkway block for students traveling from the west, possibly with the entrance near the portables.
4. There is a 2.5-metre parking lay-by on Cope Drive for parent drop-offs. Maintain the curb line along Cope Drive if possible.

Engineering

1. Cope Drive is being constructed in Phase 1 of the CRT subdivision, which will be registered shortly. The local street on the south side of the school property is not included in Phase 1 works, so may not exist in the foreseeable future.
2. Cope Drive has a particular cross-section with a multi-use pathway on one side and sidewalk on the other. Street parking is permitted on the south (school) side.
3. No noise walls or retaining walls are permitted along the site boundary. Outdoor areas near Robert Grant and Cope may need noise reduction measures.
4. Coordinate all engineering with CRT's engineering consultant IBI. Servicing stubs are available from Cope Drive:
    a. 1200m metre storm
    b. 200m metre sanitary
    c. 200m water
5. There are grade raise restrictions on the site. The geotechnical study is to be coordinated with IBI and must take into account soil plasticity and tree species in sensitive clay soils.
6. OCDSB's engineering consultant WSP will need to make a request for boundary conditions.
7. Water fire flow calculation is to be per Fire Underwriters Survey method.
8. Studies required are Stormwater Management, Servicing, Geotechnical Study; plans needed are servicing, grading, sediment and erosion control, drainage.

Transportation

1. Currently the street proposed on the south side of the school site is not within a registered plan of subdivision, so may not exist for the foreseeable future.
2. A Transportation Impact Analysis is required. Please start this process as soon as possible. Steps 1-4 of the TIA, including the Road Modification Package, is required before application can be deemed complete.

3. Ensure that sight lines are maintained for the access and the lay-by, especially with the roundabout. The TIA will have to conduct analysis on access locations in relation to distance from roundabout.
4. A site triangle of 5x5m is required at intersection of Cope Drive and Robert Grant (Collector Road to Arterial Road).
5. The clear throat requirements for a major collector is 8 to15m, and will depend on traffic volumes and site layout.
6. No access to or lay-by on Robert Grant will be permitted. It is an arterial road with a high volume of traffic. No stopping for drop-offs will be allowed.
7. The school may require a turn lane in the future. A line-up of vehicles waiting to turn in to the school cannot block the roundabout.
8. Show the lay-by on the first submission of the site plan. If it is not on the first submission, a Road Modification Agreement will be required.
9. If the design includes the long driveway to the future street on the south side, provide traffic calming measures to prevent cut-through traffic.
10. The ultimate cross-section for Robert Grant Avenue will be a four lane arterial with a Bus Rapid Transit Route down the middle. The ultimate design may change the roundabout to a signalized intersection, so keep that in mind when designing.
11. Discuss location of future bus stops with OC Transpo and engage them early on to accommodate the student traffic. Buses will have routes on both Robert Grant and Cope Drive. Bus stops cannot impede flow of traffic through roundabout.
12. Co-ordinate with CRT and their engineering consultants IBI for location of on-street parking.
13. Cope Drive has a specific cross section with a multi-use pathway on one side of the street and a sidewalk on the other.
14. Carefully consider pedestrian movements in location of walkways and indicate pedestrian crossings’ on roads.
15. It is recommended to have both two site plans: one each for the interim and final design of Robert Grant Avenue. The ultimate scenario is not designed yet. Rosanna wil put in a request to obtain what is available.
16. Requirements to illustrate on site plan:

a. Show all details/ cross-sections of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
b. Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions). Provide these on a separate drawing.
c. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible.
d. Show lane/aisle widths.
e. Sidewalk is to be continuous across access as per City Specification 7.1.
f. Grey out any area that will not be impacted by this application, i.e. existing sidewalk.

Noise

1. Schools are a noise-sensitive use, so a Noise Study is required for the road.
2. Stationary Noise Study is required for any exposed mechanical equipment.

APPENDIX

B

- FIRE UNDERWRITERS SURVEY – FIRE FLOW CALCULATION
- WATER DEMAND CALCULATION

Fire Flow Design Sheet (FUS)
New Stittsville High School
700 Cope Drive
Stittsville, ON
WSP Project No. 19M-00179-00

Date: 24-Jul-19

(Future Portable Classrooms)

Fire Flow Requirements Based on Fire Underwriters Survey (FUS) 1999

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\,C\sqrt{A}$

F = required fire flow in litres per minute
C = coefficient related to the type of construction
- 1.5 for wood construction (structure essentially combustible)
- 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
- 0.8 for noncombustible construction (unprotected metal structural components, masonry or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

A = total floor area in square metres (including all storeys, but excluding basements at least 50% below grade)

A = 3045 m^2
C = 1.0
F = 12139.9 L/min

rounded off to 12,000 L/min (min value of 2000 L/min)

2. The value obtained in 1. may be reduced by as much as 25% for occupancies having a low contents fire hazard.

Non-combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Reduction due to low occupancy hazard -15% x 12,000 = 10,200 L/min

3. The value obtained in 2. may be reduced by as much as 50% for buildings equipped with automatic sprinkler protection.

Adequate Sprinkler confirms to NFPA13	-30%
Water supply common for sprinklers & fire hoses	-10%
Fully supervised system	-10%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -40% x 10,200 = -4,080 L/min

4. The value obtained in 2. is increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	12.2	15%	north side
Side 2	24.5	10%	east side
Side 3	100	0%	south side
Side 4	20	15%	west side
		40%	(Total shall not exceed 75%)

Increase due to separation 40% x 10,200 = 4,080 L/min

5. The flow requirement is the value obtained in 2., minus the reduction in 3., plus the addition in 4.

The fire flow requirement is 10,000 L/min (Rounded to nearest 1000 L/min)
or **167 L/sec**
or 2,642 gpm (us)
or 2,200 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

Fire Flow Design Sheet (FUS)
New Stittsville High School
700 Cope Drive
Stittsville, ON
WSP Project No. 19M-00179-00

Date: 24-Jul-19

New High School
Fire Flow Requirements Based on Fire Underwriters Survey (FUS) 1999

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\,C\sqrt{A}$

F = required fire flow in litres per minute
C = coefficient related to the type of construction
- 1.5 for wood construction (structure essentially combustible)
- 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
- 0.8 for noncombustible construction (unprotected metal structural components, masonry or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

A = total floor area in square metres (including all storeys, but excluding basements at least 50% below grade)

A = 9222 m^2
C = 0.8
F = 16901.5 L/min

rounded off to 16,000 L/min (min value of 2000 L/min)

2. The value obtained in 1. may be reduced by as much as 25% for occupancies having a low contents fire hazard.

Non-combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Reduction due to low occupancy hazard -15% x 16,000 = 13,600 L/min

3. The value obtained in 2. may be reduced by as much as 50% for buildings equipped with automatic sprinkler protection.

Adequate Sprinkler confirms to NFPA13	-30%
Water supply common for sprinklers & fire hoses	-10%
Fully supervised system	-10%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -40% x 13,600 = -5,440 L/min

4. The value obtained in 2. is increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	62	0%	north side
Side 2	125	0%	east side
Side 3	165	0%	south side
Side 4	25	10%	west side
		10%	(Total shall not exceed 75%)

