EDWARD J. CUHACI AND ASSOCIATES ARCHITECTS INC.

COLLÈGE CATHOLIQUE MER BLEUE - ADDITION
6401 RENAUD ROAD, OTTAWA, ON

SERVICING AND STORMWATER MANAGEMENT REPORT

OCTOBER 21, 2022

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EDWARD J. CUHACI AND ASSOCIATES ARCHITECTS INC.

SITE PLAN APPLICATION

PROJECT NO.: 221-09207-00
DATE: OCTOBER 2022

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1 GENERAL

1.1 EXECUTIVE SUMMARY

WSP was retained by Edward J. Cuhaci and Associates Architects to provide servicing, grading and stormwater management design services for the proposed addition to Collège Catholique Mer Bleue on a 5.05 ha site located at the northwest corner of Renaud Road and Fern Casey Street within the Orleans community in Ottawa, Ontario. All services for the addition will be available from the existing school. This report outlines findings and calculations pertaining to the servicing of the proposed building with a gross building area of 1059 square metres. This report is supported by the Development Servicing Study and Stormwater Management Report prepared in 2014 by Novatech Engineering Consultants Ltd for the original construction of the school. This report has been included in Appendix A for reference.

The proposed school addition is a two-storey building with a gross floor area of 1059 square metres and a maximum building height of 11.8m, located on the north-west side of the existing school north of the Renaud Road and Fern Casey Street intersection. Bike racks are proposed north of the addition. Further, to the east of the addition, the existing portables will remain on site. The fire route access to the school and the portables will remain the same; fire trucks will access the parking lot from Fern Casey Street and will access the school from the south entrance located on Renaud Street.

Currently the land proposed for the buildings is within the 6401 Renaud Street site. The reserved land for the proposed addition is grassed. The total study area is considered to be 0.1059 hectares in size. The legal description of the property is designated as Part of Lots 2 & 3, Concession 3, Geographic Township of Gloucester in the City of Ottawa. Based on the topographic survey, the site is relatively flat. The current drainage design on the site consists of a piped storm drainage system which outlets on the west side of the site to a municipal storm sewer on Fern Casey Street, on route to off-site stormwater quantity and quality control facilities designed for the use of the school site and the surrounding community.

As per Section 3 of the Development Servicing Study and Stormwater Management Report by Novatech Engineering Consultants Ltd (refer to Appendix A), the following criteria apply: runoff from all storm events up to and including the 1:100 year event must be restricted to a rate of 860 l/s. Flows exceeding 860 l/s up to the 100-year event must be temporarily stored on site and released at a rate not exceeding 860 l/s. It should be noted that the design of the school resulted in a further reduced rate to 599.8 l/s. 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 south property line as recorded from GeoOttawa.
Renaud Street:

- 200mm diameter sanitary sewer, 1500mm storm sewer and 305mm watermain.

Fern Casey Street:

- 375mm storm sewer and 406mm 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 October 21, 2022.

1.3 LOCATION MAP AND PLAN

The proposed institutional development is located at 6401 Renaud Road, Ottawa, Ontario at the location shown in Figure 1-1 below.

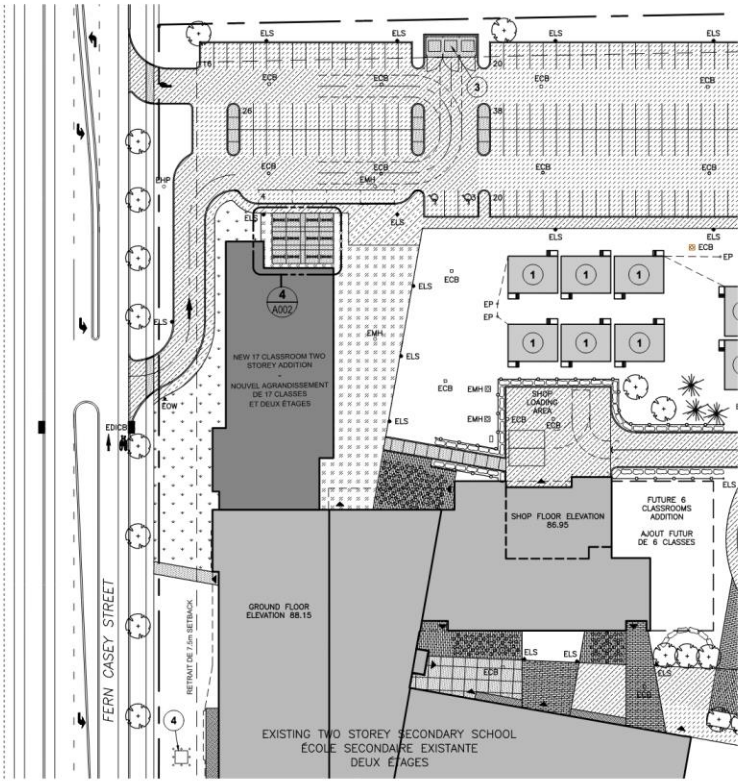


Figure 1-1 Site Location

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 August 22, 2022. 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).
- Servicing and Stormwater Management Report, WSP, Project 17M-02044-00, revised July 2018. (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), 2020.

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. The site plan includes a new addition to the main school and no change to the existing school or portables.

1.8 AVAILABLE EXISTING AND PROPOSED INFRASTRUCTURE

The existing services for the present school will not be altered. Sanitary and water services are provided at the south entrance of the main school building and connect to municipal mains on Renaud Road and Fern Casey Street respectively.

The existing storm sewer network for the site currently outlets to Fern Casey Street. The storm infrastructure currently occupying the footprint of the addition will be removed. Sanitary and water services for the addition will be provided internally from the existing school.

An off-site facility has been provided by the developer for stormwater quality control. Stormwater quantity control is required on site and roof storage will be provided on the addition.

1.9 ENVIRONMENTALLY SIGNIFICANT AREAS, WATERCOURSES AND MUNICIPAL DRAINS

There are no watercourses, municipal drains or environmentally significant areas on the site.

1.10 CONCEPT LEVEL MASTER GRADING PLAN

As the design is being submitted for site plan approval, the grading plan has been developed to the final design level. The existing and proposed grading are shown on Drawing C03 - Grading Plan. Existing grading information is based on a topographic survey of the site completed in 2017 and is noted in the background of the Drawing C03. No changes in grading are proposed beyond the site boundaries. The proposed grading plan confirms the feasibility of the proposed stormwater management system, drainage, soil removal and fills. The geotechnical investigation was completed in 2013 by LRL Associates Ltd. for the entirety of the school site.

1.11 GEOTECHNICAL STUDY

A geotechnical investigation report was prepared by LRL Associates Ltd. for the original school construction in November 2013. No additional geotechnical information was required for the design of the modified site services, including paving. This geotechnical report will be included with the contract documents to be issued for construction, and the recommendations of the reports will be referenced in the construction specifications.

1.12 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 406mm diameter municipal watermain along Fern Casey Street providing water to the property. The new addition will be protected with a supervised automatic fire protection sprinkler system and will be serviced from within the existing school. The fire department connection is located at the front entrance of the existing school building fronting. There is a private hydrant located 18m away from the Siamese connection of the building and a municipal hydrant 50m away on Renaud Road. NO changes are required to the existing City water distribution system to allow servicing for this property. The existing school building has a 152mm diameter water service, with a water entry room in the southwest corner.

2.2 SYSTEM CONSTRAINTS AND BOUNDARY CONDITIONS

A boundary service request was submitted to the City of Ottawa and boundary conditions have not yet been received. A fire flow of 11,000 l/min (183 l/s) was estimated for the existing building with the addition.

Table 2-1: Boundary Conditions

Boundary Conditions (to be completed)	
SCENARIO	Hydraulic Pressure (kPa)
Basic Day (MAX HGL)	
Peak Hour (MIN HGL)	
Max Day + Fire Flow	

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 an institutional development, consisting of sixteen classrooms. A water demand calculation sheet is included in Appendix B, and the total water demands are summarized as follows:

	WSP
Average Day	3.26 l/s
Maximum Day	4.89 l/s
Peak Hour	8.79 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 connection check will be completed once the boundary conditions are received from the City of Ottawa.

Table 2-2: Summary of minimum water pressure for the development under peak hour scenario

Peak Hour @ XXXm (to be completed later)	
ID	Hydraulic Pressure (kPa)

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.

For the addition, assuming non-combustible construction and a fully supervised sprinkler system, a fire flow demand of 11,000 l/min (183 l/s) for the existing school and the addition has been calculated. A copy of the FUS calculations is included in Appendix B.

The demand of 11,000 l/min for the existing school with the addition can be delivered through three existing municipal fire hydrants. The building is serviced by the 305mm municipal watermain on Renaud Road and an existing Siamese connection is located on the south side of the building. There is an existing hydrant located 18m from the FDC and is rated at 5800 l/min. There are also two other hydrants located at 50m and 145m from the FDC which are rated at 5800 l/min and 3800 l/min respectively. The three hydrants have a combined total of 15,400 l/min.

The minimum residual pressure will be evaluated once boundary conditions are received from the City of Ottawa.

Table 2-3: Summary of the residual pressure for the development under max day + fire scenario

Max day + Fire @ XXXm (to be completed later)	
ID	Hydraulic Pressure (kPa)

2.5 CHECK OF HIGH PRESSURE

The high pressure check will be evaluated once the boundary conditions are obtained from the City of Ottawa.

2.6 RELIABILITY REQUIREMENTS

A shut off valve is provided for the private watermain at the study boundary from Fern Casey Street. A
Water can be supplied from Fern Casey Street, north and south, and can be isolated.

2.7 CAPABILITY OF MAJOR INFRASTRUCTURE TO SUPPLY SUFFICIENT WATER

The capability of the major infrastructure to supply sufficient water will be confirmed once boundary conditions are received from the City of Ottawa.

2.8 DESCRIPTION OF PROPOSED WATER DISTRIBUTION NETWORK

The addition will be connected to the existing school's internal water supply system. The private hydrant currently within the site will be protected and maintained.

2.9 MODEL SCHEMATIC

The requirement of a model schematic will be determined once boundary conditions are received from the City of Ottawa.

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	2.89
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 5.05 ha represents the lot area of the school. An area of 1059m^2 represents the area of the addition. This is the sanitary collection area that is being considered to contribute to the existing 200mm sanitary service connection to the municipal sanitary sewer.

3.2 CONSISTENCY WITH MASTER SERVICING STUDY

The outlet for the sanitary service from the existing building is the 200 mm diameter municipal sewer on Renaud Road. 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.

For the school and the addition:

- Institutional 28000 L/Ha/day = 0.324 L/Ha/s
- Peak flow = (0.324 L/Ha/s x 5.05 ha x 1.5 peaking factor) + 0.33 l/Ha/s x 5.05 ha = 4.12 L/s

The on-site sanitary sewer network servicing the school has been confirmed to have adequate capacity for the 4.12 L/s as described above. Further, it should be noted that based on the Development Servicing Study and Stormwater Management Report prepared by Novatech Engineering Consultants Ltd., the sanitary sewer network was sized for the future expansions of the school at the time of its construction.

3.3 DESCRIPTION OF EXISTING SANITARY SEWER

The outlet sanitary sewer for the addition will be through the existing school. The sewer connects to the existing sanitary maintenance hole located at the south-west corner of the site. From there, a 200mm diameter sanitary sewer ultimately conveys sewage into the 600mm diameter trunk sewer located on Renaud Road and discharges to the pumping station located at 5965 Renaud Road.

3.4 VERIFICATION OF AVAILABLE CAPACITY IN DOWNSTREAM SEWER

The capacity of the existing sanitary sewers within the site is provided in Appendix C. The existing sanitary service from the site is a 200 mm diameter sewer at a slope of 1%. This size and slope of sewer provides a capacity of 32.8 L/s. The sanitary service from the addition will be added to this existing outlet. No new connections are proposed to the 200mm diameter municipal sanitary sewer.

4 SITE STORM SERVICING

4.1 EXISTING CONDITION

The subject property is located within the Bradley Estates Community Development area at the intersection of Renaud Road and Fern Casey Street. Most of the runoff from the institutional land is directed towards an existing 525mm diameter storm sewer on the west boundary of the site. The sewer discharges to a stormwater management pond offsite.

The allowable release rate from the site was set to 860 l/s and was further reduced during the design of the original school and thus releases at a rate of 599.8 l/s. Within the existing catchment areas A23 and A24 (renamed as catchment area B01 for the purposes of this analysis), flow was controlled and released at a rate of 7.5 l/s in the 100-year condition.

4.2 ANALYSIS OF AVAILABLE CAPACITY IN PUBLIC INFRASTRUCTURE

As the allowable release rate from the site will be reduced and was determined in conjunction with the design of the public infrastructure, there are no concerns related to the adequacy and available capacity of the downstream network. Capacity in the minor system is not a concern.

4.3 DRAINAGE DRAWING

Drawing C04 shows the detailed site sewer network. Drawings C03 provides proposed grading and drainage and includes existing grading information. Drawing C05 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. An overall grading plan and Servicing plan have also been attached to Appendix C for reference.

4.4 WATER QUANTITY CONTROL OBJECTIVE

The water quantity objective for the site is to limit the flow release to 860 l/s. Excess flows above this limit for the school site up to those generated by the 100-year storm event are temporarily stored on site. The release rate was further reduced during the design of the original school and thus releases at a rate of 599.8 l/s. Within the existing catchment areas A23 and A24, which now encompasses the proposed addition, flow was controlled and released at a rate of 7.5 l/s in the 100-year condition.

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 north and east boundaries of the site.

Stormwater storage calculations are shown in Section 4.10 of this report. Detention stormwater storage is presently provided on the school roof and is not being changed in this present site plan amendment. Additional roof storage is proposed on the addition. Ground surface storage areas provided in the original design have not been modified (refer to Appendix A).

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 by the MVCA.

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
Playground Mulch Areas	C = 0.40
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 the existing stormwater management facility located west of the site. The drainage system consists of a series of manholes, catchbasins and storm sewers leading to the outlet manhole STMMH 106 at the west of the site. All drainage areas on the site are collected in the site piped drainage system.

It is also customary for larger buildings to be provided with piped storm services for roof drainage. The roof drains for the building addition are connected to the storm sewer that flows into the sewer in an uncontrolled capacity, ensuring an unobstructed flow for these 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 is currently limited to a release rate of 860 l/s, which is achieved through the existing inlet control devices installed throughout the site during the construction of the original school. The release rate for catchment area B01 was previously set to 7.5 l/s and was achieved using an inlet flow device in CBMH 24. With the addition, flow from the roof is controlled and released at a rate of 5.7 l/s, thus resulting in a reduction in release rate of 1.8 l/s from the area. Please refer to the SWM Calculations in Appendix C

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

There will be no change to surface ponding areas or overland flow routes elsewhere on the school property.

4.9 INLET CONTROLS

The addition (catchment area B01) will have rooftop storage and be controlled to a release rate of 5.7 l/s.

The roof drains were sized according to manufacturer's design charts. The restrictions will cause the roof drains to surcharge, generating roof ponding in the rooftop areas. Ponding tables are summarized on the storm drainage plan C04 and included in Appendix C.

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 using rooftop storage on top of the addition which will release at a rate of 5.7 l/s at a maximum ponding depth of 150mm. The following Table summarizes the on-site storage requirements during the 1:100-year events.

The storage that is currently designed on the roof of the existing school will not be modified, refer to the Servicing and Stormwater Management Report included in Appendix A.

Table 4-1: Roof Storage – School Addition

Roof Segment	Roof Area (m^2)	Ponding Area (m^2)	Ponding Depth (m)	Theoretical Storage Volume (m^3)
R1	305.1	244.1	0.150	12.2
R2	347.3	277.9	0.150	13.9
R3	405.6	324.5	0.150	16.2
TOTAL	1058.0	846.4		**42.3**

As demonstrated above, the proposed addition uses new roof drains to restrict the 100 year storm event to the criteria approved by the City of Ottawa. Restricted stormwater will be contained onsite by utilizing rooftop storage. In the storm event up to 100-year, there will be no over land flow off-site from restricted areas.

The sum of design flow rates for the proposed areas is 5.7 l/s in 2-year peak flow taking the restricted flow rate from the rooftop area into account which is a reduction of 1.8 l/s from the previous controlled release rate for this area. Refer to Appendix C for storm sewer design sheet.

4.11 WATERCOURSES

There will be no modification to watercourses as a result of this proposed site plan.

4.12 PRE AND POST DEVELOPMENT PEAK FLOW RATES

The existing site has an allowable release rate of 860 l/s for up to the 100-year storm event. The design of the entire school site reduced the release rate to 599.8 l/s. The release rate will be further reduced by 1.8 l/s with the addition.

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

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. Fill on the site to not exceed 1m per 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 C05 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

This is a first submission; no comment is available.

APPENDIX

A

- PRE-CONSULTATION MEETING NOTES
- DEVELOPMENT SERVICING AND STORMWATER MANAGEMENT REPORT, NOVATECH ENGINEERING CONSULTANTS LTD, 2014

Good afternoon, Jacques, Tim,

Follow up notes to the Pre-Application Consultation meeting held on 22 August 2022 are found below. The required submission materials, for site plan control at 6401 Renaud Road, as well as related fees, are provided below.

To summarize City staff's understanding, your development proposal is in a form of an institutional development that will consist of eighteen (18) classroom two storey addition on the northern-easterly part of the lot.

-Current land use: two storey secondary school and 16 portable classrooms

-Development: 18 classrooms 2-storey addition

As part of Planning staff's review, we will evaluate the proposed development against the Ottawa Official Plan, Zoning By-law 2008-250, and other relevant guidelines. This proposal will be treated through a Site Plan Control requiring an Agreement.

From COVID-19 State of Emergency onward, City staff have essentially gone completely digital with submissions. Therefore, the number of paper copies has been reduced simply for the corporate file record and City staff's internal use.

Therefore, the following plans/reports submission list is provided, for you to review and make the application to the City. A few additional requirements/suggestions are included as well.

Planning comment - **Evode Rwagasore** – Evode.Rwagasore@ottawa.ca

I find the proposed site layout acceptable, and reasonable for the pre-consultation initial comments.

Engineering comment - **Rubina Rasool** – Rubina.Rasool@ottawa.ca

List of Plans and Studies:

- Servicing and SWM Brief (recommended to provide existing servicing report)
- Servicing Plan (plans may be combined)
- Grading Plan (plans may be combined)

The servicing brief should include the following:

- Updated water boundary conditions
- Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
    - Location of service(s)
    - Type of development and the amount of fire flow required (as per FUS, 1999)
    - Average daily demand: ___ L/s
    - Maximum daily demand: ___ L/s
    - Maximum hourly daily demand: ___ L/s
    - Fire protection (Fire demand, Hydrant Locations)
- Stormwater runoff must be maintained

Transportation comment - **Patrick McMahon** – Patrick.McMahon@ottawa.ca

- Follow Traffic Impact Assessment Guidelines
    - Start the TIA as soon as possible.
    - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step of the TIA process.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - 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).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Sidewalk is to be continuous across access as per City Specification 7.1.
- Renaud and Fern Casey is to be signalized in the future and is on the City's DC By-Law Intersection List.
- Show the protected right of way of 24m on Renaud.

SITE PLAN CONTROL APPLICATION SUBMISSIONS:

Application Type and Fees:

The proposed development qualifies for a **Site Plan Control** - New Complex type

Please refer to this link:

https://app06.ottawa.ca/online_services/forms/ds/site_plan_control_en.pdf

Fee for appraisal services - any development application to which cash-in-lieu of parkland is applicable and for which an appraisal is required, will be subject to a fee for appraisal services.

Requirements:

The following is the list of requirements for a complete submission (digital and a copy each) of the proposal. I have also included a few points of clarification where necessary:

- Site Plan

- Landscape Plan/Tree Conservation Report

- Planning Rationale, including Design Statement

- Site Survey Plan
- Concept Site Plan Showing Proposed Land Uses and Landscaping (Coloured)
- Grading Plan (plans may be combined)
- Site Servicing Plan (plans may be combined)
- Servicing and Stormwater Management Brief
- Phase 1 ESA
- USB stick – (all submitted plans and reports in .pdf format)

And, the following items are also required, but not for the purposes of a complete resubmission. If these items are not submitted with the submission package, I would like to receive them not too long afterwards.

- Coloured Elevations – new building

<u>Other issues to note</u>:

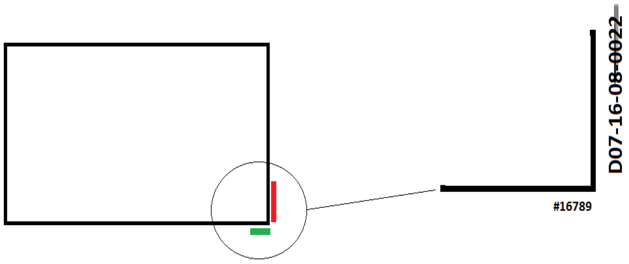
1. Contact the Conservation Authority (RVCA) Office for their requirements

2. As a suggestion, if you have not already done so, please contact and brief the Ward Councillor on your proposed application.

3. Minimum drawing and file requirements - All plans

Plans are to be submitted on standard **A1 size** (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500).

4. Please use the standard border (below)
A0.1 Place on all plans; DWG # and D07 # as per sample



Use **Bold Black text**:

Your Numbers are as per the colours listed here.
DWG **XXXXX** (place number on the bottom right)
D07 Number **D07-12-22-**

5. For information/question related to Development Charge, please contact AJ Mohmmand, Development Information Officer, Suburban East at DIOCentrum@ottawa.ca or 613-580-2424, ext. 29674

If you have any questions or require clarification with the above information, please contact me.

Sincerely,

Evode Rwagasore

ÉCOLE SECONDAIRE CATHOLIQUE – SECTEUR ORLÉANS
6401 RENAUD ROAD

DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT

Prepared by:

NOVATECH ENGINEERING CONSULTANTS LTD.
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

December 2, 2013
Revised May 23, 2014
Revised July 4, 2014

Ref: R-2013-198
Novatech File No. 113196

NOVATECH
ENGINEERING
CONSULTANTS LTD.

July 4, 2014

Conseil des écoles catholiques de centre-est (CECCE)
4004 rue Labelle
Ottawa, ON
K1J 1A1

Attention: Ms. Josée Dubois, C.E.T.

Dear Ms. Dubois:

Re: Development Servicing Study and Stormwater Management Report
École Secondaire Catholique – Secteur Orléans
6401 Renaud Road
Ottawa, ON
Our File No.: 113196

Enclosed herein is a copy of the revised 'Development Servicing Study and Stormwater Management Report' for the proposed Orleans High School. The catholic high school is located at 6401 Renaud Road, east of the Belcourt Boulevard extension, in the City of Ottawa. This report addresses the approach to site servicing and stormwater management for the subject property and is submitted in support of the site plan application.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.

François Thauvette

François Thauvette, P. Eng.
Project Engineer

FT/ft

cc: John Sevigny (City of Ottawa)
Zofia Jurewicz (Cuhaci)
Marc Carrière (GWAL)

Suite 200, 240 Michael Cowpland Dr., Ottawa ON K2M 1P6 Tel: (613) 254-9643 Fax: (613) 254-5867 www.novatech-eng.com

Consulting Engineers & Planners

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1.0 INTRODUCTION

The ‘Conseil des écoles catholiques du Centre-Est’ (CECCE) is proposing to construct a new high-school in Orleans and Novatech Engineering Consultants Ltd. (Novatech) has been retained to complete the site servicing and grading design for this project.

1.1 Purpose

This report outlines the servicing aspects of the proposed development with respect to water, sanitary and storm drainage and addresses the approach to stormwater management. This report is being submitted in support of the site plan application for the subject property.

1.2 Location and Site Description

The proposed catholic high-school will be located at 6401 Renaud Road, on the east side of the future Belcourt Boulevard intersection, in the City of Ottawa. The subject property is bordered by Renaud Road to the south, the Belcourt Boulevard extension to the west and future residential developments to the north and east.

Figure 1 – **Aerial Plan** provides an aerial view of the site.

The legal description of the property is designated as Part of Lots 2 & 3, Concession 3 (Ottawa Front) Geographic Township of Gloucester, in the City of Ottawa.

1.3 Consultation and Reference Material

A pre-consultation meeting was held with the City of Ottawa on October 11, 2013, at which time the client was advised of the general submission requirements. Refer to **Appendix A** for a summary of the correspondence from the pre-consultation meeting held with the City of Ottawa.

A pre-consultation meeting was neither held with the Ministry of the Environment (MOE) nor with the Rideau Valley Conservation Authority (RVCA) regarding the proposed development. These agencies were however consulted as part of the Master Servicing Study for the Trails Edge and Orleans Business Park. We do anticipate requiring a permit from the RVCA in order to fill the existing drainage ditch located within the northern portion of the site.

1.3.1 Reference Items

[1] The "Servicing Report for Trails Edge and Orleans Business Park" (Ref. No. 10-459) was prepared by DSEL, Revision 6, dated March 2014. (Still under review by City of Ottawa)

[2] The "Geotechnical Investigation Report" (LRL Ref. No. 130707) was prepared by LRL Associates Ltd. in November 2013.

[3] The "Phase I Environmental Site Assessment" (LRL Ref. No. 130707) was prepared by LRL Associates Ltd. on October 8, 2013.

2.0 PROPOSED DEVELOPMENT

The proposed development will consist of a 2-storey high-school and associated parking lot, bus drop-off, school yard and sports field. As per the City of Ottawa's request, the school will be located as close as possible to the northeast corner of Renaud Road and the Belcourt Boulevard intersection. The proposed school site will encompass the entire property and will be accessible from both Renaud Road and Belcourt Boulevard. The undeveloped site is approximately 5.06 hectares in size.

3.0 SITE SERVICING

The objective of the site servicing design is to conform to the requirements of the City of Ottawa; to provide a suitable domestic water supply, proper sewage outlets and to ensure that appropriate fire protection is provided.

The servicing criteria, expected sewage flows and water demands for the site have been established using the City of Ottawa municipal design guidelines for sewer and water distribution, which is consistent with the the 'Servicing Report for the Trails Edge and Orleans Business Park' Report[1].

The proposed school will be serviced by extending services to the future municipal watermain and storm sewer in the Belcourt Boulevard. A new sanitary service will be extended to the future municipal sanitary sewer in Renaud Road. Refer to the enclosed General Plan of Services and to the subsequent sections of the report for further details.

The City of Ottawa Servicing Study Guidelines for Development Applications requires a Development Servicing Study Checklist to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix B** at the back of the report.

3.1 Sanitary

The proposed high-school will be serviced by a 200mm dia. sanitary service connected to the future sanitary sewer in Renaud Road. The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed school, which includes the anticipated future expansions. The following design criteria were taken from Section 4 – 'Sanitary Sewer Systems' and Appendix 4-A - 'Daily Sewage Flow For Various Types of Establishments' of the City of Ottawa Sewer Design Guidelines:

- Average Daily Sewage Flows:
  - Institutional Average Flow: 50,000 L/gross ha/day
  - School with cafeteria, gym and showers: 90 L/person/day
- Institutional Peaking Factor = 1.5
- Infiltration Allowance: 0.28 L/s/ha x 5.06 ha site = 1.42 L/s

For comparison purposes the theoretical sanitary flows were calculated using two methods. **Table 3.1A** identifies the theoretical sanitary flows based on typical institutional flows relative to the site area, while **Table 3.1B** identifies the theoretical sanitary flows for the school based on a design population, using the above design criteria.

Table 3.1A Theoretical Sanitary Flows based on the Site Area

Site Area	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Allowance (L/s)	Total Flow (L/s)
5.06	2.93	1.5	4.39	1.42	5.81

Table 3.1B Theoretical Sanitary Flows based on the Design Population

Type of Use	Design Parameter	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Total Flow (L/s)
School	1200 students *	1.25	1.5	1.88	1.88
School	140 staff *	0.15	1.5	0.22	0.22
Total	-	1.40	-	2.10	3.52 **

* Includes the possible future expansion of the school
**Includes an Infiltration allowance of 1.42 L/s

The proposed 200mm dia. sanitary service will be a gravity pipe at a minimum slope of 1.0% with a full flow conveyance capacity of 34.2 L/s and will have sufficient capacity to convey the theoretical sanitary flows calculated in **Tables 3.1A** and **3.1B**. The sanitary service was sized to accommodate the larger, more conservative flows calculated by the Mechanical Engineer using Fixture Units.

The proposed school site has been accounted for in the 'Master Servicing Study for the Trails Edge and Orleans Business Park' prepared by DSEL.

3.2 Water

The proposed building will be serviced by a 150mm dia. water service connected to the future 400mm dia. watermain in Belcourt Boulevard. The proposed 150mm diameter service will be sized to provide both the required domestic water demand and fire flow for the proposed school. A shut-off valve will be provided at the property line. The water meter will be located in the mechanical room inside the building; while the remote meter will be located on the exterior face of the building. A new on-site hydrant will be connected to the proposed water service and will be located near the main building entrance, within 45m of the building siamese connection.

3.2.1 Domestic Water Demand

The City of Ottawa design criteria were used to calculate the theoretical water demand for the proposed school. The following design criteria were taken from Section 4 – 'Water Distribution Systems' of the Ottawa Design Guidelines – Water Distribution:

- Maximum Day Demand = 2.5 x Average Day Demand
- Maximum Hour Demand = 2.2 x Maximum Day Demand

Table 3.2.1 identifies the theoretical domestic water demands for the proposed school based on the above design criteria.

Table 3.2.1 Theoretical Water Demand

Type of Use	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Maximum Hour Demand (L/s)
School	1.40 *	3.5	7.7

*Taken from **Table 3.1B** above

3.2.2 Water Supply for Fire-Fighting

The proposed school will be sprinklered and supplied with a fire department siamese connection. A new on-site hydrant will be located near the main building entrance, within 45m of the siamese connection. Based on information provided by the Mechanical Engineer, the fire flow requirements for the building are expected to be in the order of 375 USGPM (or 23.6 L/s). The fire flow requirements include both sprinkler system and hose allowances in accordance with the OBC and NFPA 13. The sprinkler system will be designed by the fire protection (sprinkler) consultant as this process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. Booster pumps are not expected to be required.

The above information is being provided to the City of Ottawa for use in the hydraulic analysis of the municipal watermain network. It is anticipated that the current City of Ottawa boundary conditions will not be applicable as they will be affected by the significant future developments in the area (including the future 400mm dia. watermain in Belcourt Boulevard).

The proposed school site has been accounted for in the 'Master Servicing Study for the Trails Edge and Orleans Business Park' prepared by DSEL.

3.3 Storm and Stormwater Management

The stormwater management design for the proposed development will include on-site quantity control prior to releasing flows from the site. A detailed description of the sub-catchment areas and post-development flows are discussed in the subsequent sections of the report.

3.3.1 Stormwater Management Criteria and Objectives

The criteria and objectives for the proposed stormwater management design are as follows:

- Provide a dual drainage system (i.e. minor and major system flows);
- Maximize the use of available storage on site;
- Control the post-development flows from the site to the maximum allowable release rate of 860 L/s for storms up to and including the 1:100 year design event (per DSEL Report[1]).
- Create a defined major system overflow route to convey stormwater runoff exceeding the available on-site storage (greater than the 1:100 year event); and
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

3.3.2 Allowable Release Rate

As indicated in the 'Servicing Report for Trails Edge and Orleans Business Park' Report[1], the maximum allowable release rate for the site was calculated to be 860 L/s.

3.3.3 Post-Development Conditions

Under post-development conditions, the imperviousness of the site will increase significantly. In order to mitigate the stormwater related impacts due to the proposed development, flow from the site will be controlled by the use of multiple inlet control devices (ICD) and control flow roof drains prior to being directed into the municipal storm sewer system. Refer to the enclosed plans and to the subsequent sections of the report for further details.

3.3.3.1 Sub-catchment Areas A-1 to A-9

The post-development flow from sub-catchment areas A-1 to A-9 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 9. Stormwater runoff from these drainage areas will be temporarily stored on the surface of the paved bus drop-off and landscaped areas prior to being discharged into the on-site storm sewer system.

Table 3.3.3.1 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.1: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-1 to A-9				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	202 mm dia.	121.8L/s	87.44	36.1 m³	134.0 m³
1:100 Year	202 mm dia.	128.0 L/s	87.64 m	133.8 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.2 Sub-catchment Area A-10

The post-development flow from sub-catchment area A-10 will be attenuated by the use of an inlet control device installed in the outlet pipe of CB 10. Stormwater runoff from this drainage area will be temporarily stored on the surface prior to being discharged into the on-site storm sewer system.

Table 3.3.3.2 summarizes the post-development design flows from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.2: Design Flow and Inlet Control Device Table

Design Event	Drainage Area A-10				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	78 mm dia.	13.6 L/s	-	-	8.7 m³
1:100 Year	78 mm dia.	14.3 L/s	87.41 m	8.1 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix F** for IPEX inlet control device information.

3.3.3.3 Sub-catchment Areas A-11 to A-13

The post-development flow from sub-catchment areas A-11 to A-13 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 13. Stormwater runoff from these drainage areas will be temporarily stored on the surface, adjacent to the sports field, prior to being discharged into the on-site storm sewer system.

Table 3.3.3.3 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.3: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-11 to A-13				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	140 mm dia.	58.7 L/s	87.50 m	70.4 m³	232.5 m³
1:100 Year	140 mm dia.	60.0 L/s	87.59 m	216.9 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.4 Sub-catchment Areas A-14 to A-15

The post-development flow from sub-catchment areas A-14 to A-15 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 15. Stormwater runoff from these drainage areas will be temporarily stored on the surface (future parking lot expansion area) prior to being discharged into the on-site storm sewer system.

Table 3.3.3.4 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.4: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-14 to A-15				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	105 mm dia.	31.6 L/s	87.30	2.4 m³	25.0 m³
1:100 Year	105 mm dia.	33.0 L/s	87.46 m	21.7 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.5 Sub-catchment Areas A-16 to A-17

The post-development flow from sub-catchment areas A-16 to A-17 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 17. Stormwater runoff from these drainage areas will be temporarily stored on the surface of the paved parking lot prior to being discharged into the on-site storm sewer system.

Table 3.3.3.5 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.5: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-16 to A-17				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m^3)	Max Volume Provided (m^3)
1:5 Year	103 mm dia.	29.1 L/s	87.30 m	2.4 m^3	24.8 m^3
1:100 Year	103 mm dia.	30.3 L/s	87.44 m	19.8 m^3	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.6 Sub-catchment Areas A-18 to A-19

The post-development flow from sub-catchment areas A-18 to A-19 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 19. Stormwater runoff from these drainage areas will be temporarily stored on the surface of the paved parking lot prior to being discharged into the on-site storm sewer system.

Table 3.3.3.6 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.6: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-18 to A-19				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m^3)	Max Volume Provided (m^3)
1:5 Year	107 mm dia.	31.7 L/s	87.30 m	2.4 m^3	23.4 m^3
1:100 Year	107 mm dia.	33.0 L/s	87.44 m	21.3 m^3	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.7 Sub-catchment Area A-20

The post-development flows from sub-catchment area A-20 will be attenuated by the use of twenty six (26) adjustable control flow roof drains. Stormwater runoff from this drainage area will be temporarily controlled on the roof, prior to being discharged into the on-site storm sewer system, via the building service. Each roof drain will control the flow to a maximum release rate of 3.8 L/s (or 60 USGPM) per drain at a maximum ponding depth of 0.15m above each drain.