Increase due to separation 10% x 13,600 = 1,360 L/min

5. The flow requirement is the value obtained in 2., minus the reduction in 3., plus the addition in 4.

The fire flow requirement is 10,000 L/min (Rounded to nearest 1000 L/min)
or **167 L/sec**
or 2,642 gpm (us)
or 2,200 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

Water Demand Calculation Sheet

Project: New Stittsville High School
Location: 700 Cope Drive, Stittsville, ON
WSP Project No. 19M-00179-00

Date: 24/07/2019
Design: D.B.Y
Page: 1 of 1

Proposed Buildings	Residential				Non-Residentail			Average Daily			Maximum Daily			Maximum Hourly			Fire
	Units			Beds	Industrial	Institutional	Commercial	Demand (l/s)			Demand (l/s)			Demand (l/s)			Demand
	SF	APT	ST		(ha)	(ha)	(ha)	Res.	Non-Res.	Total	Res.	Non-Res.	Total	Res.	Non-Res.	Total	(l/min)
New Stittsville HS						6.56			2.13	2.13		3.19	3.19		5.74	5.74	10,000

Population Densities		**Average Daily Demand**		**Maximum Daily Demand**		**Maximum Hourly Demand**	
Single Family	3.4 person/unit	Residentail	280 l/cap/day	Residential	2.5 x avg. day	Residential	2.2 x max. day
Semi-Detached	2.7 person/unit	Industrial	35000 l/ha/day	Industrial	1.5 x avg. day	Industrial	1.8 x max. day
Duplex	2.3 person/unit	Institutional	28000 l/ha/day	Institutional	1.5 x avg. day	Institutional	1.8 x max. day
Townhome (Row)	2.7 person/unit	Commercial	28000 l/ha/day	Commercial	1.5 x avg. day	Commercial	1.8 x max. day
Bachelor Apartment	1.4 person/unit						
1 Bedroom Apartment	1.4 person/unit						
2 Bedroom Apartment	2.1 person/unit						
3 Bedroom Apartment	3.1 person/unit						
4 Bedroom Apartment	4.1 person/unit						
Avg. Apartment	1.8 person/unit						

APPENDIX

C

- STORM SEWER DESIGN SHEET
- POST DEVELOPMENT STORM DRAINAGE AREA PLAN C11
- STORMWATER MANAGEMENT CALCULATIONS

STORM SEWER DESIGN SHEET

New Stittsville High School
700 Cope Drive, Stittsville, ON
Project: 19M-00179-00
Date: July, 2019

LOCATION				AREA (Ha)						RATIONAL DESIGN FLOW													PROPSOED SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.25	C= 0.35	C= 0.50	C= 0.60	C= 0.75	C= 0.90	IND 2.78AC	CUM 2.78 AC	INLET (min)	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (100) (mm/hr)	BLDG FLOW (L/s)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	MATERIAL PIPE	SIZE (mm)	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME IN PIPE	AVAIL CAP (5yr) (L/s)	(%)
POST-DEVELOPMENT																															
To Cope Drive																															
Stittsville HS	S101	CB124	STMH118	0.026					0.073	0.201	0.201	10.00	10.42	76.81	104.19	178.56		15.42				15.42	PVC DR-35	200.0	1.00	26.05	32.83	1.04	0.42	17.42	53.05%
Stittsville HS	S104	CB122	CBMH122	0.105						0.073	0.073	10.00	10.46	76.81	104.19	178.56		5.60				5.60	PVC DR-35	200.0	1.00	29.00	32.83	1.04	0.46	27.23	82.93%
Stittsville HS	S105	CBMH122	CBMH120						0.034	0.085	0.158	10.46	10.86	75.07	101.81	174.43		11.86				11.86	PVC DR-35	250.0	0.45	19.50	39.93	0.81	0.40	28.07	70.29%
Stittsville HS	S106	RYCB2	CBMH121	0.766						0.532	0.532	20.00	20.16	52.03	70.25	119.95		27.70				27.70	PVC DR-35	250.0	1.00	11.80	59.53	1.21	0.16	31.83	53.47%
Stittsville HS	S107	CBMH121	CBMH120	0.054						0.038	0.570	20.16	20.75	51.77	69.90	119.34		29.50				29.50	PVC DR-35	250.0	0.45	28.70	39.93	0.81	0.59	10.43	26.11%
Stittsville HS	S108	CBMH120	CBMH119						0.039	0.098	0.826	20.75	21.15	50.85	68.64	117.18		41.98				41.98	PVC DR-35	300.0	0.35	19.20	57.27	0.81	0.40	15.29	26.69%
Stittsville HS	S102	CB123	CBMH123	0.020					0.043	0.121	0.121	10.00	10.31	76.81	104.19	178.56		9.33				9.33	PVC DR-35	200.0	1.00	19.55	32.83	1.04	0.31	23.50	71.58%
Stittsville HS	S103	CBMH123	CBMH119						0.035	0.088	0.209	10.31	10.72	75.63	102.57	175.76		15.81				15.81	PVC DR-35	200.0	0.60	19.60	25.43	0.81	0.40	9.62	37.83%
Stittsville HS	S109	CBMH119	STMH118						0.038	0.095	1.130	21.15	21.56	50.26	67.83	115.78		56.77				56.77	PVC DR-35	375.0	0.26	20.10	89.49	0.81	0.41	32.72	36.56%
Stittsville HS		STMH118	CBMH116							0.000	1.330	21.56	22.01	49.65	67.00	114.36		66.05				66.05	PVC DR-35	375.0	0.26	21.95	89.49	0.81	0.45	23.44	26.19%