Table 3.3.3.7 summarizes the post-development design flows from this sub-catchment area as well as the type of roof drains, the maximum ponding depths, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.7: Design Flow and Roof Drain Table

Design Event	Drainage Area A-20				
	Post-Development Conditions				
	Control Flow Roof Drains	Design Flow (L/s)	Ponding Depth (m)	Surface Vol. Required (m^3)	Max Volume Provided (m^3)
1:5 Year	Zurn Z-105 (US)	26 x 3.8L/s 98.8 L/s	Variable	26.0 m^3	156.0 m^3
1:100 Year	Zurn Z-105 (US)	26 x 3.8L/s 98.8 L/s	0.15 m	155.6 m^3	

As indicated in the table above, the building roof will provide sufficient storage for both the 1:5 year and 1:100 year design events. Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix G** for roof drain information.

3.3.3.8 Sub-catchment Area A-21

The uncontrolled post-development flow from sub-catchment area A-21 was calculated using the Rational Method to be 16.7 L/s for the 1:5 year design event and 31.8 L/s for the 1:100 year design event. Refer to **Appendix C** for Rational Method calculations.

3.3.3.9 Sub-catchment Area A-22

The post-development flow from sub-catchment area A-22 will be attenuated by the use of an inlet control device installed in the outlet pipe of CB 22. Stormwater runoff from this drainage area will be temporarily stored on the surface prior to being discharged into the on-site storm sewer system.

Table 3.3.3.9 summarizes the post-development design flows from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.9: Design Flow and Inlet Control Device Table

Design Event	Drainage Area A-22				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	115 mm dia.	30.1 L/s	87.40 m	-	15.5 m³
1:100 Year	115 mm dia.	33.90 L/s	87.62 m	14.7 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.10 Sub-catchment Areas A-23 to A-24

The post-development flow from sub-catchment areas A-23 to A-24 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 24. Stormwater runoff from these drainage areas will be temporarily stored on the surface prior to being discharged into the on-site storm sewer system.

Table 3.3.3.10 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.10: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-23 to A-24				
	Post-Development Conditions				
	IPEX LMF Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	‘Tempest’ Vortex	7.3 L/s	87.65 m	-	5.0 m³
1:100 Year	‘Tempest’ Vortex	7.5 L/s	87.76 m	4.8 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix F** for IPEX inlet control device information.

3.3.3.11 Sub-catchment Area A-25

The post-development flow from sub-catchment area A-25 will be attenuated by the use of an inlet control device installed in the outlet pipe of CB 25. Stormwater runoff from this drainage area will be temporarily stored on the surface prior to being discharged into the on-site storm sewer system.

Table 3.3.3.11 summarizes the post-development design flows from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.11: Design Flow and Inlet Control Device Table

Design Event	Drainage Area A-25				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	81 mm dia.	14.9 L/s	87.40 m	-	8.4 m³
1:100 Year	81 mm dia.	16.2 L/s	87.60 m	7.5 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix F** for IPEX inlet control device information.

3.3.3.12 Sub-catchment Areas A-26 to A-27

The post-development flow from sub-catchment areas A-26 to A-27 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 27. Stormwater runoff from these drainage areas will be temporarily stored on the surface of the paved parking lot prior to being discharged into the on-site storm sewer system.

Table 3.3.3.12 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.12: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-26 to A-27				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m³)	Max Volume Provided (m³)
1:5 Year	90 mm dia.	22.1 L/s	87.30 m	2.2 m³	18.1 m³
1:100 Year	90 mm dia.	23.0 L/s	87.44 m	15.7 m³	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix F** for IPEX inlet control device information.

3.3.3.13 Sub-catchment Areas A-28 to A-29

The post-development flow from sub-catchment areas A-28 to A-29 will be attenuated by the use of an inlet control device installed in the outlet pipe of CBMH 29. Stormwater runoff from these drainage areas will be temporarily stored on the surface of the paved parking lot prior to being discharged into the on-site storm sewer system.

Table 3.3.3.13 summarizes the post-development design flows from these sub-catchment areas as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.13: Design Flow and Inlet Control Device Table

Design Event	Drainage Areas A-28 to A-29				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m^3)	Max Volume Provided (m^3)
1:5 Year	99 mm dia.	26.8 L/s	87.30 m	2.6 m^3	23.5m^3
1:100 Year	99 mm dia.	28.0 L/s	87.45 m	19.2 m^3	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix E** for sample orifice calculations.

3.3.3.14 Sub-catchment Area A-30

The uncontrolled post-development surface runoff from sub-catchment area A-30 was calculated using the Rational Method to be 17.7 L/s for the 1:5 year design event and 35.5 L/s for the 1:100 year design event. Refer to **Appendix C** for Rational Method calculations.

3.3.3.15 Sub-catchment Area A-31

The post-development flow from sub-catchment area A-25 will be attenuated by the use of an inlet control device installed in the outlet pipe of CB 30. Stormwater runoff from this drainage area will be temporarily stored on the surface prior to being discharged into the on-site storm sewer system.

Table 3.3.3.15 summarizes the post-development design flows from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3.3.3.15: Design Flow and Inlet Control Device Table

Design Event	Drainage Area A-31				
	Post-Development Conditions				
	Orifice Plug Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Volume Required (m^3)	Max Volume Provided (m^3)
1:5 Year	105 mm dia.	24.8 L/s	87.25 m	-	14.3 m^3
1:100 Year	105 mm dia.	27.4 L/s	87.49 m	12.8 m^3	

Refer to **Appendix C** for Rational Method calculations, **Appendix D** for SWM summary and storage calculations and to **Appendix F** for IPEX inlet control device information.

3.3.3.16 Summary of Flows

Table 3.3.3.16 summarizes the post-development flows for both the 1:5 year and 1:100 year design events.

Table 3.3.3.16: Summary of Post-Development flows from site

Design Event	Post-Development Flow (L/s)														
	A-1 to A-9	A-10	A-11 to A-13	A-14 to A-15	A-16 to A-17	A-18 to A-19	A-20	A-21	A-22	A-23 to A-24	A-25	A-26 to A-27	A-28 to A-29	A-30	A-31	Total
1:5 year	121.8	13.6	58.7	31.6	29.1	31.7	98.8	16.7	30.1	7.3	14.9	22.1	26.8	17.7	24.8	545.7
1:100 year	128.0	14.3	60.0	33.0	30.3	33.0	98.8	31.8	33.0	7.5	16.2	23.0	28.0	35.5	27.4	599.8

3.8

As indicated in the table above, the post-development flows from the site are <u>well below</u> the allowable release rate of 860 L/s. During the 1:5 year and 1:100 year design events, the flows are approximately 314 L/s and 260 L/s below the allowable release rate, respectively.

Furthermore, the on-site storm sewer system has been designed to convey the 1:100 year peak controlled flows, as opposed to the typical 1:5 year flows, as indicated on the Storm Sewer Design Sheet in **Appendix D** of the report.

3.3.3.17 Future School Site Expansion Considerations

The post-development flows from all drainage areas, with the exception of runoff from drainage area A-21 (construction shop loading area) and area A-30, will be controlled. Should the school site be expanded in the future, the post-development flows from the building addition and expanded paved areas will also be controlled. This will be achieved by the use of additional controlled flow roof drains, new ICDs within new structures and/or by replacing existing ICDs.

Should the bus loop be expanded in the future, the tributary flows from sub-catchment areas A-10 and A-31 would be increased slightly, however the increased bus loop area flows would be stored on the surface and controlled by ICDs. Should the building be expanded, the tributary flows from sub-catchment areas A-8, A-21 and A-22 would be reduced due to the proposed building expansion. Furthermore, the controlled flows from sub-catchment areas A-23 and A-24 would be replaced with controlled building roof flows. It should be noted that the future parking lot expansion has already been accounted for in the weighted runoff coefficient calculations for sub-catchment areas A-14 and A-15. Similarly, the future portable roofs have already been accounted for in the weighted runoff coefficient calculations for sub-catchment areas A-10, A-19, A-22, A-25 and A-31.

Detailed stormwater management calculations for all sub-catchment areas have not been included in this report, as the exact limits of the building additions and bus loop expansion are only schematic. Detailed calculations will need to be completed in the future to confirm the flows should the school and paved areas be expanded. Furthermore, the site has been designed with a dual drainage system (i.e. able to accommodate both minor and major system flows). Should the post-development flows increase slightly due to the future building additions and expansion of the paved areas, they will never exceed the allowable release rate for the site. As a result, it is reasonable to confirm that the proposed stormwater management system has been designed to accommodate the possible future expansion of the site.

3.3.3.18 Water Quality Control

On-site water quality control is not required or provided as it will be provided by the downstream stormwater management facility (SWMF) as described in the 'Servicing Report for Trails Edge and Orleans Business Park' Report[1].

4.0 SITE GRADING

The existing site is generally flat and approximately 1.0m below the current elevation of Renaud Road. An existing drainage ditch is located within the northern portion of the property and drains in a westerly direction towards Mud Creek, which is tributary to the East Urban Community (EUC) stormwater management facility (SWMF). The existing drainage ditch will be realigned (by others) on the north side of the school site as indicated on the enclosed plans and filled to accommodate the proposed development. The realignment of the drainage ditch, along with all appropriate applications for regulatory permits and approvals will be completed by others.

The proposed site will have to be raised to match into the Renaud Road elevations and future Belcourt Boulevard elevations. The ground floor of the proposed school will be set at an elevation of 88.15m, slightly higher than the elevation of Renaud Road. The existing grades adjacent to the perimeter of the property will be raised to match into the future residential developments on the north and east side of the property. The proposed grading design includes considerations for the possible future school expansion. Refer to the enclosed plans for details.

4.1 Major System Overflow Route

In the case of a major rainfall event exceeding the design storms provided for, the stormwater located within landscaped areas adjacent to the school will pond to a maximum depth of 0.30m prior to overflowing to a lower sub-catchment drainage area. Similarly, the stormwater located within the paved bus drop-off area will pond to a maximum depth of 0.25m before overflowing towards the paved parking area on the north side of the property. Stormwater located within the drainage swales adjacent to the sports field and running track will pond to a maximum depth of 0.30m before overflowing towards the paved parking lot. Stormwater located within the main parking lot area will pond to a maximum depth of 0.25m before overflowing into Belcourt Boulevard and ultimately into the realigned Mud Creek to the west. The major system overflow route is shown on the enclosed plan.

4.2 Erosion and Sediment Control

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags will be placed under the grates of nearby catchbasins, manholes and drains and will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed as per OPSS 577 and OPSD 219.110 along the surrounding construction limits;
- Street sweeping and cleaning will be performed as required to suppress dust and to provide safe and clean roadways adjacent to the construction site.

The proposed erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken regularly.

5.0 PHASING

The proposed development will proceed as a single phase project. The enclosed plans do however indicate the possible future school expansion limits as well as the possible future parking lot and bus loop expansions.

6.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared by LRL Associates Ltd. for the proposed project. Refer to the Geotechnical Report[2] for subsurface conditions, construction recommendations and geotechnical inspection requirements.

7.0 CONCLUSION

This report has been prepared in support of the site plan application for the proposed Orleans High School located at the intersection of Renaud Road and the future Belcourt Boulevard extension, in the City of Ottawa.

The conclusions are as follows:

- The proposed development will consist of a 2-storey high-school complete with associated parking lot, bus drop-off, school yard and sports field.
- The proposed building will be serviced by extending services to the future municipal watermain and storm sewer in Belcourt Boulevard and to the future municipal sanitary sewer in Renaud Road.
- The building will be sprinklered and supplied with a fire department siamese connection. The siamese connection will be located within 45m of an on-site fire hydrant.
- Under post-development conditions, stormwater runoff from the site will consist of a combination of uncontrolled direct runoff and controlled flow. The controlled flow will be provided by the use of inlet control devices and control flow roof drains.
- The total post-development flow from the site will be controlled to a combined maximum rate of 545.7 L/s for the 1:5 year design event and to a combined maximum rate of 599.8 L/s for the 1:100 year design event, well below the allowable release rate of 860 L/s for the site.
- The stormwater management system has been designed to accommodate the possible future expansion of the school site.
- Temporary on-site storage will be provided on the surface (parking lots and grass swales) as well as on the building roof.
- Regular inspection and maintenance of the storm sewer system is recommended to ensure that the storm drainage system is clean and operational.
- Temporary erosion and sediment control measures will be implemented during all phases of construction.

It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH ENGINEERING CONSULTANTS LTD.

Prepared by:

LICENSED PROFESSIONAL ENGINEER
François Thauvette
F.S. THAUVETTE
100041399
July 4, 2014
PROVINCE OF ONTARIO

François Thauvette, P. Eng.
Project Manager

APPENDIX A

Correspondence

Francois Thauvette

From: Zofia Jurewicz [Zofiaj@cuhaci.com]
Sent: Monday, October 21, 2013 2:32 PM
To: Francois Thauvette; James B Lennox
Cc: Simon Rioux; Jerzy Jurewicz
Subject: FW: Pre-application consultation for CECCE (Renaud & Belcourt)
Importance: High
Attachments: Applicant's Study and Plan Identification List.pdf

Good afternoon Francois and Jim, please find enclosed a copy of the comments /directions from the City of Ottawa regarding the pre-application meeting on October11.
Regards
Zofia Jurewicz

Zofia Jurewicz OAA. AIA.
President

171 Slater Street, Suite 100, Ottawa, Ontario, Canada, K1P 5H7
Tel: (613) 236-7135 Fax: (613) 236-1944
email:zofiaj@cuhaci.com
www.cuhaci.com

From: Gervais, Melanie [mailto:Melanie.Gervais@ottawa.ca]
Sent: Friday, October 18, 2013 2:07 PM
To: paquetteplanning@sympatico.ca
Cc: Luc Poulin; Karolyn Bois; Josée Dubois; Zofia Jurewicz; Sevigny, John; Warnock, Charles; Yousfani, Asad
Subject: Pre-application consultation for CECCE (Renaud & Belcourt)

Good afternoon Dan,

Below is a follow-up to our pre-consultation meeting on Friday October 11, 2013.
As discussed in the pre-consultation meeting the CECCE is looking to purchase land from Richcraft and will be submitting a severance application followed by a re-zoning and site plan application with the City to develop the land for a new high school. These applications can be submitted at the same time but the severance will have to be granted prior to going to Planning Committee with the rezoning and the rezoning will have to be in force prior to approving the Site Plan. We will require the following report/studies as part of their applications.

SEVERANCE

- The site currently does not have any sanitary or storm sewer outlets. We will not require any reports for the severance however there will be a condition of severance that the owner enter into a Development Agreement to extend public services to the property.

RE-ZONING

Site Servicing Brief:
- Assessing the adequacy of public services to support the development. This does not have to be a very comprehensive study. Just a brief discussing the existing public services and whether their proposed development will have any negative impacts on them.

Concept Plan showing ultimate use of land

SITE PLAN

See the attached list of required plans and studies.
The following consists of further information related to the attached list.

Site Plan and Landscape Plan:

- The link below outlines the requirements for the plans http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

Site Servicing Study:

- The report is to follow the City's Servicing Study guidelines which can be found at the following link: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications
- Prior to submitting the servicing report the consultant should contact me and request boundary conditions for the watermain design. The consultant will need to provide the type of development, fire flow required, average day demand, maximum day demand and maximum hour demand.
- As discussed in the meeting the City and Richcraft are still in discussions regarding the storm water management design. The two possible scenarios are for the post development flows to be controlled to 85 l/s/ha or to the 1:5 year level of service. All flows volumes above the allowable flow rate are to be controlled/stored on site. Once the stormwater management design has been confirmed we will let you know.

Geotechnical Study:

- Containing detailed information on geotechnical matters and recommendations (i.e. pavement, foundation, bedding construction etc.). The report is to follow the City's Geotechnical Reporting Guidelines which can be found at http://www.ottawa.ca/cs/groups/content/@webottawa/documents/pdf/mdaw/mtm4/~edisp/cap137602.pdf

Exterior Site Lighting Letter:

- The letter is to be certified by a qualified engineer confirming the site lighting design a) meets the criteria for Full Cut-off (Sharp cut-off) Classification, as recognized by the Illuminating Engineering Society of North America (IESNA or IES) AND b) the site lighting spillage will be minimal (i.e. 0.5 foot-candle is normally the maximum allowable spillage).

Engineering Drawings:

- The link below outlines the requirements for the plans http://ottawa.ca/en/city_hall/planningprojectsreports/planning/dev_review_process/guide/servicing_grading/index.html
    - Site Servicing Plan
    - Grading and Drainage Plan
    - Erosion and Sediment Control Plan (can be combined with the grading plan)

Transportation Impact Brief and Noise Brief:

- The consultants can contact Asad Yousfani at 613-580-2424 x16571 or Asad.Yousfani@ottawa.ca in obtain specific requirements

Tree Conservation Report:

- Further details and requirements of the TRC can be found in section 4.7.2 of the Official Plan and Schedule "A" of the Urban Tree Conservation Bylaw http://ottawa.ca/en/residents/laws-licenses-and-permits/laws/urban-tree-conservation-law-0

Phase 1 ESA

- Must be complete in accordance with the Ontario Regulation 153/04 (as amended) as per the City's Official Plan

Rideau Valley Conservation Authority:

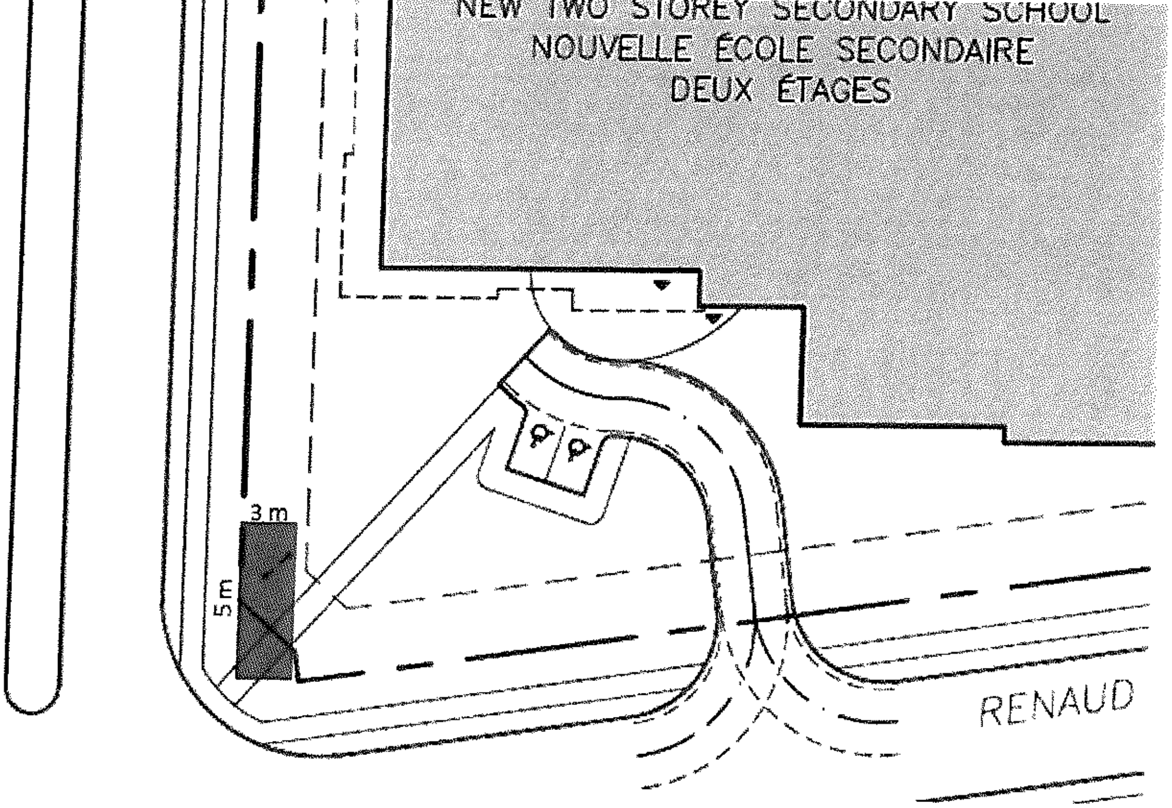
- As discussed at the meeting, ultimately the plan is to close Mud Creek (to the west of) the Belcourt Extension.
- An Authorization for works to close the watercourse and provide compensation at Brewer's Pond has been issued to the Richcraft Group of companies by the Department of Fisheries and Oceans (file #10-HCAA-CA4-00350) valid until March 15, 2015. The compensation work is now scheduled to be undertaken summer 2014. Provided this work is executed as scheduled, is does address the fisheries aspect of the proposal to alter/close the watercourse segment on this site.
- However, a permit is also required to make any alteration to the watercourse under the RVCA O.Reg 174/06 'Watercourse Alterations' policies. You will need to apply for that permit and receive approval in advance of any works that affect the existing watercourse and its banks. As no development application has been submitted on the lands to the north and east of this site, the development of this property will still need to address maintaining existing flows through this corridor in the interim until the headwater catchment area is serviced and surface water is managed through future infrastructure. Further, there may still be in water work timeframe restrictions and detailed design /phasing considerations. **Please contact with Hal Stimson, RVCA Regulations Officer on what is required to apply for this permission** (hal.stimson@rvca.ca).
- The RVCA recommended that you contact the engineering consultants who are managing the downstream watercourse works, David Schaeffer Engineering Limited.
- The RVCA will review the stormwater management plan for this property, and their involvement will depend on whether the site is captured within an existing valid MSS and what the receiver will be.

As discussed in the meeting, there will not be a possibility for a break in the median on Belcourt as this is not possible within a left turn lane.

Concerning the Round About, it was discussed internally and it was decided that we shall not require a Round About at the intersection of Renaud and Belcourt.

The Fire Access is to be moved on Renaud Rd as previously indicated.

Concerning the Gateway Feature, the East Urban Community CDP Phase 1 requires a Landscaped Gateway Feature at this intersection. It is not possible to have the feature on the west side of Belcourt as the Draft Plan of Subdivision identifies a residential lot fronting on Renaud Rd. In order to ensure that there is enough space for a proper gateway feature at this location, a requirement for a 3m x 5m block on the east side of Renaud Rd has been required as a potential Draft Condition for the Trails Edge Subdivision. Be advised that this block may not be required if there is enough space in the Right of Way to build the Landscaped Gateway Feature. The block will remain as a requirement unless a detailed plan and design of the Landscaped Gateway Feature shows the feature within the Right of Way (not requiring the block), this must be to the satisfaction of the City.



As discussed in the meeting there are important things to consider for this site.

- Frontage Charges of $190/meter of total lot frontage on Renaud Rd. will be required at time of severance.
- After the meeting I looked into the area specific development charge for stormwater management and the School Board is exempt.
- The parcel currently contains a municipal drain called the James Blais Municipal Drain. This drain will need to be abandoned prior to site plan approval.
- As per OPA 118, prior to the severance the Owner will need to provide evidence from a Trustee that the owner is party to the cost sharing agreement between all benefiting land owners and that they have paid their share of the costs.
- As indicated in the preconsultation meeting the City is currently in negotiations with the current land owners regarding the allowable stormwater management release rate. Once we have a confirmed commitment we will inform the school board of the decision.
- During the meeting there was discussion as to whether the City would consider a building permit prior to site plan approval. This is not the City's current practice and would also require approval from Building Services. From an infrastructure perspective, we would not support a building permit without servicing. At this point there are no sanitary are storm services fronting the property and we understand that there may not be any services until late next summer. The school board should keep this in mind when planning their construction schedule.

We also recommend that you contact the local Ministry of Environment to determine what approvals, if any, will be required for the site. The Contact information is below.
Charles Goulet, District Engineer & Provincial Officer
Phone: (613) 521-3450 ext. 246
Fax: (613) 521-5437
email: Charles.Goulet@ene.gov.on.ca

An email has been sent to the Sign Officer in order to determine the sign requirements and therefore determine if a sign variance is required. Further information will be sent shortly. If a sign variance is required, this is a process separate from the Committee of

Adjustment (these variances are dealt within the Building Services department). The Addressing & Signs can be reached at 613-580-2424 x41162.

Regards,

Mélanie Gervais
Planner / Urbaniste
Development Review /
Examen des demandes d'aménagement
Planning and Growth Management Dept. /
Urbanisme et Gestion de la croisssance
City of / Ville d'Ottawa
110, avenue Laurier Avenue West / Ouest,
4th Floor / 4ième étage
Ottawa, ON K1P 1J1
Tel. : 613-580-2424 ext. 24025
Fax / Télécopieur : 613-580-2576
E-mail / Courriel : Melanie.Gervais@ottawa.ca
Mail Code: 01-14

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend:

The letter **S** indicates that the study or plan is required with application submission.
The letter **A** indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information on preparing required studies and plans refer to:

http://ottawa.ca/en/city-hall/planning-and-development/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	55	1. Site Servicing Plan	2. Site Servicing Study	S	6
S	55	3. Grade Control and Drainage Plan	4. Geotechnical Study	S	4
	2	5. Composite Utility Plan	6. Groundwater Impact Study		6
	5	7. Servicing Options Report	8. Wellhead Protection Study		6
S	9	9. Transportation Impact Brief	10. Erosion and Sediment Control Plan / Brief	S	6
	6	11. Storm water Management Report / Brief	12. Hydro geological and Terrain Analysis		8
	3	13. Hydraulic Water main Analysis	14. Noise Brief	S	3
	35/50/55	15. Roadway Modification Design Plan	16. Exterior Site Lighting letter	S	3

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage		2
	30	19. Draft Plan of Condominium	20. Planning Rationale (Design Statement and Integrated Environmental Review Statement**)	S	4
S	55	21. Site Plan	22. Minimum Distance Separation (MDS)		3
	20	23. Concept Plan Showing Proposed Land Uses and Landscaping	24. Agrology and Soil Capability Study		5
	3	25. Concept Plan Showing Ultimate Use of Land	26. Cultural Heritage Impact Statement		3
S	55	27. Landscape Plan	28. Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)		3
S	2	29. Survey Plan	30. Sun Shadow Study		3
S	3	31. Architectural Building Elevation Drawings (dimensioned)	32. Design Review Panel Submission Package		Available online

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	4	33. Phase 1 Environmental Site Assessment **(Ontario Reg. 153/04)**	34. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
	5	35. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	36. Assessment of Landform Features		7
	4	37. Record of Site Condition	38. Mineral Resource Impact Assessment		4
S	10	39. Tree Conservation Report	40. Environmental Impact Statement / Impact Assessment of Endangered Species		11
	4	41. Mine Hazard Study / Abandoned Pit or Quarry Study	42. Watercourse Alteration Permit **(RVCA)**	A	

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
		43.	44.		

Meeting Date: October 11, 2013

Application Type: *Site Plan Control*

File Lead: Melanie Gervais

Engineer/Project Manager: John Sevigny

Site Address: CECCE (Renaud & Belcourt)

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5☐

*One (1) indicates that considerable revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal, or in any way guarantee application approval.

**Two (2) indicates if the application falls within a design priority area and is subject to review by the Urban Design Review Panel, the planning rationale does not need to include a design statement or urban design analysis.

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, City Planning will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the City.

Last updated January, 2012

APPENDIX B

Development Servicing Study Checklist

4. Development Servicing Study Checklist

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

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

4.1 General Content

NA ☐ Executive Summary (for larger reports only).

☑ Date and revision number of the report.

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

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

REFER TO DSEL'S MASTER SERVICING STUDY ☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

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

☑ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.

☑ Statement of objectives and servicing criteria.

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

☑ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

☑ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

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

☑ Proposed phasing of the development, if applicable.

☑ Reference to geotechnical studies and recommendations concerning servicing.

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

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

4.2 Development Servicing Report: Water

☑ Confirm consistency with Master Servicing Study, if available

REFER TO DSEL'S MASTER SERVICING STUDY

☐ Availability of public infrastructure to service proposed development

☐ Identification of system constraints

☐ Identify boundary conditions

☐ Confirmation of adequate domestic supply and pressure

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

☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

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

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

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

REFER TO DSEL'S MASTER SERVICING REPORT

☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

☐ Description of off-site required 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.

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

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

4.3 Development Servicing Report: Wastewater

☑ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

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

NA ☐ 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.

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

REFER TO DSEL'S MASTER SERVICING REPORT

☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.

☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.

NA ☐ 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).

NA ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

NA ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

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

NA ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

REFER TO DSEL's MASTER SERVICING REPORT

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

☐ Analysis of available capacity in existing public infrastructure.

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

☑ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

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

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

NA ☐ Set-back from private sewage disposal systems.

☐ Watercourse and hazard lands setbacks.

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

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

☑ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

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

☑ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.

REFER TO DSEL'S MASTER SERVICING REPORT

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

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

NA ☐ 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.

REFER TO DSEL'S MASTER SERVICING REPORT

☐ Identification of potential impacts to receiving watercourses

☐ Identification of municipal drains and related approval requirements.

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

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

NA ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.

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

NA ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.

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

4.5 Approval and Permit Requirements: Checklist

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

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

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

☐ Changes to Municipal Drains.

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

4.6 Conclusion Checklist

☑ Clearly stated conclusions and recommendations

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

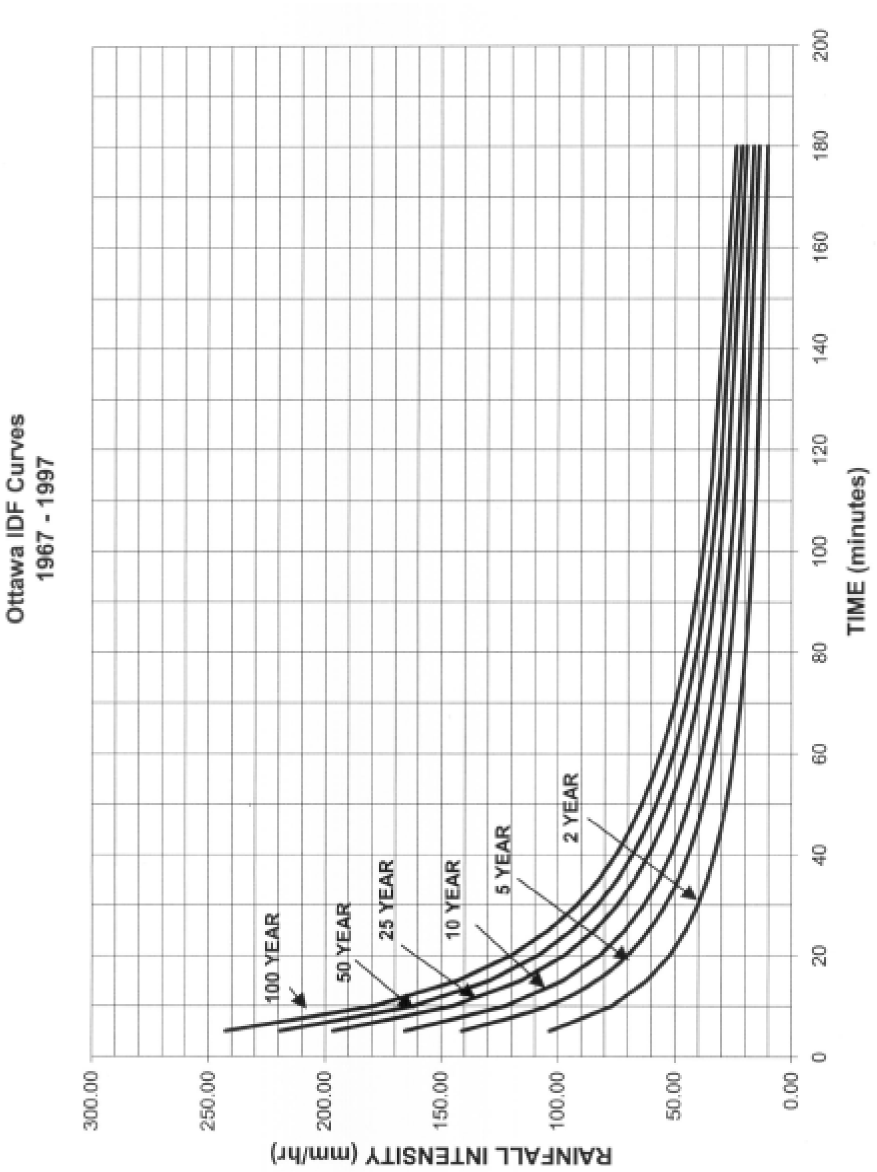
☑ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX C

Rational Method Calculations, IDF Curves

Ottawa Sewer Design Guidelines

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



City of Ottawa Appendix 5-A.1 November 2004

RATIONAL METHOD

The Rational Method was used to determine the allowable release rate, pre-development and post-development runoff for the site. The equation is as follows:

Q=2.78 CIA

Where:
Q is the runoff in L/s
C is the weighted runoff coefficient*
I is the rainfall intensity in mm/hr**
A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{perv} \times C_{perv}) + (A_{imp} \times C_{imp})}{A_{tot}}$$

Where:
A_{perv} is the pervious area in hectares
C_{perv} is the pervious area runoff coefficient (C_{perv}=0.20)
A_{imp} is the impervious area in hectares
C_{imp} is the impervious area runoff coefficient (C_{imp}=0.90)
A_{tot} is the catchment area (A_{perv} + A_{imp}) in hectares

Note: Increase the C values above by 25% for the 1:100 year event (max. C_{imp}=1.0).

** The rainfall intensities used were taken from the City of Ottawa IDF curves. A time of concentration (t_c) of 10 minutes was used for the post-development conditions, resulting in rainfall intensities of 104.2 mm/hr for the 1:5 year event and 178.6 mm/hr for the 1:100 year event.

SAMPLE POST-DEVELOPMENT FLOW CALCULATIONS

AREA A-21: SHOP CLASS LOADING AREA

Drainage Area (A) = 0.052 ha
Impervious Area = 0.052 ha
Pervious Area = NA
Runoff Coefficient (C_{5yr}) = 0.90
Runoff Coefficient (C_{w100yr}) = 1.0
Intensity (I_5) = 104.2 mm/hr
Intensity (I_{100}) = 178.6 mm/hr

$$C_{5yr} = \frac{(0.052 \times 0.90) + (0 \times 0.2)}{0.052} = 0.90$$

Q_5= 2.78 CIA
Q_5= 2.78 x 0.90 x 104.2 x 0.052
Q_5= 13.6 L/s

$$C_{100yr} = \frac{(0.052 \times 1.0) + (0 \times 0.25)}{0.052} = 1.00$$

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 1.0 x 178.6 x 0.052
Q_{100}= 25.8 L/s

Refer to the SWM Summary Spreadsheets in **Appendix D** for post-development flow for all sub-catchment drainage areas.