Stittsville HS	S110	CB121	CBMH117	0.127					0.007	0.106	0.106	10.00	10.50	76.81	104.19	178.56		8.12				8.12	PVC DR-35	200.0	1.00	31.50	32.83	1.04	0.50	24.71	75.25%
Stittsville HS	S111	CBMH117	CBMH116	0.028					0.043	0.127	0.233	10.50	11.12	74.93	101.61	174.09		17.44				17.44	PVC DR-35	200.0	0.60	29.90	25.43	0.81	0.62	7.99	31.40%
Stittsville HS	S113	CB120	CBMH116-CBMH111	0.048					0.013	0.066	0.066	10.00	10.35	76.81	104.19	178.56		5.06				5.06	PVC DR-35	200.0	1.00	21.75	32.83	1.04	0.35	27.77	84.59%
Stittsville HS	S112	CBMH116	CBMH111	0.006					0.086	0.219	1.848	22.01	22.99	49.00	66.12	112.84		90.58				90.58	PVC DR-35	450.0	0.21	48.00	130.78	0.82	0.97	40.20	30.74%
Stittsville HS	S153	RYCB1	CBMH115	0.094						0.065	0.065	15.00	15.42	61.77	83.56	142.89		4.04				4.04	PVC DR-35	250.0	1.00	30.75	59.53	1.21	0.42	55.49	93.22%
Stittsville HS	S114	CBMH115	CBMH114	0.022					0.094	0.250	0.316	15.42	16.05	60.79	82.21	140.58		19.20				19.20	PVC DR-35	250.0	0.50	32.30	42.09	0.86	0.63	22.90	54.39%
Stittsville HS	S115	CB118	CBMH114						0.065	0.163	0.163	10.00	10.28	76.81	104.19	178.56		12.49				12.49	PVC DR-35	200.0	1.00	17.80	19.00	1.04	0.28	6.51	34.26%
Stittsville HS	S116	CBMH114	CBMH113	0.032					0.019	0.070	0.548	16.05	16.58	59.39	80.31	137.29		32.56				32.56	PVC DR-35	250.0	0.50	27.40	42.09	0.86	0.53	9.53	22.65%
Stittsville HS	S117	CB117	CBMH113	0.019					0.083	0.221	0.221	10.00	10.32	76.81	104.19	178.56		16.96				16.96	PVC DR-35	200.0	1.00	20.35	32.83	1.04	0.32	15.87	48.33%
Stittsville HS	S118	CBMH113	CBMH112	0.057					0.005	0.052	0.821	16.58	17.13	58.26	78.76	134.62		47.85				47.85	PVC DR-35	300.0	0.40	28.10	61.22	0.87	0.54	13.37	21.84%
Stittsville HS	S119	CB116	CBMH112	0.035					0.072	0.204	0.204	10.00	10.37	76.81	104.19	178.56		15.70				15.70	PVC DR-35	200.0	1.00	23.00	32.83	1.04	0.37	17.13	52.17%
Stittsville HS	S120	CBMH112	CBMH111	0.091					0.004	0.073	1.099	17.13	17.52	57.17	77.26	132.04		62.82				62.82	PVC DR-35	375.0	0.30	20.70	96.13	0.87	0.40	33.31	34.65%
Stittsville HS	S121	CBMH127	CBMH111	1.139				0.378		1.580	1.580	25.00	25.33	45.17	60.90	103.85		71.35				71.35	PVC DR-35	375.0	0.30	17.05	96.13	0.87	0.33	24.78	25.78%
Stittsville HS	S123	CB115	CBMH111-CBMH105						0.096	0.240	0.240	10.00	10.27	76.81	104.19	178.56		18.45				18.45	PVC DR-35	200.0	1.00	16.75	32.83	1.04	0.27	14.38	43.81%
Stittsville HS	S122	CBMH111	CBMH105	0.008					0.058	0.151	4.918	25.33	26.40	44.79	60.38	102.96		220.26				220.26	PVC DR-35	675.0	0.13	54.50	303.38	0.85	1.07	83.12	27.40%
From Future Building Expansion																															
Stittsville HS	Future	Fut. Building Exp.	CBMH105						0.311	0.778	0.778	10.00	10.08	76.81	104.19	178.56		59.76				59.76	PVC DR-35	300.0	1.50	8.10	118.55	1.68	0.08	58.79	49.59%
To Cope Drive Continue																															
Stittsville HS	S124	CB114	CBMH110	0.072						0.050	0.050	10.00	10.44	76.81	104.19	178.56		3.84				3.84	PVC DR-35	200.0	1.00	27.40	32.83	1.04	0.44	28.99	88.29%
Stittsville HS	S125	CBMH110	CBMH109	0.028						0.019	0.070	10.44	11.66	75.17	101.94	174.66		5.22				5.22	PVC DR-35	250.0	0.45	59.60	39.93	0.81	1.22	34.71	86.92%
Stittsville HS	S126	CBMH109	CBMH108	0.029						0.020	0.090	11.66	12.88	70.97	96.17	164.69		6.36				6.36	PVC DR-35	250.0	0.45	59.60	39.93	0.81	1.22	33.57	84.07%
Stittsville HS	S127	CBMH108	CBMH107	0.027						0.019	0.108	12.88	13.33	67.26	91.09	155.90		7.29				7.29	PVC DR-35	250.0	0.45	21.65	39.93	0.81	0.44	32.64	81.74%
Stittsville HS	S128	CBMH107	CBMH106	0.070					0.022	0.104	0.212	13.33	14.79	66.02	89.39	152.96		14.00				14.00	PVC DR-35	250.0	0.45	71.50	39.93	0.81	1.47	25.93	64.93%
Stittsville HS	S129	CBMH106	CBMH105	0.033					0.011	0.050	0.263	14.79	15.17	62.26	84.23	144.06		16.35				16.35	PVC DR-35	250.0	0.45	18.20	39.93	0.81	0.37	23.58	59.06%
Stittsville HS	S130	CBMH105	CBMH104	0.012					0.069	0.181	5.362	26.40	26.73	43.59	58.75	100.16		233.71				233.71	PVC DR-35	750.0	0.13	18.20	401.80	0.91	0.33	168.09	41.84%
Stittsville HS	S148	Building	CBMH104						0.612	1.531	1.531	10.00	10.22	76.81	104.19	178.56		117.61				117.61	PVC DR-35	375.0	1.50	25.10	214.95	1.94	0.22	97.35	45.29%

Definition:
Q=2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall Intensity in millimeters per hour (mm/hr)
i = 732.951/(TC+6.199)^0.810 — 2 Year
i = 1174.184/(TC+6.014)^0.816 — 5 Year
i = 1735.688/(TC+6.014)^0.820 — 100 Year

Notes:
1. Mannings coefficient (n) = 0.013

Time-of-Concentration in the Swale
FAA Equation: t (min) = 3.258 [(1.1 - C) L^0.5 / S^.33]
Where: Longest Watercourse Length, L (m). S (%)
Runoff Coef.C = Impervious

No.	L (m)	S %
1		

Tc= #DIV/0! min

Designed: D.B.Y.
Checked: D.B.Y./J.J.
Dwg. Reference: C10

No.	Revision	Date
1.	City Submission No. 1	24/07/2019

File Reference:	Date:	Sheet No:
19M-00179-00	24/07/2019	1 of 2

STORM SEWER DESIGN SHEET

New Stittsville High School
700 Cope Drive, Stittsville, ON
Project: 19M-00179-00
Date: July, 2019

LOCATION				AREA (Ha)						RATIONAL DESIGN FLOW													PROPSOED SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.25	C= 0.35	C= 0.50	C= 0.60	C= 0.75	C= 0.90	IND 2.78AC	CUM 2.78 AC	INLET (min)	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (100) (mm/hr)	BLDG FLOW (L/s)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	MATERIAL PIPE	SIZE (mm)	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME IN PIPE	AVAIL CAP (5yr) (L/s)	(%)
To Cope Drive Continue																															
Stittsville HS	S131	CB112	STMH123	0.037					0.011	0.053	0.053	10.00	10.34	76.81	104.19	178.56		4.09				4.09	PVC DR-35	200.0	1.00	21.20	32.83	1.04	0.34	28.74	87.55%
Stittsville HS	S132	CB113	STMH123	0.037					0.011	0.053	0.053	10.00	10.34	76.81	104.19	178.56		4.09				4.09	PVC DR-35	200.0	1.00	21.35	32.83	1.04	0.34	28.74	87.55%
Stittsville HS	S133	CB111	STMH123-CBMH104	0.038					0.022	0.081	0.081	10.00	10.34	76.81	104.19	178.56		6.26				6.26	PVC DR-35	200.0	1.00	21.00	32.83	1.04	0.34	26.58	80.94%
Stittsville HS	S134	CB110	STMH123-CBMH104	0.120					0.044	0.193	0.193	10.00	10.23	76.81	104.19	178.56		14.86				14.86	PVC DR-35	200.0	1.00	14.35	32.83	1.04	0.23	17.97	54.74%
Stittsville HS	S135	CB109	STMH123-CBMH104	0.038					0.022	0.081	0.081	10.00	10.33	76.81	104.19	178.56		6.26				6.26	PVC DR-35	200.0	1.00	20.60	32.83	1.04	0.33	26.58	80.94%
Stittsville HS	S136	CB108	STMH123-CBMH104	0.018					0.061	0.165	0.165	10.00	10.16	76.81	104.19	178.56		12.68				12.68	PVC DR-35	200.0	1.00	10.10	32.83	1.04	0.16	20.15	61.37%
Stittsville HS		STMH125	CBMH104							0.000	0.628	10.34	12.48	75.52	102.43	175.50		47.43				47.43	PVC DR-35	300.0	0.35	103.95	57.27	0.81	2.14	9.84	17.18%
Stittsville HS	S137	CBMH104	CBMH101	0.009					0.103	0.264	7.785	26.73	27.19	43.23	58.26	99.32		336.55				336.55	PVC DR-35	750.0	0.13	24.83	401.80	0.91	0.46	65.26	16.24%
Stittsville HS	S139	CB107	CBMH103-CBMH101	0.031					0.013	0.054	0.054	10.00	10.49	76.81	104.19	178.56		4.15				4.15	PVC DR-35	200.0	1.00	30.60	32.83	1.04	0.49	28.68	87.35%
Stittsville HS	S140	CB106	CBMH103-CBMH101	0.019					0.052	0.143	0.143	10.00	10.04	76.81	104.19	178.56		11.01				11.01	PVC DR-35	200.0	1.00	2.65	32.83	1.04	0.04	21.82	66.47%
Stittsville HS	S141	CB105	CBMH103-CBMH101	0.015					0.065	0.173	0.173	10.00	10.26	76.81	104.19	178.56		13.29				13.29	PVC DR-35	200.0	1.00	16.30	32.83	1.04	0.26	19.54	59.52%
Stittsville HS	S142	CB104	CBMH103-CBMH101	0.025					0.063	0.175	0.175	10.00	10.05	76.81	104.19	178.56		13.44				13.44	PVC DR-35	200.0	1.00	3.25	32.83	1.04	0.05	19.39	59.06%
Stittsville HS	S143	CB103	CBMH103-CBMH101						0.060	0.150	0.150	10.00	10.25	76.81	104.19	178.56		11.53				11.53	PVC DR-35	200.0	1.00	15.85	32.83	1.04	0.25	21.30	64.88%
Stittsville HS	S144	CB102	CBMH103-CBMH101	0.029					0.052	0.150	0.150	10.00	10.06	76.81	104.19	178.56		11.54				11.54	PVC DR-35	200.0	1.00	3.75	32.83	1.04	0.06	21.29	64.85%
Stittsville HS	S145	CB101	CBMH103-CBMH101						0.050	0.125	0.125	10.00	10.25	76.81	104.19	178.56		9.61				9.61	PVC DR-35	200.0	1.00	15.35	32.83	1.04	0.25	23.22	70.73%
Stittsville HS	S138	CBMH103	CBMH101	0.017					0.029	0.084	1.055	10.49	12.49	74.98	101.68	174.21		79.12				79.12	PVC DR-35	375.0	0.35	112.75	103.83	0.94	2.00	24.71	23.80%
Stittsville HS	S150	CB126	CBMH124-CBMH102	0.015						0.010	0.010	10.00	10.08	76.81	104.19	178.56		0.80				0.80	PVC DR-35	200.0	1.00	5.25	32.83	1.04	0.08	32.03	97.56%
Stittsville HS	S151	CB125	CBMH124-CBMH102	0.012						0.008	0.008	10.00	10.17	76.81	104.19	178.56		0.64				0.64	PVC DR-35	200.0	1.00	10.90	32.83	1.04	0.17	32.19	98.05%
Stittsville HS	S146	CBMH124	STMH102	0.007					0.077	0.198	0.216	10.17	11.25	76.14	103.28	176.98		16.47				16.47	PVC DR-35	250.0	0.45	52.45	39.93	0.81	1.08	23.46	58.76%
Stittsville HS	S147	CB119	STMH102-CBMH101	0.029					0.057	0.163	0.163	10.00	10.03	76.81	104.19	178.56		12.50				12.50	PVC DR-35	200.0	1.00	2.05	32.83	1.04	0.03	20.33	61.92%
Stittsville HS		STMH102	CBMH101							0.000	0.379	11.25	11.65	72.32	98.03	167.89		27.41				27.41	PVC DR-35	250.0	0.45	19.50	39.93	0.81	0.40	12.52	31.35%
Stittsville HS	S149	CBMH101	STMH100						0.033	0.083	9.302	27.19	27.45	42.75	57.61	98.20		397.68				397.68	PVC DR-35	825.0	0.13	15.35	518.08	0.97	0.26	120.40	23.24%
Stittsville HS		STMH100	*Ex. MH176*							0.000	9.302	27.45	27.60	42.48	57.24	97.56		395.14				395.14	PVC DR-35	*1200.0*	*0.15*	*12.00*	1511.50	1.34	0.15	1116.35	73.86%

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i = 732.951/(TC+6.199)^0.810 — 2 Year
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Notes:
1. Mannings coefficient (n) = 0.013

Time-of-Concentration in the Swale
FAA Equation: t (min) = 3.258 [(1.1 - C) L^0.5 / S^.33]
Where: Longest Watercourse Length, L (m). S (%)
Runoff Coef.C = Impervious