APPENDIX D

SWM Summary Sheet, Storage Calculations, Storm Sewer Design Sheet

Project: Orleans High School (113196)
Location: 6401 Renaud Rd
Client: CECCE

DATE: December 2013
Rev: May 2014
Rev: July 2014

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Stormwater Management Summary Sheet

		Area							Effective											
Sub Area I.D.	Sub Area (ha)	C = 0.2	C = 0.9	5 year Individual Composite C	5 year Combined Composite C	100 year Combined Composite C	Outlet Location	100 year Controlled Release (L/s)	Top of Grate (m)	Ponding Depth (m)	Available 5 year volume (cu.m)	Required 5 year volume (cu.m)	Available 100 year volume (cu.m)	Required 100 year volume (cu.m)	Invert or Pan Elev. (m)	Pipe dia (if plug type) (mm)	Head on Orifice (if plug) (m)	Diameter of Orifice (mm)	Ipex Tempest ICD Model	Head on Ipex ICD
A1	0.118	0.056	0.062	0.57	0.65	0.74	CBMH 9	128.0	87.45	0.19	39.0	36.1	134.0	133.8	85.31	457	2.10	202	N/A	N/A
A2	0.030	0.003	0.027	0.83																
A3	0.037	0.033	0.004	0.28																
A4	0.058	0.051	0.007	0.29																
A5	0.037	0.022	0.015	0.48																
A6	0.222	0.046	0.176	0.75																
A7	0.243	0.031	0.212	0.81																
A8	0.150	0.082	0.068	0.52																
A9	0.064	0.012	0.052	0.77																
A10	0.152	0.128	0.024	0.31	0.31	0.37	CB 10	14.3	87.30	0.11	N/A	N/A	8.7	8.1	86.10	203	1.21	78	N/A	N/A
A11	0.919	0.737	0.182	0.34	0.34	0.40	CBMH 13	60.0	87.35	0.24	76.2	70.4	232.5	216.9	85.36	381	2.04	140	N/A	N/A
A12	0.478	0.400	0.078	0.31																
A13	0.365	0.270	0.095	0.38																
A14	0.128	0.067	0.061	0.53	0.58	0.65	CBMH 15	33.0	87.30	0.16	2.7	2.4	25.0	21.7	85.43	203	1.93	105	N/A	N/A
A15	0.085	0.031	0.054	0.64																
A16	0.076	0.020	0.056	0.72	0.80	0.89	CBMH 17	30.3	87.30	0.14	2.6	2.4	24.8	19.8	85.58	203	1.76	103	N/A	N/A
A17	0.067	0.001	0.066	0.89																
A18	0.073	0.017	0.056	0.74	0.76	0.85	CBMH 19	33.0	87.30	0.14	2.6	2.4	23.4	21.3	85.58	203	1.76	107	N/A	N/A
A19	0.089	0.015	0.074	0.78																
A20	0.685	0.000	0.685	0.90	0.90	1.00	ROOF	98.8	N/A	N/A	N/A	N/A	156.0	155.6	N/A	N/A	N/A	N/A	N/A	N/A
A21	0.064	0.000	0.064	0.90	0.90	1.00	FREE FLOW	31.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A22	0.134	0.024	0.110	0.77	0.77	0.87	CB 22	33.0	87.40	0.22	N/A	N/A	15.5	14.7	86.20	203	1.32	115	N/A	N/A
A23	0.051	0.047	0.004	0.25	0.22	0.28	CBMH 24	7.5	87.65	0.11	N/A	N/A	5.0	4.8	85.47	203	2.19	48	Vortex 75	2.29
A24	0.062	0.062	0.000	0.20																
A25	0.069	0.015	0.054	0.75	0.75	0.84	CB 25	16.2	87.40	0.20	N/A	N/A	8.4	7.5	86.20	203	1.30	81	N/A	N/A
A26	0.053	0.011	0.042	0.75	0.82	0.91	CBMH 27	23.0	87.30	0.14	2.6	2.2	18.1	15.7	85.57	203	1.77	90	N/A	N/A
A27	0.055	0.001	0.054	0.88																
A28	0.069	0.020	0.049	0.70	0.69	0.77	CBMH 29	28.0	87.30	0.15	2.6	2.6	23.5	19.2	85.57	203	1.78	99	N/A	N/A
A29	0.087	0.027	0.060	0.68																
A30	0.166	0.126	0.040	0.37	0.37	0.43	FREE FLOW	35.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A31	0.174	0.101	0.073	0.49	0.49	0.56	CB 30	27.4	87.25	0.24	N/A	N/A	14.3	12.8	86.05	203	1.34	105	N/A	N/A
	5.06	2.46	2.60					599.8												

M:\2013\113196\DATA\Calculations\Sewer Calcs\SWM\113196 - SWM Summary.xls

Project: Orleans High School
Location: 6401 Renaud Rd
Client: CECCE

DATE: December 2013
Rev: May 2014
Rev: July 2014

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Storage Requirements for Area A1-A9 (CBMH 9)

Area	**0.959**	hectares
5 Year Runoff Coefficient =	**0.65**	post development
100 Year Runoff Coefficient=	**0.74**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
	10	**104.19**	**181.92**	**121.8**	**60.1**	**36.1**
5 Year	20	70.25	122.66	121.8	0.9	1.0
	30	53.93	94.15	121.8	-27.6	-49.8
	40	44.18	77.14	121.8	-44.7	-107.2
	50	37.65	65.74	121.8	-56.1	-168.2
	10	**178.56**	**351.03**	**128.0**	**223.0**	**133.8**
	20	119.95	235.81	128.0	107.8	129.4
100 Year	30	91.87	180.60	128.0	52.6	94.7
	40	75.15	147.73	128.0	19.7	47.3
	50	63.95	125.73	128.0	-2.3	-6.8

Storage Requirements for Area A10 (CB 10)

Area	**0.152**	hectares
5 Year Runoff Coefficient =	**0.31**	post development
100 Year Runoff Coefficient=	**0.37**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**13.67**	**13.6**	**0.1**	**0.0**
	20	70.25	9.22	13.6	-4.4	-5.3
	30	53.93	7.08	13.6	-6.5	-11.7
	40	44.18	5.80	13.6	-7.8	-18.7
	50	37.65	4.94	13.6	-8.7	-26.0
	10	**178.56**	**27.80**	**14.3**	**13.5**	**8.1**
100 Year	20	119.95	18.67	14.3	4.4	5.2
	30	91.87	14.30	14.3	0.0	0.0
	40	75.15	11.70	14.3	-2.6	-6.2
	50	63.95	9.96	14.3	-4.3	-13.0

Storage Requirements for Area A11-A13 (CBMH 13)

Area	**1.762**	hectares
5 Year Runoff Coefficient =	**0.34**	post development
100 Year Runoff Coefficient=	**0.40**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
	10	104.19	174.05	58.7	115.4	69.2
	20	**70.25**	**117.35**	**58.7**	**58.7**	**70.4**
5 Year	30	53.93	90.09	58.7	31.4	56.5
	40	44.18	73.81	58.7	15.1	36.3
	50	37.65	62.90	58.7	4.2	12.6
	10	178.56	350.83	60.0	290.8	174.5
	20	119.95	235.67	60.0	175.7	210.8
100 Year	**30**	**91.87**	**180.50**	**60.0**	**120.5**	**216.9**
	40	75.15	147.64	60.0	87.6	210.3
	50	63.95	125.65	60.0	65.7	197.0

Storage Requirements for Area A14-A15 (CBMH 15)

Area **0.213** hectares
5 Year Runoff Coefficient = 0.58 post development
100 Year Runoff Coefficient= 0.65 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**35.66**	**31.6**	**4.1**	**2.4**
	20	70.25	24.04	31.6	-7.6	-9.1
	30	53.93	18.45	31.6	-13.1	-23.7
	40	44.18	15.12	31.6	-16.5	-39.6
	50	37.65	12.89	31.6	-18.7	-56.1
100 Year	**10**	**178.56**	**69.25**	**33.0**	**36.2**	**21.7**
	20	119.95	46.52	33.0	13.5	16.2
	30	91.87	35.63	33.0	2.6	4.7
	40	75.15	29.14	33.0	-3.9	-9.3
	50	63.95	24.80	33.0	-8.2	-24.6

Storage Requirements for Area A16-A17 (CBMH 17)

Area **0.143** hectares
5 Year Runoff Coefficient = 0.80 post development
100 Year Runoff Coefficient= 0.89 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**33.08**	**29.1**	**4.0**	**2.4**
	20	70.25	22.30	29.1	-6.8	-8.2
	30	53.93	17.12	29.1	-12.0	-21.6
	40	44.18	14.03	29.1	-15.1	-36.2
	50	37.65	11.96	29.1	-17.1	-51.4
100 Year	**10**	**178.56**	**63.28**	**30.3**	**33.0**	**19.8**
	20	119.95	42.51	30.3	12.2	14.6
	30	91.87	32.56	30.3	2.3	4.1
	40	75.15	26.63	30.3	-3.7	-8.8
	50	63.95	22.66	30.3	-7.6	-22.9

Storage Requirements for Area A18-A19 (CBMH 19)

Area **0.162** hectares
5 Year Runoff Coefficient = 0.76 post development
100 Year Runoff Coefficient= 0.85 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**35.74**	**31.7**	**4.0**	**2.4**
	20	70.25	24.10	31.7	-7.6	-9.1
	30	53.93	18.50	31.7	-13.2	-23.8
	40	44.18	15.16	31.7	-16.5	-39.7
	50	37.65	12.92	31.7	-18.8	-56.3
100 Year	**10**	**178.56**	**68.50**	**33.0**	**35.5**	**21.3**
	20	119.95	46.02	33.0	13.0	15.6
	30	91.87	35.24	33.0	2.2	4.0
	40	75.15	28.83	33.0	-4.2	-10.0
	50	63.95	24.54	33.0	-8.5	-25.4

Storage Requirements for Area A20 (ROOF)

Area	0.685	hectares
5 Year Runoff Coefficient =	0.90	post development
100 Year Runoff Coefficient=	1.00	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
	10	104.19	178.63	98.8	79.8	47.9
	20	**70.25**	**120.44**	**98.8**	**21.6**	**26.0**
5 Year	30	53.93	92.45	98.8	-6.3	-11.4
	40	44.18	75.75	98.8	-23.1	-55.3
	50	37.65	64.55	98.8	-34.2	-102.7
	10	178.56	340.13	98.8	241.3	144.8
	20	**119.95**	**228.49**	**98.8**	**129.7**	**155.6**
100 Year	30	91.87	175.00	98.8	76.2	137.2
	40	75.15	143.14	98.8	44.3	106.4
	50	63.95	121.82	98.8	23.0	69.1

Storage Requirements for Area A21 (CBMH 21 FREE FLOW)

Area	0.064	hectares
5 Year Runoff Coefficient =	0.90	post development
100 Year Runoff Coefficient=	1.00	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Free Flow Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
	10	**104.19**	**16.68**	**16.7**	**0.0**	**0.0**
	20	70.25	11.25	16.7	-5.5	-6.5
5 Year	30	53.93	8.64	16.7	-8.1	-14.5
	40	44.18	7.08	16.7	-9.6	-23.1
	50	37.65	6.03	16.7	-10.7	-32.0
	10	**178.56**	**31.77**	**31.8**	**0.0**	**0.0**
	20	119.95	21.34	31.8	-10.5	-12.6
100 Year	30	91.87	16.35	31.8	-15.5	-27.8
	40	75.15	13.37	31.8	-18.4	-44.2
	50	63.95	11.38	31.8	-20.4	-61.3

Storage Requirements for Area A22 (CB 22)

Area	0.134	hectares
5 Year Runoff Coefficient =	0.77	post development
100 Year Runoff Coefficient=	0.87	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
	10	**104.19**	**30.07**	**30.1**	**0.0**	**0.0**
	20	70.25	20.27	30.1	-9.8	-11.8
5 Year	30	53.93	15.56	30.1	-14.5	-26.2
	40	44.18	12.75	30.1	-17.3	-41.6
	50	37.65	10.87	30.1	-19.2	-57.7
	10	**178.56**	**57.58**	**33.0**	**24.6**	**14.7**
	20	119.95	38.68	33.0	5.7	6.8
100 Year	30	91.87	29.63	33.0	-3.4	-6.1
	40	75.15	24.23	33.0	-8.8	-21.0
	50	63.95	20.62	33.0	-12.4	-37.1

Storage Requirements for Area A23-A24 (CBMH 24)

Area	0.113	hectares
5 Year Runoff Coefficient =	0.22	post development
100 Year Runoff Coefficient=	0.28	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**7.36**	**7.3**	**0.1**	**0.0**
	20	70.25	4.96	7.3	-2.3	-2.8
	30	53.93	3.81	7.3	-3.5	-6.3
	40	44.18	3.12	7.3	-4.2	-10.0
	50	37.65	2.66	7.3	-4.6	-13.9
100 Year	**10**	**178.56**	**15.51**	**7.5**	**8.0**	**4.8**
	20	119.95	10.42	7.5	2.9	3.5
	30	91.87	7.98	7.5	0.5	0.9
	40	75.15	6.53	7.5	-1.0	-2.3
	50	63.95	5.56	7.5	-1.9	-5.8

Storage Requirements for Area A25 (CB 25)

Area	0.069	hectares
5 Year Runoff Coefficient =	0.75	post development
100 Year Runoff Coefficient=	0.84	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**14.95**	**14.9**	**0.0**	**0.0**
	20	70.25	10.08	14.9	-4.8	-5.8
	30	53.93	7.74	14.9	-7.2	-12.9
	40	44.18	6.34	14.9	-8.6	-20.5
	50	37.65	5.40	14.9	-9.5	-28.5
100 Year	**10**	**178.56**	**28.67**	**16.2**	**12.5**	**7.5**
	20	119.95	19.26	16.2	3.1	3.7
	30	91.87	14.75	16.2	-1.5	-2.6
	40	75.15	12.06	16.2	-4.1	-9.9
	50	63.95	10.27	16.2	-5.9	-17.8

Storage Requirements for Area A26-A27 (CBMH 27)

Area	0.108	hectares
5 Year Runoff Coefficient =	0.82	post development
100 Year Runoff Coefficient=	0.91	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**25.74**	**22.1**	**3.6**	**2.2**
	20	70.25	17.35	22.1	-4.7	-5.7
	30	53.93	13.32	22.1	-8.8	-15.8
	40	44.18	10.91	22.1	-11.2	-26.8
	50	37.65	9.30	22.1	-12.8	-38.4
100 Year	**10**	**178.56**	**49.18**	**23.0**	**26.2**	**15.7**
	20	119.95	33.04	23.0	10.0	12.0
	30	91.87	25.30	23.0	2.3	4.1
	40	75.15	20.70	23.0	-2.3	-5.5
	50	63.95	17.61	23.0	-5.4	-16.2

Storage Requirements for Area A28-A29 (CBMH 29)

Area 0.156 hectares
5 Year Runoff Coefficient = 0.69 post development
100 Year Runoff Coefficient= 0.77 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**31.14**	**26.8**	**4.3**	**2.6**
	20	70.25	20.99	26.8	-5.8	-7.0
	30	53.93	16.12	26.8	-10.7	-19.2
	40	44.18	13.20	26.8	-13.6	-32.6
	50	37.65	11.25	26.8	-15.5	-46.6
100 Year	**10**	**178.56**	**59.94**	**28.0**	**31.9**	**19.2**
	20	119.95	40.27	28.0	12.3	14.7
	30	91.87	30.84	28.0	2.8	5.1
	40	75.15	25.23	28.0	-2.8	-6.7
	50	63.95	21.47	28.0	-6.5	-19.6

Storage Requirements for Area A30 (FREE FLOW)

Area 0.166 hectares
5 Year Runoff Coefficient = 0.37 post development
100 Year Runoff Coefficient= 0.43 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Free Flow Direct Runoff	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**17.73**	**17.7**	**0.0**	**0.0**
	20	70.25	11.95	17.7	-5.7	-6.9
	30	53.93	9.18	17.7	-8.5	-15.3
	40	44.18	7.52	17.7	-10.2	-24.4
	50	37.65	6.41	17.7	-11.3	-33.9
100 Year	**10**	**178.56**	**35.49**	**35.5**	**0.0**	**0.0**
	20	119.95	23.84	35.5	-11.7	-14.0
	30	91.87	18.26	35.5	-17.2	-31.0
	40	75.15	14.94	35.5	-20.6	-49.4
	50	63.95	12.71	35.5	-22.8	-68.4

Storage Requirements for Area A31 (CB 30)

Area 0.174 hectares
5 Year Runoff Coefficient = 0.49 post development
100 Year Runoff Coefficient= 0.56 post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**24.88**	**24.8**	**0.1**	**0.0**
	20	70.25	16.78	24.8	-8.0	-9.6
	30	53.93	12.88	24.8	-11.9	-21.5
	40	44.18	10.55	24.8	-14.2	-34.2
	50	37.65	8.99	24.8	-15.8	-47.4
100 Year	**10**	**178.56**	**48.77**	**27.4**	**21.4**	**12.8**
	20	119.95	32.76	27.4	5.4	6.4
	30	91.87	25.09	27.4	-2.3	-4.2
	40	75.15	20.52	27.4	-6.9	-16.5
	50	63.95	17.47	27.4	-9.9	-29.8

Stormwater Storage Volumes for Areas A1 to A9

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	82.7	N/A	2.68	2.68
		254.0	69.7	N/A	3.53	6.21
		304.8	100.4	N/A	7.32	13.53
		381.0	66.4	N/A	7.57	21.09
Catchbasin Storage	CB 1	N/A	N/A	1.20	0.43	21.53
	CB 6A	N/A	N/A	1.20	0.43	21.96
	CB 7A	N/A	N/A	1.20	0.43	22.39
	CB 8	N/A	N/A	1.20	0.43	22.82
Catchbasin Manhole Storage	CBMH 2	N/A	N/A	1.44	1.63	24.45
	CBMH 3	N/A	N/A	1.57	1.77	26.22
	CBMH 4	N/A	N/A	1.69	1.91	28.13
	CBMH 5	N/A	N/A	1.84	2.08	30.21
	CBMH 6	N/A	N/A	2.02	2.28	32.50
	CBMH 7	N/A	N/A	2.00	2.26	34.76
	CBMH 7B	N/A	N/A	1.53	1.73	36.49
	CBMH 9	N/A	N/A	2.18	2.46	38.95
					Pipe and Structure storage =	**38.95**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A11 to A13

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		254.0	353.5	N/A	17.90	17.90
		381.0	75.0	N/A	8.55	26.45
Catchbasin	CB 8	N/A	N/A	0	0.00	29.18
Catchbasin Manhole Storage	CBMH 11E	N/A	N/A	1.15	1.30	30.48
	CBMH 11	N/A	N/A	1.47	1.66	32.15
	CBMH 12	N/A	N/A	1.85	2.09	34.24
	CBMH 13C	N/A	N/A	1.45	1.64	35.88
	CBMH 13	N/A	N/A	2.01	2.27	38.15
					Pipe and Structure storage =	**38.15**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A14 to A15

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	17.0	N/A	0.55	0.55
Catchbasin Storage	CB 14	N/A	N/A	1.20	0.43	0.98
Catchbasin Manhole Storage	CBMH 15	N/A	N/A	1.54	1.74	2.72
					Pipe and Structure storage =	**2.72**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A16 to A17

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	17.0	N/A	0.55	0.55
Catchbasin Storage	CB 16	N/A	N/A	1.20	0.43	0.98
Catchbasin Manhole Storage	CBMH 17	N/A	N/A	1.42	1.61	2.59
					Pipe and Structure storage =	**2.59**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A18 to A19

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	17.0	N/A	0.55	0.55
Catchbasin Storage	CB 18	N/A	N/A	1.20	0.43	0.98
Catchbasin Manhole Storage	CBMH 19	N/A	N/A	1.42	1.61	2.59
					Pipe and Structure storage =	**2.59**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A26 to A27

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	17.7	N/A	0.57	0.57
Catchbasin Storage	CB 26	N/A	N/A	1.20	0.43	1.00
Catchbasin Manhole Storage	CBMH 27	N/A	N/A	1.43	1.62	2.62
					Pipe and Structure storage =	**2.62**

*Cumulative Volume = Sum of all (Pipe Area x Pipe Length) + (CB Area x CB Depth) + (CBMH Area x CBMH Depth)

Stormwater Storage Volumes for Areas A28 to A29

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m^3)	Cumulative Volume (m^3)*
Pipe Storage		203.0	17.5	N/A	0.57	0.57
Catchbasin Storage	CB 28	N/A	N/A	1.20	0.43	1.00
Catchbasin Manhole Storage	CBMH 29	N/A	N/A	1.43	1.62	2.61
					Pipe and Structure storage =	**2.61**

Project: Orleans High School (113196)
Location: 6401 Renaud Rd.
Client: CECCE

DATE: December 2013
Rev: May 2014
Rev: July 2014

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Table 2. Storm Sewer Design Sheet

LOCATION		AREA (Ha)			FLOW					PROPOSED SEWER							
FROM	TO	TOTAL AREA	R= 0.2	R= 0.9	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
CB 1	CBMH 2	0.118	0.056	0.062	0.19	0.19	10.00	104.19	19.43	203.0	1.00	17.9	34.16	1.05	0.28	14.73	0.57
CBMH 2	CBMH 3	0.030	0.003	0.027	0.07	0.26	10.28	102.72	26.26	254.0	0.45	17.7	41.66	0.82	0.36	15.40	0.63
CBMH 3	CBMH 4	0.037	0.033	0.004	0.03	0.28	10.64	100.92	28.66	304.8	0.35	30.9	59.74	0.82	0.63	31.08	0.48
CBMH 4	CBMH 5	0.058	0.051	0.007	0.05	0.33	11.27	97.92	32.32	304.8	0.35	38.9	59.74	0.82	0.79	27.42	0.54
CBMH 5	CBMH 6	0.037	0.022	0.015	0.05	0.38	12.06	94.42	35.87	304.8	0.35	30.6	59.74	0.82	0.62	23.88	0.60
CBMH 6	CBMH 7	0.222	0.046	0.176	0.47	0.85	12.69	91.86	77.69	381.0	0.35	34.0	108.32	0.95	0.60	30.63	0.72
CBMH 7	CBMH 9	0.243	0.031	0.212	0.55	1.39	13.28	89.54	124.77	381.0	0.47	32.4	125.52	1.10	0.49	0.75	0.99
CB 8	CBMH 9	0.150	0.082	0.068	0.22	0.22	10.00	104.19	22.48	203.0	2.20	17.3	50.67	1.56	0.18	28.19	0.44
CB 10	MAIN	0.152	0.128	0.024	0.13	0.13	10.00	104.19	14.30	203.0	1.00	6.7	34.16	1.05	0.11	19.86	0.42
CBMH 9	STMMH 100	0.064	0.012	0.052	0.14	1.88	13.78	87.73	142.30	457.2	0.25	64.9	148.87	0.91	1.19	6.57	0.96
CBMH 11	CBMH 12	0.919	0.737	0.182	0.87	0.87	10.00	104.19	90.14	381.0	0.55	51.0	135.79	1.19	0.71	45.65	0.66
CBMH 12	CBMH 13	0.478	0.400	0.078	0.42	1.28	10.71	100.56	128.99	381.0	0.55	24.0	135.79	1.19	0.34	6.79	0.95
CBMH 13	STMMH 100	0.365	0.270	0.095	0.39	1.67	11.05	98.95	60.00	381.0	0.45	36.4	122.82	1.08	0.56	62.82	0.49
CB 14	CBMH 15	0.128	0.067	0.061	0.19	0.19	10.00	104.19	19.78	203.0	1.00	17.0	34.16	1.05	0.27	14.38	0.58
CBMH 15	STMMH 100	0.085	0.031	0.054	0.15	0.34	10.27	102.79	33.00	203.0	1.00	2.9	34.16	1.05	0.05	1.16	0.97
CB 16	CBMH 17	0.076	0.020	0.056	0.15	0.15	10.00	104.19	15.76	203.0	1.00	17.0	34.16	1.05	0.27	18.40	0.46
CBMH 17	MAIN	0.067	0.001	0.066	0.17	0.32	10.27	102.79	30.30	254.0	1.00	2.8	62.10	1.22	0.04	31.80	0.49
CB 30	MAIN	0.174	0.101	0.073	0.24	0.24	10.00	104.19	27.40	203.0	1.00	20.0	34.16	1.05	0.32	6.76	0.80
CB 18	CBMH 19	0.073	0.017	0.056	0.15	0.15	10.00	104.19	15.58	203.0	1.00	17.0	34.16	1.05	0.27	18.58	0.46
CBMH 19	MAIN	0.089	0.015	0.074	0.19	0.34	10.27	102.79	33.00	203.0	1.00	2.8	34.16	1.05	0.04	1.16	0.97
STMMH 100	STMMH 102	0.000	0.000	0.000	0.00	4.79	14.97	83.65	326.00	609.6	0.28	98.4	339.29	1.16	1.41	13.29	0.96
BLDG	STMMH 104	0.685	0.000	0.685	1.71	1.71	10.00	104.19	98.80	375.0	1.00	32.5	175.51	1.59	0.34	76.71	0.56
CBMH 21*	STMMH 104	0.064	0.000	0.064	0.16	0.16	10.00	104.19	31.80	203.0	1.00	37.8	34.16	1.05	0.60	2.36	0.93
CB 22	MAIN	0.134	0.024	0.110	0.29	0.29	10.00	104.19	33.00	203.0	1.50	2.0	41.84	1.29	0.03	8.84	0.79
CB 23	CBMH 24	0.051	0.047	0.004	0.04	0.04	10.00	104.19	3.77	203.0	1.90	22.9	47.09	1.45	0.26	43.32	0.08
CBMH 24	STMMH 104	0.062	0.062	0.000	0.03	0.07	10.26	102.83	7.50	203.0	1.00	22.4	34.16	1.05	0.35	26.66	0.22
CB 25	MAIN	0.069	0.015	0.054	0.14	0.14	10.00	104.19	16.20	203.0	1.00	15.3	34.16	1.05	0.24	17.96	0.47

M:\2013\113196\DATA\Calculations\Sewer Calcs\SWM\113196 - SWM Summary.xls

LOCATION		AREA (Ha)			FLOW					PROPOSED SEWER							
FROM	TO	TOTAL AREA	R= 0.2	R= 0.9	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
STMMH 104	STMMH 102	0.000	0.000	0.000	0.00	2.38	10.62	101.04	187.30	457.2	0.40	30.0	188.30	1.15	0.44	1.00	0.99
CB 26	CBMH 27	0.053	0.011	0.042	0.11	0.11	10.00	104.19	11.59	203.0	1.00	17.7	34.16	1.05	0.28	22.58	0.34
CBMH 27	STMMH 102	0.055	0.001	0.054	0.14	0.25	10.28	102.74	23.00	203.0	1.00	2.7	34.16	1.05	0.04	11.16	0.67
CB 28	CBMH 29	0.069	0.020	0.049	0.13	0.13	10.00	104.19	13.93	203.0	1.00	17.5	34.16	1.05	0.28	20.23	0.41
CBMH 29	MAIN	0.087	0.027	0.060	0.17	0.30	10.28	102.75	28.00	203.0	1.00	2.5	34.16	1.05	0.04	6.16	0.82
STMMH 102	STMMH 106	0.000	0.000	0.000	0.00	7.71	16.38	79.34	564.30	762.0	0.30	41.6	636.77	1.39	0.50	72.47	0.89
STMMH 106	BELCOURT	0.000	0.000	0.000	0.00	7.71	16.88	77.94	564.30	1066.8	0.30	21.3	1561.92	1.75	0.20	997.62	0.36

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) * Represents 100-year peak flow (free flow)
▨ Indicates 100-year controlled peak flow

SURFACE STORAGE						
	5 YEAR			**100 YEAR**		
LOCATION	**AREA**	**DEPTH**	**VOLUME**	**AREA**	**DEPTH**	**VOLUME**
CB 1	N/A	N/A	N/A	28.7	0.04	0.38
CBMH 2	N/A	N/A	N/A	0	0.00	0.00
CBMH 3	N/A	N/A	N/A	8.7	0.04	0.12
CBMH 4	N/A	N/A	N/A	17.4	0.04	0.23
CBMH 5	N/A	N/A	N/A	14.2	0.04	0.19
CBMH 6	N/A	N/A	N/A	302.9	0.19	19.18
CB 6A	N/A	N/A	N/A	0.0	0.00	0.00
CBMH 7	N/A	N/A	N/A	467.6	0.19	29.61
CB 8	N/A	N/A	N/A	403.4	0.19	25.55
CBMH 9	N/A	N/A	N/A	311.7	0.19	19.74
		Sub Total	**0.00**		**Sub Total**	**95.01**
CB 10	N/A	N/A	N/A	236.3	0.11	**8.66**
LD 11A	19.5	0.10	0.65	79.5	0.19	5.04
LD 11B	52.3	0.10	1.74	159.5	0.19	10.10
LD 11 C	45.3	0.10	1.51	193.9	0.19	12.28
LD 11 D	28.7	0.10	0.96	125.2	0.19	7.93
CBMH 11 E	233.5	0.15	11.68	666.8	0.24	53.34
CBMH 11	50.7	0.10	1.69	143.5	0.19	9.09
LD 12 A	20.1	0.10	0.67	79.8	0.19	5.05
LD 12 B	53.4	0.10	1.78	165.9	0.19	10.51
CBMH 12	56.0	0.10	1.87	156.8	0.19	9.93
LD 13 A	61.5	0.10	2.05	264.0	0.19	16.72
LD 13 B	19.5	0.10	0.65	97.4	0.19	6.17
CBMH 13 C	256.1	0.15	12.81	603.0	0.24	48.24
		Sub Total	**38.05**		**Sub Total**	**194.40**
CB 14	N/A	N/A	N/A	213.4	0.16	11.38
CBMH 15	N/A	N/A	N/A	205.2	0.16	10.94
		Sub Total	**0.00**		**Sub Total**	**22.33**
CB 16	N/A	N/A	N/A	220.4	0.14	10.29
CBMH 17	N/A	N/A	N/A	255.7	0.14	11.93
		Sub Total	**0.00**		**Sub Total**	**22.22**
CB 18	N/A	N/A	N/A	215.3	0.14	10.05
CBMH 19	N/A	N/A	N/A	231.2	0.14	10.79
		Sub Total	**0.00**		**Sub Total**	**20.84**
CB 22	N/A	N/A	**N/A**	210.9	0.22	**15.47**
CB 23	N/A	N/A	N/A	57.7	0.11	2.12
CBMH 24	N/A	N/A	N/A	79.0	0.11	2.90
					Sub Total	**5.01**
CB 25	N/A	N/A	**N/A**	125.8	0.20	**8.39**
CB 26	N/A	N/A	N/A	181.7	0.14	8.48
CBMH 27	N/A	N/A	N/A	150.7	0.14	7.03
		Sub Total	**0.00**		**Sub Total**	**15.51**
CB 28	N/A	N/A	N/A	240.0	0.15	12.00
CBMH 29	N/A	N/A	N/A	178.1	0.15	8.91
		Sub Total	**0.00**		**Sub Total**	**20.91**
CB 30	N/A	N/A	N/A	179.0	0.24	14.32
		Sub Total	**0.00**		**Sub Total**	**14.32**

APPENDIX E

Sample Calculations

SAMPLE ORIFICE CALCULATION

AREAS A-1 to A-9: ICD WITHIN OUTLET PIPE OF CBMH 9

In order to reduce the flow from these catchment areas an ICD will be installed in the outlet pipe of CBMH 9. Iterative calculations will be required to determine the orifice size, approximate design flow and head. The controlled flow through the orifice is assumed to be in the order of 128 L/s for the 1:100 year design event. The head is calculated from the water elevation to the centerline of the orifice and will be approximately 2.11m (87.65m – (85.31m + 0.23m)).

$Q = 0.62 \times A \times (2gh)^{1/2}$
$0.128 = 0.62 \times A \times (2 \times 9.81 \times 2.11)^{1/2}$
$A = 0.032087$
$A = 3.14 \times d^2/4$
$d = 0.202124$, therefore use a 202mm dia. orifice

Iterative calculations were done to determine the release rate for the 1:5 year design event. The same orifice, with a design head of 1.91m (87.45m – (85.31m + 0.23m), will release the 1:5 year design event at the rate of:

$Q_5 = 0.62 \times A \times (2gh)^{1/2}$
$Q_5 = 0.62 \times 0.032047 \times (2 \times 9.81 \times 1.91)^{1/2}$
$Q_5 = 0.12178$ or 121.8 L/s

Refer to the SWM Summary spreadsheets in **Appendix D** for the proposed orifice sizes.

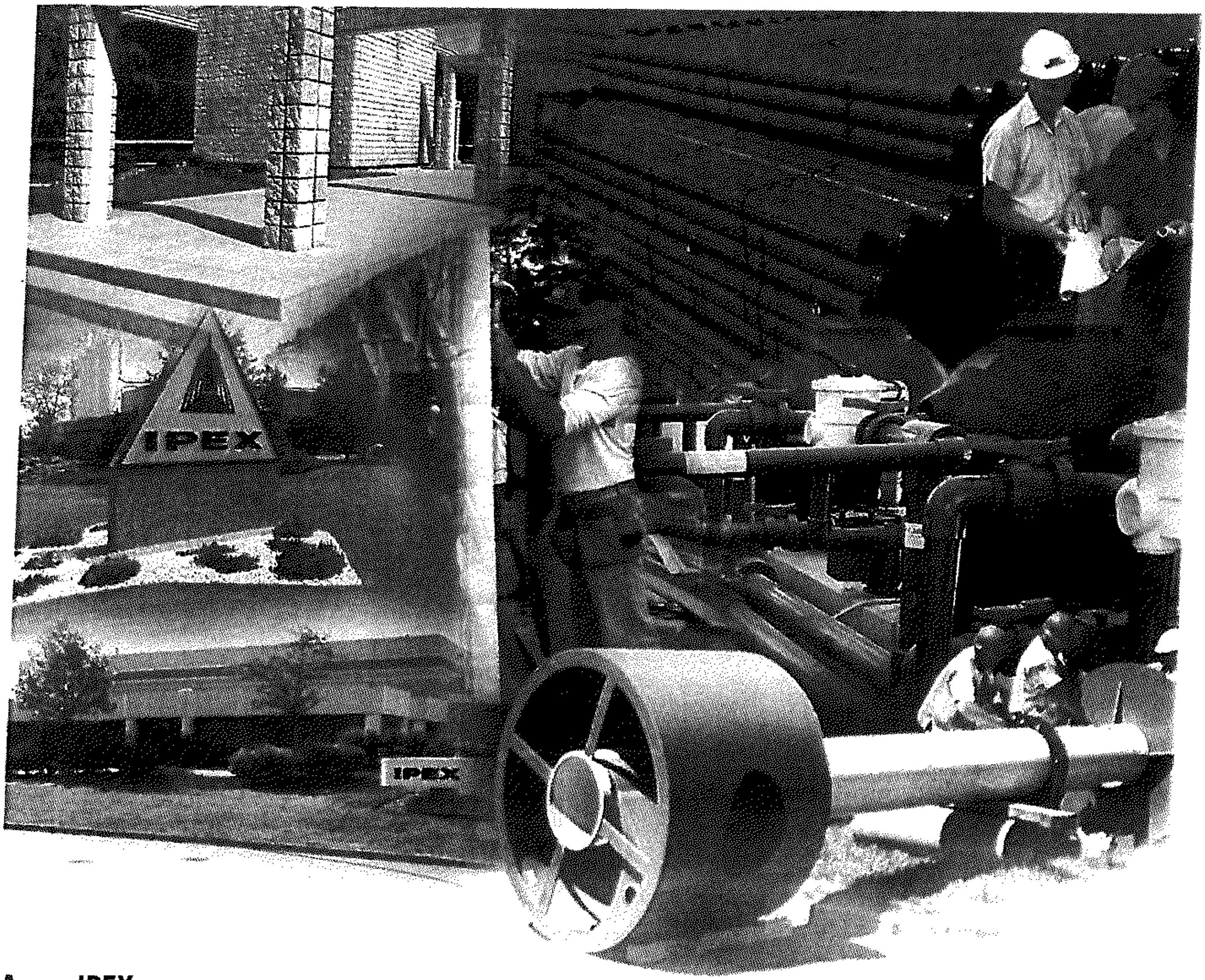
APPENDIX F

IPEX Inlet Control Device Information

IPEX Tempest™
Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition



About IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

CONTENTS

TEMPEST INLET CONTROL DEVICES Technical Manual

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

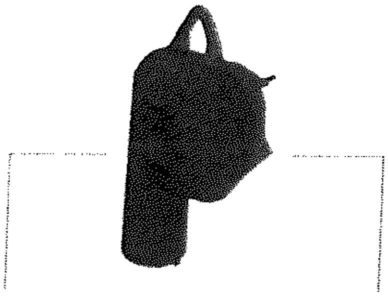
The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