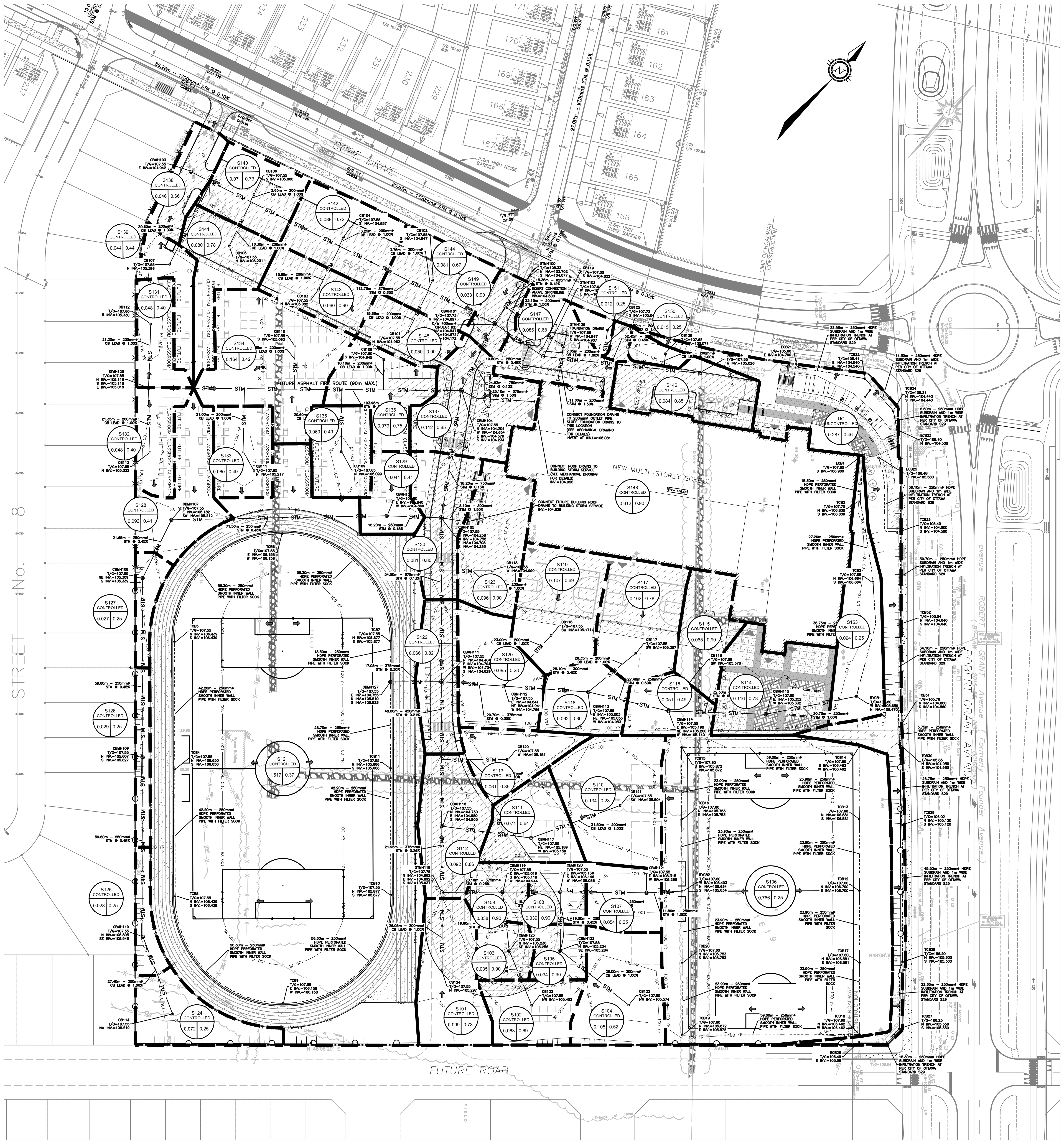
No.	L (m)	S %
1		

Tc= #DIV/0! min

Designed: D.B.Y.
Checked: D.B.Y./J.J.
Dwg. Reference: C10

No.	Revision	Date
1.	City Submission No. 1	24/07/2019

File Reference:	Date:	Sheet No:
19M-00179-00	24/07/2019	2 of 2



SURFACE PONDING TABLE

POND #	AREA ID	LOCATION	PONDING ELEVATION (m)	TOP OF CB ELEVATION (m)	PONDING DEPTH (m)	PONDING AREA (m^2)	PONDING VOLUME (m^3)
SURFACE PONDING							
1	S101	CB124	107.80	107.55	0.25	448.45	37.37
2	S104	CB122	107.80	107.55	0.25	492.76	41.06
3	S105	CBMH122	107.80	107.55	0.25	171.66	14.31
4	S106	RYCB2	107.80	107.60	0.20	3314.41	220.96
5	S107	CBMH121	107.80	107.55	0.25	265.31	22.11
6	S108	CBMH120	107.80	107.55	0.25	200.53	16.71
7	S102	CB123	107.80	107.55	0.25	304.41	25.37
8	S103	CBMH123	107.80	107.55	0.25	185.58	15.46
9	S109	CBMH119	107.80	107.55	0.25	208.85	17.40
10	S110	CB121	107.80	107.55	0.25	830.03	69.17
11	S111	CBMH117	107.80	107.55	0.25	412.60	34.38
12	S113	CB120	107.80	107.55	0.25	276.07	23.01
13	S112	CBMH116	107.80	107.55	0.25	587.73	48.98
14	S153	RYCB1	107.80	107.60	0.20	578.41	38.56
15	S114	CBMH115	107.80	107.55	0.25	528.09	44.01
16	S115	CB118	107.80	107.55	0.25	318.97	26.58
17	S116	CBMH114	107.80	107.55	0.25	410.57	34.21
18	S117	CB117	107.80	107.55	0.25	425.77	35.48
19	S118	CBMH113	107.80	107.55	0.25	520.81	43.40
20	S119	CB116	107.80	107.55	0.25	449.62	37.47
21	S120	CBMH112	107.80	107.55	0.25	616.17	51.35
22	S121	CBMH127	107.80	107.55	0.25	9021.95	751.83
23	S123	CB115	107.80	107.55	0.25	349.41	29.12
24	S122	CBMH111	107.80	107.55	0.25	349.43	29.12
25	S124	CB114	107.80	107.55	0.25	191.51	15.96
26	S125	CBMH110	107.80	107.55	0.25	153.02	12.75
27	S126	CBMH109	107.80	107.55	0.25	159.08	13.26
28	S127	CBMH108	107.80	107.55	0.25	120.99	10.08
29	S128	CBMH107	107.80	107.55	0.25	257.91	21.49
30	S129	CBMH106	107.80	107.60	0.20	203.59	13.57
31	S130	CBMH105	107.80	107.55	0.25	344.95	28.75
32	S131	CB112	107.80	107.60	0.20	177.79	11.85
33	S132	CB113	107.80	107.60	0.20	111.18	7.41
34	S133	CB111	107.80	107.65	0.15	106.59	5.33
35	S134	CB110	107.80	107.55	0.25	405.43	33.79
36	S135	CB109	107.80	107.65	0.15	103.75	5.19
37	S136	CB108	107.80	107.60	0.20	103.25	6.88
38	S137	CBMH104	107.80	107.55	0.25	341.82	28.48
39	S139	CB107	107.80	107.55	0.25	128.29	10.69
40	S140	CB106	107.80	107.55	0.25	480.88	40.07
41	S141	CB105	107.80	107.55	0.25	425.50	35.46
42	S142	CB104	107.80	107.55	0.25	622.68	51.89
43	S143	CB103	107.80	107.55	0.25	532.61	44.38
44	S144	CB102	107.80	107.55	0.25	486.72	40.56
45	S145	CB101	107.80	107.55	0.25	431.92	35.99
46	S138	CBMH103	107.80	107.55	0.25	280.43	23.37
47	S150	CB126	107.80	107.62	0.18	81.77	4.91
48	S151	CB125	107.80	107.72	0.08	50.25	1.34
49	S146	CBMH124	107.80	107.55	0.25	327.07	27.26
50	S147	CB119	107.80	107.55	0.25	288.92	24.08
51	S149	CBMH101	107.80	107.73	0.07	57.38	1.34

*Ponding Volume is calculated using ponding area mulitplied by the maximum ponding depth, and divided by 3 for a conical pond.