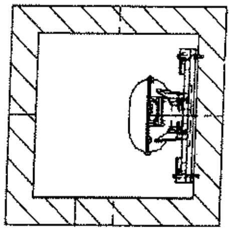
Product Applications

Will accommodate both square and round applications:

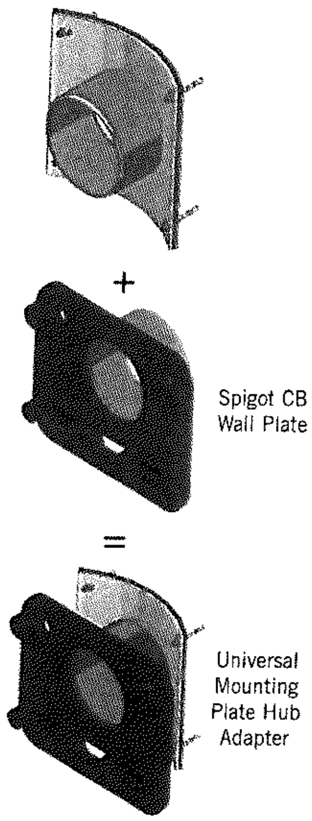


Square Application

Universal Mounting Plate



Round Application



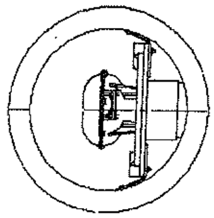


Chart 1: LMF 14 Preset Flow Curves

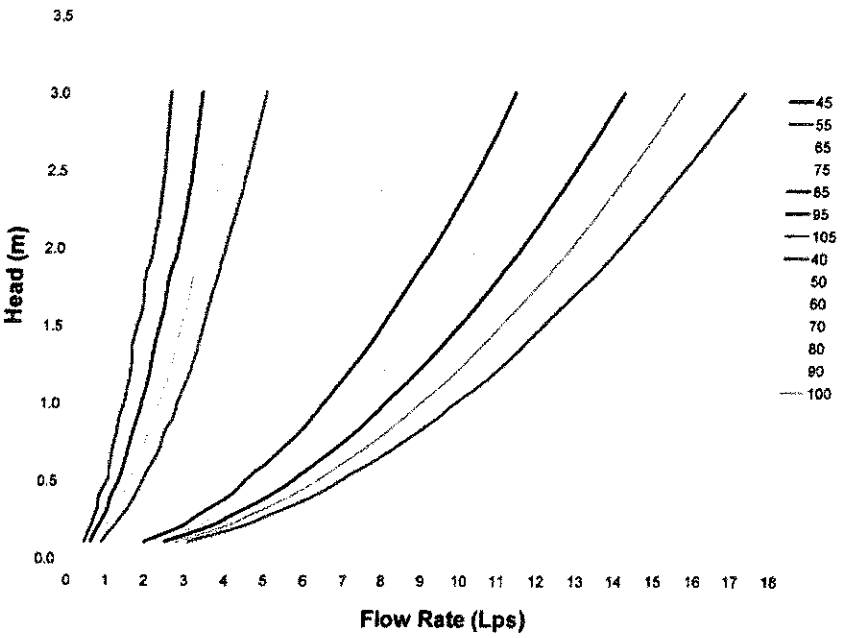
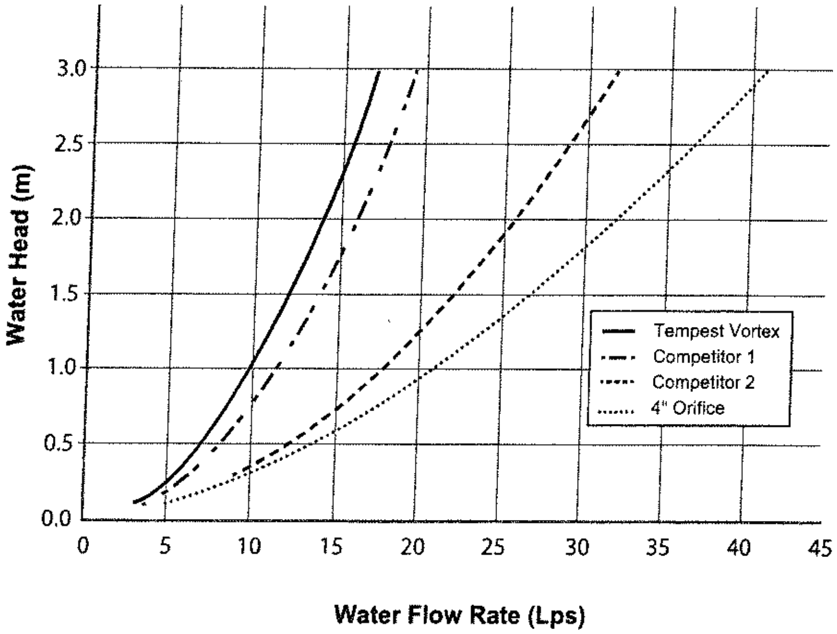


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX G

Control Flow Roof Drain Information

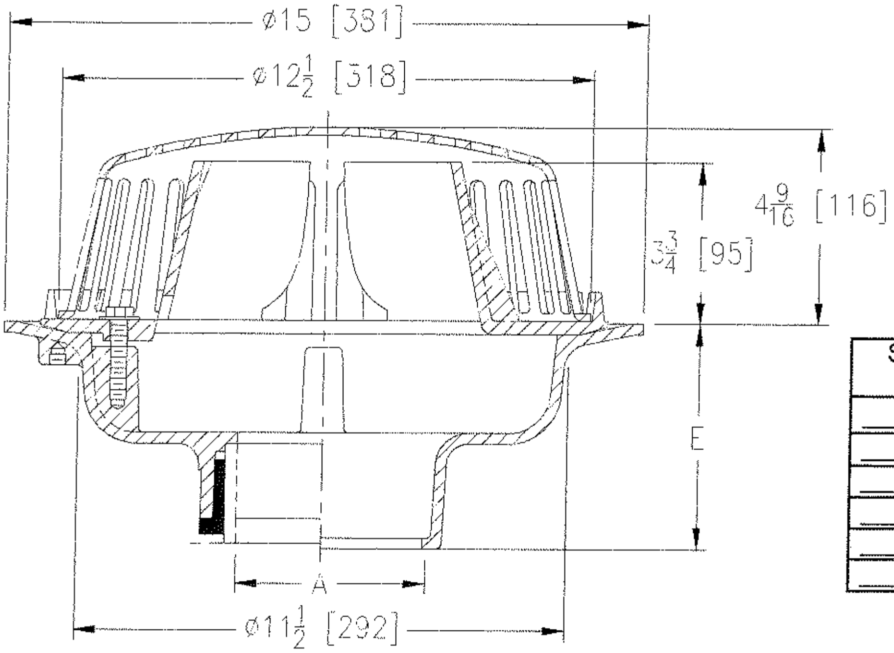
ZURN®

Z105
CONTROL-FLO ROOF DRAIN W/ PARABOLIC WEIR

SPECIFICATION SHEET

TAG ______

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
____-N1	One Notch
____-N2	Two Notches
____-N3	Three Notches
____-N4	Four Notches
____-N5	Five Notches
____-N6	Six Notches

A- Pipe Size In.	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm^2]
2-3-4 [51-76-102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105

15 [381] Diameter Control-Flo Roof Drain for Dead-Level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates.

OPTIONS (Check/specify appropriate options)

PIPE SIZE	(Specify size/type) **OUTLET**		**E BODY HT. DIM.**
2 , 3, 4 [51, 76, 102]	______ IC	Inside Caulk	5-1/4 [133]
2 , 3, 4 [51, 76, 102]	______ IP	Threaded	3-3/4 [95]
2 , 3, 4 [51, 76, 102]	______ NH	No-Hub	5-1/4 [133]
2 , 3, 4 [51, 76, 102]	______ NL	Neo-Loc	4-9/16 [116]

PREFIXES

____ Z D.C.C.I. Body with Poly-Dome*
____ ZA D.C.C.I. Body with Aluminum Dome
____ ZC D.C.C.I. Body with Cast Iron Dome
____ ZRB D.C.C.I. Body with Plain Bronze Dome

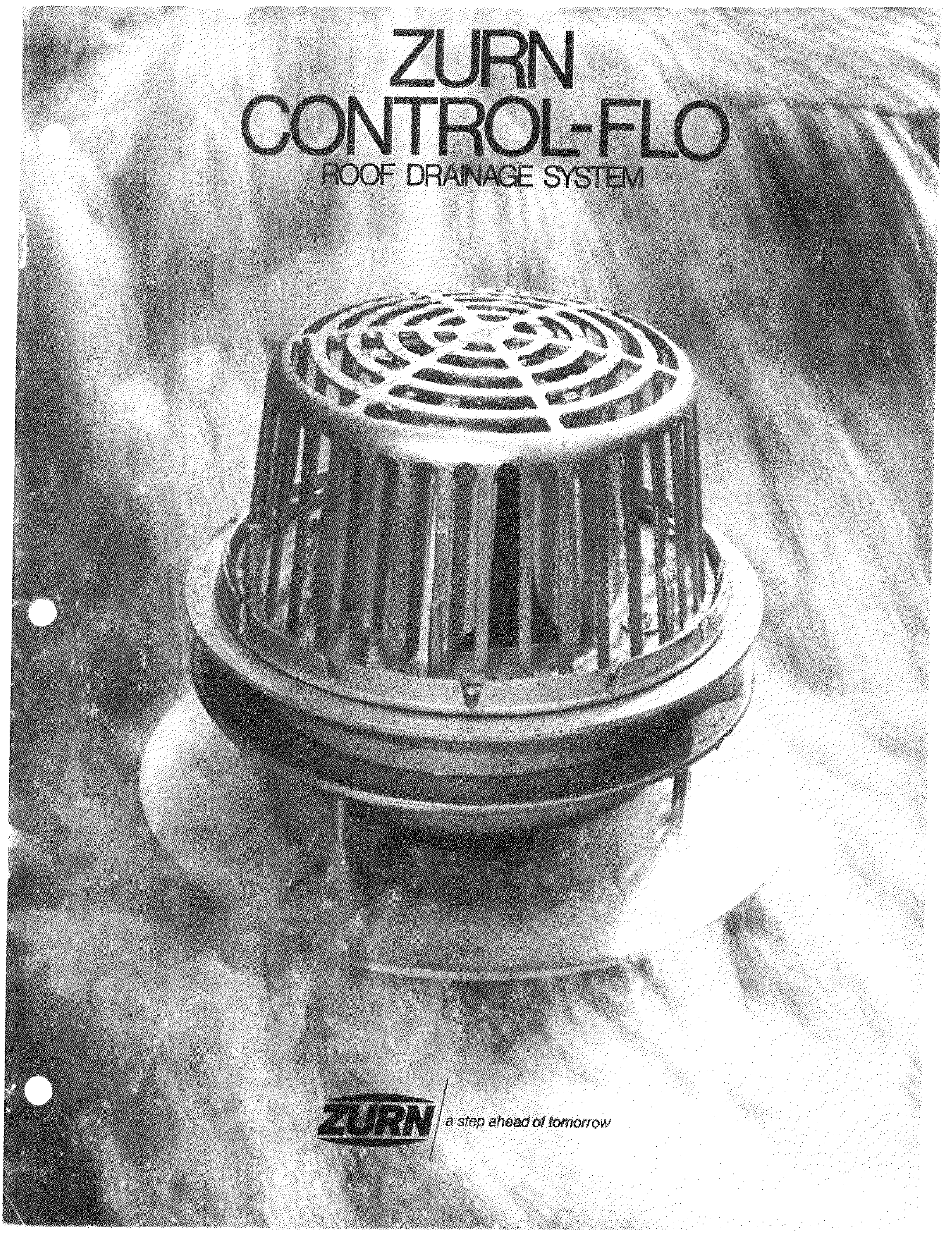
SUFFIXES

____ -C Underdeck Clamp
____ -DE Deck Extension
____ -DP Top-Set® Deck Plate (Replaces both -C & -R)
____ -DR Top-Set® Drain Riser
____ -DX Dex-o-Tex Flange
____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
____ -EA Adjustable Extension Assembly 2-1/8 [54] thru 3-1/2 [89]
____ -G Galvanized Cast Iron
____ -R Roof Sump Receiver
____ -SC Secondary Clamping Collar
____ -TC Neo-Loc Test Cap Gasket (2-4 [51-102] NL Bottom Outlet Only)
____ -VP Vandal Proof Secured Top
____ -XJ Vertical Expansion Joint (See Z190)
____ -10 6 [152] High Parabolic Weir for Sloped Roof (Z or ZA)
____ -90 90° Threaded Side Outlet Body

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. H **DATE: 08/17/12** **C.N. NO. 124666**
DWG. NO. 58816 **PRODUCT NO. Z105**

ZURN
CONTROL-FLO
ROOF DRAINAGE SYSTEM



ZURN a step ahead of tomorrow

ZURN Control-Flo…Today's Successful Answer to More

THE ZURN "CONTROL-FLO CONCEPT"

Originally, Zurn introduced the scientifically-advanced "Control-Flo" drainage principle for dead-level roofs. Today, after thousands of successful applications in modern, large dead-level roof areas, Zurn engineers have adapted the comprehensive "Control-Flo" data to **sloped roof** areas.

WHAT IS "CONTROL-FLO"?

It is an advanced method of removing rain water off dead-level or sloped roofs. As contrasted with conventional drainage practices, which attempt to drain off storm water as quickly as it falls on the roof's surface, "Control-Flo" drains the roof at a controlled rate. Excess water accumulates on the roof under controlled conditions . . . then drains off at a lower rate after a storm abates.

CUTS DRAINAGE COSTS

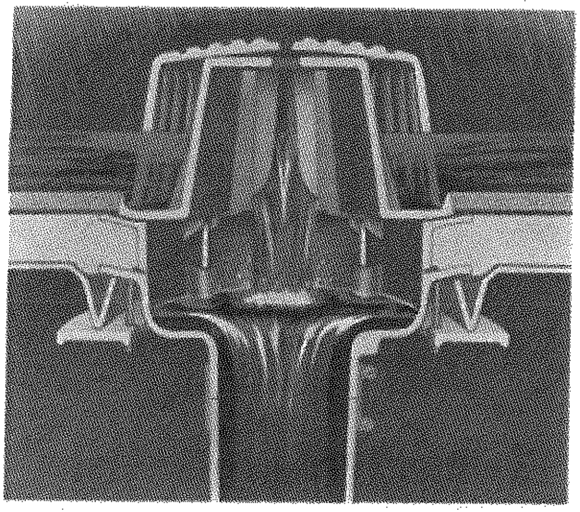
Fewer roof drains, smaller diameter piping, smaller sewer sizes, and lower installation costs are possible with a "Control-Flo" drainage system because roof areas are utilized as temporary storage reservoirs.

REDUCES PROBABILITY OF STORM DAMAGE

Lightens load on combination sewers by reducing rate of water drain from roof tops during severe storms thereby reducing probability of flooded sewers, and consequent backflow into basements and other low areas.

THANKS TO EXCLUSIVE ZURN "AQUA-WEIR" ACTION

Key to successful "Control-Flo" drainage is a unique, scientifically-designed weir containing accurately calibrated notches with sides formed by parabolic curves which provide flow rates directly proportional to the head. Shape and size of notches are based on predetermined flow rates, and all factors involved in roof drainage to assure permanent regulation of drainage flow rates for specific geographic locations and rainfall intensities.

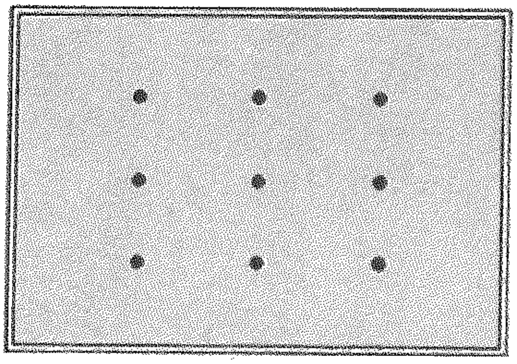


3rd Floor
30-80 Thomson Ave. Long Island City, New York
2 11/01

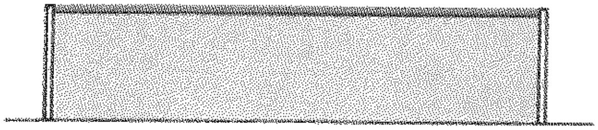
DEFINITION

DEAD LEVEL ROOFS

A dead-level roof for purposes of applying the Zurn "Control-Flo" drainage principle is one which has been designed for zero slope across its entire surface.



(Plan View)

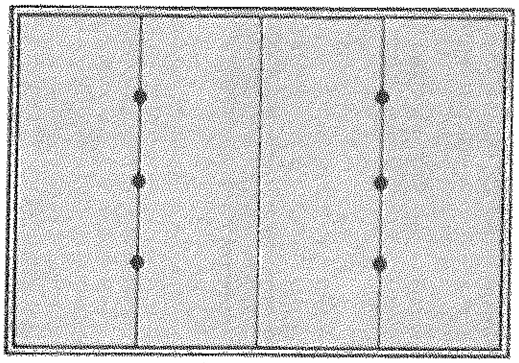


(Section View)

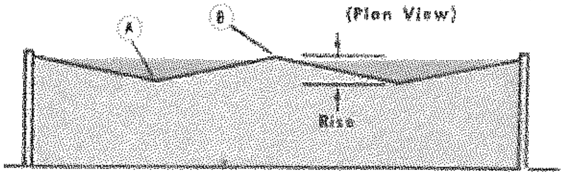
SLOPED ROOFS

A sloped roof is one designed commonly with a shallow slope. The Zurn "Control-Flo" drainage system can be applied to any slope which results in a total rise up to 6" . . . and data can be calculated for rises exceeding 6".

The total rise of a roof as calculated for "Control-Flo" application is defined as the vertical increase in height in inches, from the low point or valley of a sloping roof (A) to the top of the sloping section (B). (Example: a roof that slopes ⅛" per foot having a 24-foot span would have a rise of 24 x ⅛ or 3").



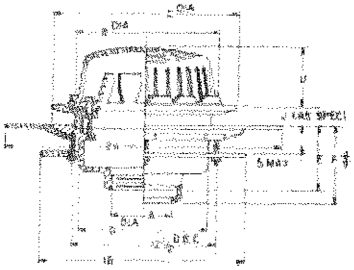
(Plan View)

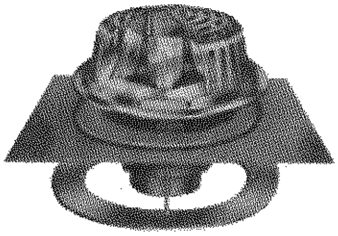


(Section View)

Economical Roof Drainage Installations

SPECIFICATION DATA

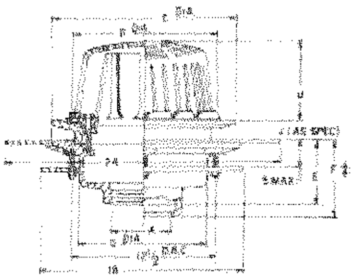


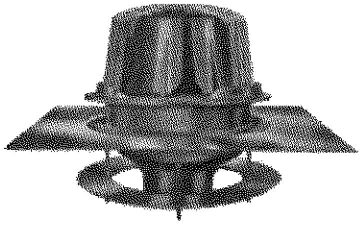


‡ Caulk And No-Hub

A Pipe Size In.	App. Wt. Lbs.	DIMENSIONS IN INCHES								Open Area Sq. In.
		B	C	D	E	F‡	J Min.	J Max.	U	
2	85	12½	15	11½	3¾	5¼	1	4	4½	112
3	87	12½	15	11½	3¾	5¼	1	4	4½	112
4	88	12½	15	11½	3¾	5¼	1	4	4½	112

ENGINEERING SPECIFICATION: ZURN Z-105ERC "Control-Flo" roof drain, for Dead-Level roof construction, Dura-Coated cast iron body with extension, roof sump receiver and underdeck clamp. "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates.





‡ Caulk And No-Hub

A Pipe Size In.	App. Wt. Lbs.	DIMENSIONS IN INCHES								Open Area Sq. In.
		B	C	D	E	F‡	J Min.	J Max.	U	
2	90	12½	15	11½	3¾	5¼	1	4	6¾	148
3	92	12½	15	11½	3¾	5¼	1	4	6¾	148
4	93	12½	15	11½	3¾	5¼	1	4	6¾	148

ENGINEERING SPECIFICATION: ZURN Z-105-10ERC "Control-Flo" roof drain, for Sloped roof construction, Dura-Coated cast iron body with extension, roof sump receiver and underdeck clamp. "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and aluminum dome. All data shall be verified proportional to flow rates.

ROOF DESIGN RECOMMENDATIONS

Basic roofing design should incorporate protection that will prevent roof overloading by installing adequate overflow scuppers in parapet walls.

GENERAL RECOMMENDATIONS

On dead-level roofs, our general recommendations are to design for a 3" depth for the 10-year storm. In this case, even the 100-year storm will not result in a maximum depth of 6". A 6" depth represents a roof load of 31.2 pounds per square foot which approximates the 30 pound per square foot factor commonly used in roof design.

NOTE: A more conservative practice used by a few engineers in the past, depending upon other design considerations, has been to design for the 3" depth with the 25, 50, or even 100-year storm . . . and to also lower scuppers to 5" or 4" above roof level. In either case, the final determination rests with the engineering personnel responsible for this phase of the design.

GENERAL RECOMMENDATIONS

On sloping roofs, we again recommend a 3" design depth for the 10-year storm, but by 3" we refer to an equivalent depth of 3". An equivalent depth is the depth of water attained at the drains that results in the same roof stresses as those realized on a dead-level roof. In all cases this equivalent depth is almost equal to that attained by using the same notch area rating for the different rises to 6". With the same depth of water at the drain the roof stresses will decrease with increasing total rise. Therefore, it would be possible to have a depth in excess of 6" at the drain on a sloping roof without exceeding stresses normally encountered in a 6" depth on a dead-level roof. However, it is recommended that scuppers be placed to limit the maximum water depth on any roof to 6" to prevent the over flow of the weirs on the drains and consequent overloading of drain piping.

NOTE: An equivalent depth is that depth of water attained at the drains at the lowest line or valley of the roof with all other conditions such as notch area and rainfall intensity being equal. For Galveston, Texas a notch area of 1800 square feet results in a 3" depth on a **dead-level** roof for a 10-year storm. For the same notch area and a 10-year storm, equivalent depths for a 2", 4", and 6" rise respectively on a **sloped roof** would be 3.4", 3.8", and 4.6". Roof stresses will be approximately equal in all cases.

ZURN Control-Flo Drain Selection is Quick and Easy

The exclusive Zurn "Selecta-Drain" Chart (pages 6, 7, 8, 9) tabulates recommended selection data for several hundred localities in the United States. It constitutes your best assurance of sure, safe, economical application of Zurn "Control-Flo" systems for your specific geographical area. If the "Selecta-Drain" Chart does not suit your specific design criteria, write directly to Zurn Industries, Inc., Field Service Engineering, Hydromechanics Div., Erie, Pa. for additional data for your locality. Listed below is additional information pertinent to proper engineering of the "Control-Flo" System.

ROOF USED AS TEMPORARY RETENTION

The key to economical "Control-Flo" drainage is the utilization of large roof areas to temporarily store the maximum amount of water without overloading average roofs or creating excessive draindown time during periods of heavy rainfall. The data shown in the "Selecta-Drain" Chart, which takes all these factors into consideration, represents only one point on a series of curves prepared for each locality and was determined after careful study and research as imparting optimum economy in design.

ROOF LOADING AND RUN-OFF RATES

The values for notch areas selected from the design curves were based on a 3" head on a dead-level roof for the 10-year storm. In low rainfall localities the area per notch was limited to 25,000 square feet to keep the draindown time within reasonable limits. The same area for each respective locality was used for the various roof rises for sloping roofs. Extensive studies show that stresses due to water load on a sloping roof for any fixed set of conditions are very nearly the same as those on a dead-level roof. A sloping roof tends to concentrate more water in the valleys and increase the water depth at this point. The greater depth around the drain leads to a faster run-off rate, particularly a faster early run-off rate. As a result, the total volume of water stored on the roof is less, and the total load on the sloping roof is less. By using the same area on the sloping roof as on the dead-level roof the increase in roof stresses due to increased water depth in the valleys is offset by the decrease in the total load due to less water stored. The net result is the maximum roof stresses are approximately the same for any single span, rise and fixed set of conditions. A fixed set of conditions would be the same notch area, the same frequency storm, and the same locality.

NOTCH FLOW AND WATER DEPTH

The flow through each notch of the "Control-Flo" weir is 10 GPM per inch of head. To compute the depth of water in inches at the drain, obtain the total flow for any fixed set of conditions and locale from the "Selecta-Drain" Chart and divide by 10. For example, for Anniston, Alabama the discharge rates are 30, 35, 39 and 43 GPM for the 10, 25, 50 and 100-year storms respectively on a dead-level roof. Since the possibility of exceeding 4.3" of water exists only once every 100 years, the drains can be sized to carry 43 GPM per notch and scuppers can be set at a height of 4.3" above the roof to prevent overloading the drains if a worse than 100-year storm occurs. On a similar basis, drain pipe sizes and scupper heights can be selected for various roof slopes and storm frequencies.

ADDITIONAL NOTCH RATINGS

The "Selecta-Drain" Chart along with Tables I and II enables the engineer to select "Control-Flo" Drains and drain pipe sizes for most applications. The "Selecta-Drain" Chart and Tables I and II are computed for a proportional flow weir that is sized to give a flow of 10 GPM per inch of head. However, this data can be applied to other sizes of proportional flow weirs by simple multiplication or division. For example, if a similar weir that is sized to give a flow of 5 GPM per inch is substituted for the 10 GPM per inch weir, the notch area and discharge in GPM would be divided by two, and this opening would be given a ½ notch area rating.

PROPER DRAIN LOCATION

The following good design practice is recommended for selecting the proper number of "Control-Flo" drains for a given area. **On dead-level roofs,** drains should be located no further than 50 feet from each edge of the roof to assure good run-off regardless of wind direction. Weir should be flush with roof surface, not recessed. **On sloping roofs,** drains should be located in the valleys at a distance no greater than 50 feet from each end of the valleys. Weir should be flush with the valley roof surface, not recessed. **On large roof areas**, drains should not be spaced at a distance greater than 200 feet.

. . Saves Specification Time, Assures Proper Application

QUICK EASY SELECTION

Using the "Selecta-Drain" Chart (pages 6, 7, 8, 9) in combination with the steps and examples appearing below, should save you countless hours in engineering specification time. This vast compilation of data is related to the proper selection of drains for over 200 cities. If a specific city does not appear in this tabulation, choose the city nearest your area and select the proper drain using these factors.

3 EASY STEPS

AND 3 TYPICAL EXAMPLES FOR APPLICATION OF SURE, SCIENTIFIC CONTROL OF DRAINAGE FROM DEAD-LEVEL AND SLOPING ROOFS WITH THE ZURN CONCEPT

WASHINGTON, D. C.	DEAD-LEVEL ROOF	4 INCH RISE	6 INCH RISE
1 Determine total roof area or individual areas when roof is divided by expansion joints or peaks in the case of sloping roof.	Roof Area: 192 ft. x 500 ft. = 96,000 sq. ft.	3 Individual Roof Areas: 64 ft. x 500 ft. = 32,000 sq. ft. Valleys 500 ft. long 3 x 32,000 = 96,000 sq. ft.	2 Individual Roof Areas: 98 ft. x 500 ft. = 48,000 sq. ft. Valleys 500 ft. long 2 x 48,000 = 96,000 sq. ft.
2 Divide roof area or individual areas by Zurn Notch Area Rating to obtain the total number of notches required.	Zurn Notch Area Rating for Washington, D. C. = 13,300 from "Selecta-Drain" Chart Total Notches Required = **96,000 sq. ft.** 13,300 sq. ft. notch area = 7.2 notches—USE 8 PER AREA	Zurn Notch Area Rating for Washington, D. C. = 13,300 from "Selecta-Drain" Chart Total Notches Required = **32,000 sq. ft.** 13,300 sq. ft. notch area = 2.4 notches—USE 3 PER AREA	Zurn Notch Area Rating for Washington, D. C. = 13,300 from "Selecta-Drain" Chart Total Notches Required = **48,000 sq. ft.** 13,300 sq. ft. notch area = 3.6 notches—USE 4 PER AREA
3 Determine total number of drains required by not exceeding maximum spacing dimensions in the preceding instructions. Divide total number of notches required to determine the number of notches per drain. Note flow rate for the 100-year storm and divide by 10 to determine maximum water depth at drain and use this dimension to determine scupper height. Maximum scupper height to be used is 6". Use this flow rate to size leaders and drain lines.	6 drains required. 3 along each side within 50 ft. of the side with a spacing of 50 ft.—200 ft.—200 ft.—50 ft. Two drains must have two notches for a total of eight notches. Locate at diagonally opposite corners. Flow rate for the 100-year storm is 44 GPM. Maximum water depth and scupper height equals 4.4" Size leaders from single notch drains for 44 GPM and leaders from double notch drains for 88 GPM.	3 drains per area required located in the valleys 50 ft. from each end with one in the middle. All drains will have one notch. Flow rate for the 100-year storm is 59 GPM maximum. Water depth and scupper height equals 5.9". Size leaders for 59 GPM.	3 drains per area required located in the valleys 50 ft. from each end with one in the middle. 4 notches are required therefore one drain must have two notches. Locate this one in the middle. Flow rate for the 100-year storm is 64 GPM. Locate scuppers at 6" and use 60 GPM as maximum flow rate and 6" for maximum depth. The probability of water flowing out scuppers is now less than once every 50 years instead of every 100 years. Size leaders for 60 GPM.

SPECIAL CONSIDERATIONS

The 3" design water level for the 10-year storm represents a roof load of approximately 15 lbs. per sq. ft. This is only half the usual minimum design roof load rating of 30 lbs. per sq. ft. and so presents no problem from that aspect. However, since it is desirable to contain the design depth of water on the roof and to prevent spillage over the roof in high wind conditions, it is recommended that any roof construction, parapets, flashing and curbs should be high enough to prevent flooding over them.

Another special case applies to water cooled roofs and here the "Control-Flo" principle can still be used. An adjustable collar on the drain body will retain a pool of water 0 to 3" deep on the roof and a 3" high "Control-Flo" Weir on top of the adjustable collar will control storm water falling on this pool. This restricts the maximum depth on the roof to 6" and scuppers should be located at this height. Since the weirs are only 3" high on this drain, they should be selected for a 3" head based on the 100-year frequency storm.

Select The Proper Vertical Drain Leaders

ROOF DRAINAGE DATA

While the flow rate for any design condition can be easily computed from the data contained on the preceding pages, the tabulations shown below (and on the opposite page) can be used to simplify selection of drain line sizes.

TABLE I—Suggested Relation of Drain Outlet and Vertical Leader Size to Zurn Control-Flo Roof Drains (Based on National Plumbing Code ASA-A40.8 Data on Vertical Leaders).

No. of Notches In Drain	Max. Flow per Notch in GPM			
	Pipe Size			
	2	3	4	5
1	30	60*	—	—
2	15	46	60*	—
3	—	31	60*	—
4	—	23	48	60*
5	—	18	38	60*
6	—	15	32	60*

*Maximum flow obtainable from 1 notch.

Table I illustrates gallons per minute from each notch of the six Z-105-10 drains that can be carried off by various leader sizes. Once the drains are selected for a given roof per this manual, simply read the GPM flow per notch from the chart, refer to Table I and select the smallest drain line that will accommodate that flow. Drain pipes should be sized for the 100-year storm unless scuppers are located at a height that will not permit a depth of water to accumulate on the roof that is predicted for the 100-year storm. For example, if your installation is in Anniston, Alabama, on a dead-level roof the data for the 100-year storm shows a discharge of 43 GPM per notch. For this application scuppers would be located at a 4.3" height. Using Table I a 3" drain pipe or vertical leader would be used for a drain with 1- or 2-notches. A 4" leader would be used with a 3- or 4-notch drain and a 5" leader with a 5- or 6-notch drain. For Anniston, Alabama, and a roof with a 2" rise, the 100-year storm shows a flow rate of 50 GPM. In this case scuppers should be located at a height of 5.0". A 3" leader would be used with a single notch drain, a 4" leader with a 2- and 3-notch drain, and a 5" leader with a 4-, 5- or 6-notch drain. The same type of selection would be made for a roof with a 4" rise. For Anniston, Alabama, the flow rate for the 100-year storm would be located at a height of 5.9".

For the roof with a 6" rise, the data for Anniston, Alabama, as well as several other localities, for the 100-year storm, shows a flow rate greater than 60 GPM. In these cases the scuppers will be located at the maximum recommended height of 6" and the vertical leaders will be sized for a maximum flow rate of 60 GPM per notch.

In the few cases where the data shows a flow rate in excess of 60 GPM for the 100-year storm, and if all drains and drain lines are sized according to recommendations, the only consequence will be a brief flow through the scuppers more often than once every 100 years.

EXAMPLE

		DEAD-LEVEL				2 INCH RISE				4 INCH RISE				6 INCH RISE			
LOCATION	Notch Area Rating	Discharge G.P.M. Draindown Time Hrs.				Discharge G.P.M. Draindown Time Hrs.				Discharge G.P.M. Draindown Time Hrs.				Discharge G.P.M. Draindown Time Hrs.			
		10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.
La Crosse, Wis.	25,000	28 42	31 45	35 48	39 51	35 38	40 43	43 45	46 47	43 26	48 30	52 32	56 35	51 21	56 24	59 25	62 26
Madison, Wis.	25,000	29 43	36 49	40 52	44 54	37 40	43 45	47 47	50 50	46 28	51 32	55 34	60 38	54 23	60 25	62 26	65 28
Milwaukee, Wis.	25,000	26 40	30 44	35 48	39 51	34 38	38 41	42 43	45 46	41 25	45 28	49 31	53 33	49 20	54 23	57 24	