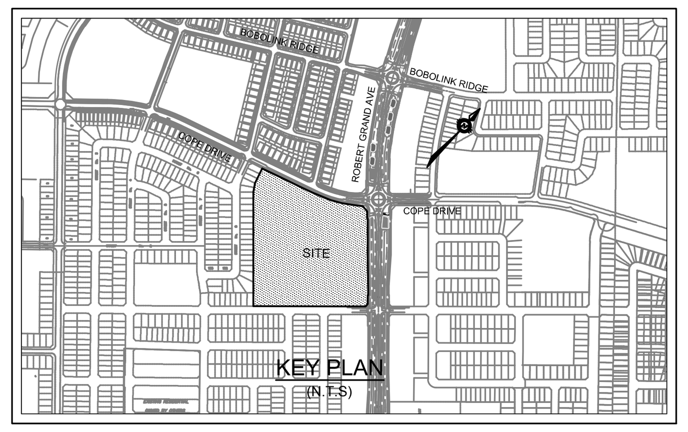
LEGEND:

- EXISTING FIRE HYDRANT
- EXISTING V&VB
- EXISTING VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED V&B
- PROPOSED REMOTE METER
- PROPOSED METER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSE CATCHBASIN
- PROPOSE LANDSCAPE CATCHBASIN
- EXISTING CATCHBASIN MANHOLE
- STM — EXISTING STORM SEWER AND MANHOLE
- STM — PROPOSED STORM SEWER AND MANHOLE
- STORM DRAINAGE BOUNDARY
- ID / CONTROLLED / A C — ID DENOTES WATERSHED NAME; A DENOTES AREA IN HECTARES; C DENOTES RUNOFF COEFFICIENT
- OVERLAND MAJOR FLOW ROUTE

10m 0 10 20 30m

SCALE: 1:750

OTTAWA–CARLETON DISTRICT SCHOOL BOARD



ISSUE NO.	REV. NO.	DATE YY/MM/DD	ISSUE
1	0	19/07/24	ISSUED FOR SITE PLAN APPLICATION

REGISTERED PROFESSIONAL ENGINEER — D. B. YANG — 100230568 — 2019-07-24 — PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER — J. C. JOHNSTON — 2019-07-24 — PROVINCE OF ONTARIO

NOT VALID UNLESS SIGNED AND DATED

wsp

300-2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 1-613-829-2800 | FAX: 1-613-829-8299 | WWW.WSPGROUP.COM

PROJECT TITLE/TITRE DU PROJET

NEW STITTSVILLE HIGH SCHOOL
700 COPE DRIVE
STITTSVILLE, ON

OTTAWA CARLETON DISTRICT SCHOOL BOARD
NEPEAN, ON K2H 6L3
133 GREENBANK ROAD

DRAWING TITLE/TITRE DU DESSIN

STORM DRAINAGE AREA PLAN

SCALE / ECHELLE	AS SHOWN	PROJ. No 19M-00179-00	ISSUE No 1	REV. No 1
DRAWN BY / DESSINE PAR	D.B.Y.	DRAWING/DESSIN		
CHECKED BY / VERIFIE PAR	J.J.	C11		
DATE	2019-05-17	ACAD FILE/FICHIER: 19M-00179-00_CIVIL.DWG		

New Stittsville High School
700 Cope Drive, Stittsville, ON
Project: 19M-00179-00
Date: July, 2019

Stormwater Management Summary

Drainage Area I.D.	Location	Sub Area (ha)	Avg. Composite 'C' 5 yr	Avg. Composite 'C' 100 yr	Outlet Location	5 Year Uncontrolled/ Controlled Release (L/s)	5 year Storage Required (m^3)	100 Year Uncontrolled/ Controlled Release (L/s)	100 year Storage Required (m^3)	100 Year Storage Provided (m^3)
Total Allowable Release Rate (Golder Associate Ltd, 2006)								**801.37**		
CONTROLLED										
S101-S151	CBMH101	6.344	0.54	0.62	Cope Drive	713.53	167.26	720.80	738.99	2260.59
UNCONTROLLED										
UC	ROBERT GRANT AVE (R.O.W.)	0.287	0.460	0.53	ROBERT GRANT AVE	38.20		75.50		
		Maximum Allowable Release Rate (WSP, 2019)						**796.30**		
Total		6.631				751.73	167.26	796.30	738.99	2260.59

New Stittsville High School
700 Cope Drive, Stittsville, ON
Project: 19M-00179-00
Date: July, 2019

Pre-Deleveopment (IBI Group, 2017)
Table 1a - Allowable Release Rate (Pre-Development)

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.25)/A_{tot}$

5 Year Event

	C	Intensity	Area
5 Year	0.50	90.02	6.570
2.78CIA=	822.04		
	822.04	L/s	

*Use a 13.16 minute time of concentration for 5 year

DDSWMM Parameters (IBI Group, 2017)

Area ID	Area (HA)	MH	D/S Segment	IMP Ratio	Length (m)	Width (m)	Avail. Storage (m^3)	5 Year Simulated Flow (L/s)	ICD Restriction (L/s)
INST2	6.57	MH176	S175	0.50	739	1478	618*	822	801.37

Note: *Assumed ponding volume. Assumes that on-site storage will be provided up to the 100 year 3 hour Chicago event

Equations:

Flow Equation

$Q = 2.78 \times C \times I \times A$

Where:

C is the runoff coefficient

I is the intensity of rainfall, City of Ottawa IDF

Rainfall Intensity = $998.071/(T+6.053)^{\wedge-0.814}$ T= time in minutes

A is the total drainage area

New Stittsville High School
700 Cope Drive, Stittsville, ON
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TABLE 2 - Uncontrolled Flow to Robert Grand Ave and Cope Drive

Runoff Coefficient Equation
$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$
$*C = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{tot}$

*Runoff coefficients increased by 25% up to a maximum value of 0.99 for the 100-Year event

Post Dev run-off Coefficient "C"

			2 & 5 Year Event		100 Year Event	
Area	**Surface**	**Ha**	**"C"**	**C_{avg}**	**"C"+25%**	**$*C_{avg}$**
Total	Asphalt	0.091	0.90	**0.46**	0.99	**0.53**
0.287	Roof	0.000	0.90		0.99	
	Grass	0.196	0.25		0.31	

Post Dev Free Flow
5 Year Event

Pre Dev.	**C**	**Intensity**	**Area**
5 Year	0.46	104.19	0.287
2.78CIA=	38.24		
38.20	L/S		

**Use a 10 minute time of concentration for 5 year

100 Year Event

Pre Dev.	**C**	**Intensity**	**Area**
100 Year	0.53	178.56	0.287
2.78CIA=	75.51		
75.50	L/S		

**Use a 10 minute time of concentration for 100 year

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the intensity of rainfall, City of Ottawa IDF
A is the total drainage area

New Stittsville High School
700 Cope Drive, Stittsville, ON
Project: 19M-00179-00
Date: July, 2019

TABLE 2 - Storage Required for New Stittsville High School

Maximum Allowable Release Rate to Pond 5:
725.87 l/s

Post Dev run-off Coefficient "C"

Area	Surface	Ha	2 & 5 Year Event "C"	C_{avg}	100 Year Event "C" x 1.25	$C_{100\ avg}$
Total	Asphalt	2.522	0.90	0.54	0.99	0.62
6.344	Gravel	0.378	0.75		0.94	
	Grass	3.444	0.25		0.31	

*Areas are approximate based on Architectural site plan and Storm Draiange Area Plan

Runoff Coefficient Equation
$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$
$*C = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{tot}$

*Runoff coefficients increased by 25% up to a maximum value of 0.99 for the 100-Year event

QUANTITY STORAGE REQUIREMENTS - 5 Year

6.344 = Area(ha)
0.54 = C
725.9 l/s = max allowable release rate

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Runoff (L/s)	Net Runoff To Be Stored (L/s)	Storage Req'd m^3	Storage Avail m^3
5 YEAR	10	104.19	992.29	713.53	278.76	167.26	2260.59
	20	70.25	669.04	713.53	-44.49	-53.39	2260.59
	30	53.93	513.59	713.53	-199.95	-359.90	2260.59
	40	44.18	420.80	713.53	-292.74	-702.57	2260.59
	50	37.65	358.59	713.53	-354.94	-1064.81	2260.59
	60	32.94	313.74	713.53	-399.79	-1439.25	2260.59

QUANTITY STORAGE REQUIREMENTS - 100 Year

6.344 = Area(ha)
0.62 = *C
725.9 l/s = max allowable release rate

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Runoff (L/s)	Net Runoff To Be Stored (L/s)	Storage Req'd m^3	Storage Avail m^3
100 YEAR	10	178.56	1952.46	720.80	1231.66	738.99	2260.59
	20	119.95	1311.60	720.80	590.80	708.96	2260.59
	30	91.87	1004.53	720.80	283.73	510.72	2260.59
	40	75.15	821.68	720.80	100.88	242.10	2260.59
	50	63.95	699.31	720.80	-21.49	-64.48	2260.59
	60	55.89	611.18	720.80	-109.62	-394.63	2260.59
	70	49.79	544.43	720.80	-176.38	-740.78	2260.59

Orifice #1 Sizing
CBMH101

Event	Flow (L/s)	Head (m)	ORIFICE AREA(m^2)	SQUARE (1-side mm)	CIRC (mmØ)
5 Year	713.53	3.42	0.145	381	430
100 Year	720.80	3.49	0.145	381	430

Orifice Control Sizing
Q = 0.6 x A x (2gh)1/2
Where:
Q is the release rate in m^3/s
A is the orifice area in m^2
g is the acceleration due to gravity, $9.81 m/s^2$
h is the head of water above the orifice centre in m
d is the diameter of the orifice in m

Orifice Invert =	104.097	m
Ponding Elevation =	107.800	m
Top of CB Elevation =	107.730	m

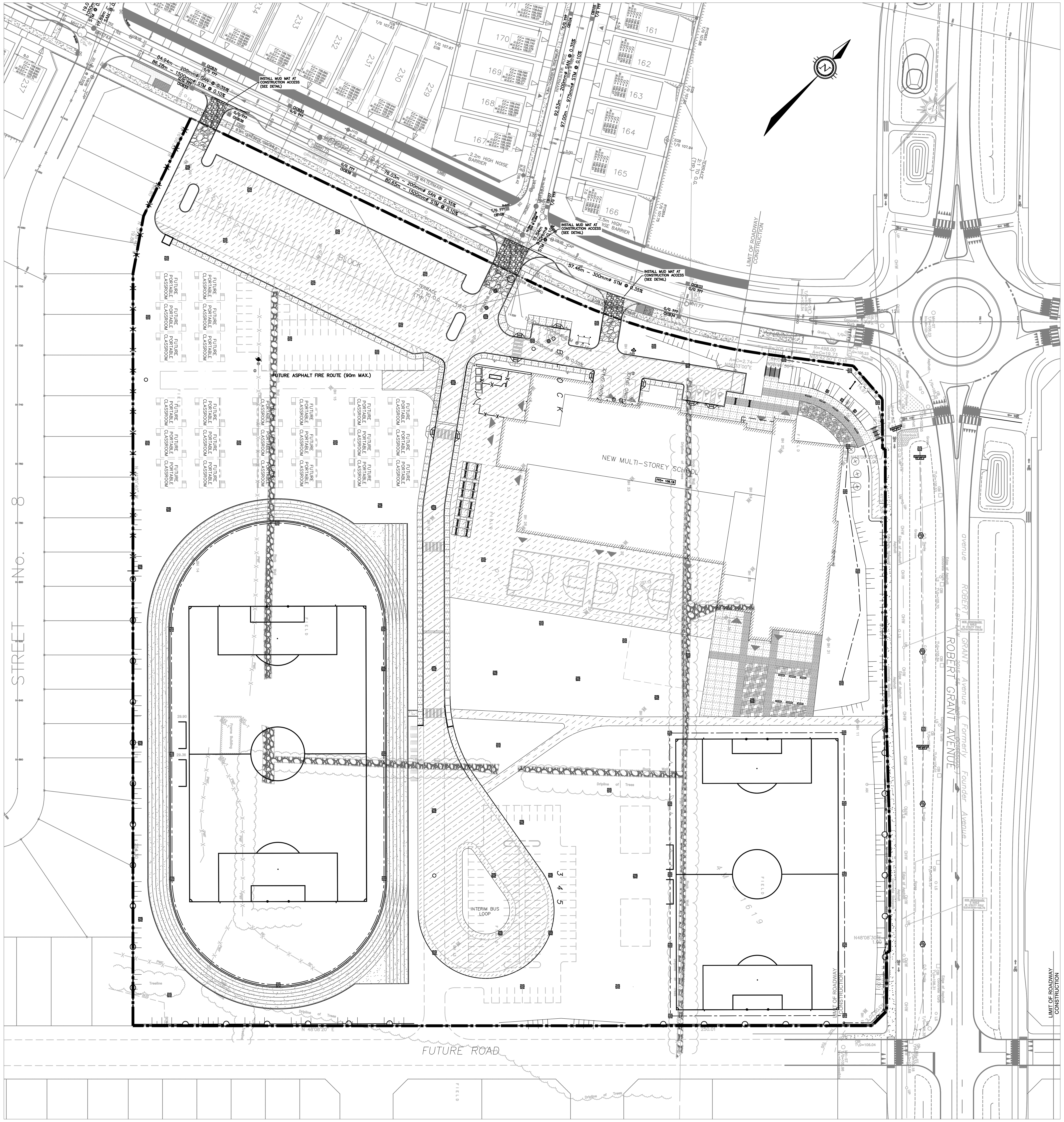
Note: Orifice #1 is located on the downstream invert of Ex.CBMH101

Equations:
Flow Equation
Q = 2.78 x C x I x A
Where:
C is the runoff coefficient
I is the intensity of rainfall, City of Ottawa IDF
A is the total drainage area

APPENDIX

D

- EROSION AND SEDIMENTATION CONTROL PLAN C12

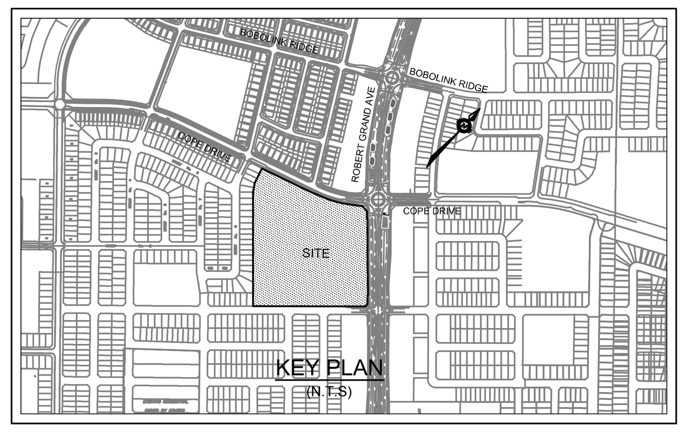


LEGEND

— · —	LIGHT DUTY SILT FENCE AS PER OPSD-219.110
— — —	SNOW FENCE
⬡	ROCK CHECK DAM AS PER OPSD-219.211
▭	STRAW BALE CHECK DAM AS PER OPSD-219.180
▨	FILTER CLOTH PLACED UNDER CB AND CBMH COVER

10m 0 10 20 30m
SCALE: 1:750

OTTAWA–CARLETON DISTRICT SCHOOL BOARD



ISSUE NO.	REV. NO.	DATE YY/MM/DD	ISSUE
1	0	19/07/24	ISSUED FOR SITE PLAN APPLICATION

REGISTERED PROFESSIONAL ENGINEER
D. B. YANG
100230568
2019-07-24
PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER
J. C. JOHNSTON
2019-07-24
PROVINCE OF ONTARIO

NOT VALID UNLESS SIGNED AND DATED

wsp

300-2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 1-613-829-2800 | FAX: 1-613-829-8299 | WWW.WSPGROUP.COM

PROJECT TITLE/TITRE DU PROJET
NEW STITTSVILLE HIGH SCHOOL
700 COPE DRIVE
STITTSVILLE, ON

OTTAWA CARLETON DISTRICT SCHOOL BOARD
NEPEAN, ON K2H 6L3
133 GREENBANK ROAD

DRAWING TITLE/TITRE DU DESSIN

EROSION AND SEDIMENTATION CONTROL PLAN

SCALE / ECHELLE	AS SHOWN	PROJ. No 19M-00179-00	ISSUE No 1	REV. No 1
DRAWN BY / DESSINE PAR	D.B.Y.	DRAWING/DESSIN		
CHECKED BY / VERIFIE PAR	J.J.	C12		
DATE	2019-05-17	ACAD FILE/FICHIER: 19M-00179-00_CIVIL.DWG		

APPENDIX

E

- SUBMISSION CHECK LIST

4.1 General Content

☒ Executive Summary (for larger reports only).

Comments: Refer to Servicing Report Section 1.1

☒ Date and revision number of the report.

Comments: *Refer to front page of the Report*

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

Comments: *Refer to Figure 1.1 Site Location for Location Map and Plan*

☒ Plan showing the site and location of all existing services.

Comments: *Refer to drawing C07 to C10*

☒ 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.

Comments: *Refer to Architectural Site Plan*

☒ Summary of Pre-consultation Meetings with City and other approval agencies.

Comments: Refer to Appendix A for Pre-Consultation Meeting Notes

☒ 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 defendable design criteria.

Comments: *N/A*

☒ Statement of objectives and servicing criteria.

Comments: Refer to Servicing Report Section 1.7

☒ Identification of existing and proposed infrastructure available in the immediate area.

Comments: *Refer to drawing C07 to C10*

☒ 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).

Comments: *N/A*

☒ 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.

Comments: *Refer to drawing C03 to C06*

☒ 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.

Comments: *N/A*

☒ Proposed phasing of the development, if applicable.

Comments: *N/A*

☒ Reference to geotechnical studies and recommendations concerning servicing.

Comments: *N/A*

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

- ☒ Metric scale
- ☒ North arrow (including construction North)
- ☒ Key plan
- ☒ Name and contact information of applicant and property owner
- ☒ Property limits including bearings and dimensions
- ☒ Existing and proposed structures and parking areas
- ☒ Easements, road widening and rights-of-way
- ☒ Adjacent street names

Comments: *Refer to drawing C03 to C10*

4.2 Development Servicing Report: Water

☒ Confirm consistency with Master Servicing Study, if available

Comments: *Refer to Servicing Report Section 2.1*

☒ Availability of public infrastructure to service proposed development

Comments: Refer to Servicing Report Section 2.1

☒ Identification of system constraints

Comments: N/A

☒ Identify boundary conditions

Comments: *Refer to Servicing Report Section 2.2*

☒ Confirmation of adequate domestic supply and pressure

Comments: *Refer to Servicing Report Section 2.3*

☒ 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.

Comments: *Refer to Servicing Report Section 2.4*

☒ 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.

Comments: *Refer to Servicing Report Section 2.5*

☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

Comments: *Refer to Servicing Report Section 2.6*

☒ Address reliability requirements such as appropriate location of shut-off valves

Comments: *Refer to Servicing Report Section 2.7*

☒ Check on the necessity of a pressure zone boundary modification.

Comments: *Refer to Servicing Report Section 2.8*

☒ 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

Comments: *Refer to Servicing Report Section 2.9*

☒ 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.

Comments: *Refer to Servicing Report Section 2.10*

☒ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

Comments: *Refer to Servicing Report Section 2.11*

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

Comments: *Refer to Servicing Report Section 2.12*

☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

Comments: *Refer to Servicing Report Section 2.13*

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).

Comments: *Refer to Servicing Report Section 3.1*

☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.

Comments: *Refer to Servicing Report Section 3.2*

☒ 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.

Comments: *Refer to Servicing Report Section 3.3*

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

Comments: *Refer to Servicing Report Section 3.4*

☒ 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)

Comments: *Refer to Servicing Report Section 3.5*

☒ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

Comments: Refer to Servicing Report Section 3.9 and 3.11

☒ Special considerations such as contamination, corrosive environment etc.

Comments: *Refer to Servicing Report Section 3.8*

4.4 Development Servicing Report: Stormwater

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

Comments: *Refer to Servicing Report Section 4.1*

☒ Analysis of available capacity in existing public infrastructure.

Comments: *Refer to Servicing Report Section 4.2*

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

Comments: *Refer to drawing C03 to C06*

☒ 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.

Comments: *Refer to Servicing Report Section 4.4*

☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

Comments: *Refer to Servicing Report Section 4.5*

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

Comments: *Refer to Servicing Report Section 4.6-4.10*

☒ Set-back from private sewage disposal systems.

Comments: *N/A*

☒ Watercourse and hazard lands setbacks.

Comments: N/A

☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

Comments: N/A

☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

Comments: *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).

Comments: *Refer to Servicing Report Section 4.6-4.10 and Appendix C*

☒ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

Comments: *Refer to Servicing Report Section 4.11*

☒ 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.

Comments: *Refer to Servicing Report Section 4.12*

☒ Any proposed diversion of drainage catchment areas from one outlet to another.

Comments: *Refer to Servicing Report Section 4.13*

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

Comments: Refer to Servicing Report Section 4.6-4.10, Appendix C and drawing C11

☒ 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.

Comments: Refer to Servicing Report Section 4.6-4.10 and Appendix C

☒ Identification of potential impacts to receiving watercourses

Comments: *Refer to Servicing Report Section 4.15*

☒ Identification of municipal drains and related approval requirements.

Comments: *Refer to Servicing Report Section 4.16*

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

Comments: *Refer to Servicing Report Section 4.17*

☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

Comments: Refer to drawings C03 to C06

☒ Inclusion of hydraulic analysis including hydraulic grade line elevations.

Comments: *Refer to Servicing Report Section 4.18*

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

Comments: *Refer to Servicing Report Section 5.0*

☒ 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.

Comments: *N/A*

☒ Identification of fill constraints related to floodplain and geotechnical investigation.

Comments: *N/A*

4.5 Approval and Permit Requirements: Checklist

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

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

Comments: Not applicable.

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

Comments: Not applicable.

☐ Changes to Municipal Drains.

Comments: *Not applicable.*

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

Comments: *Not applicable.*

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

Comments:

☐ 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.

Comments: *Further comments to be added following site plan application review.*

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

Comments: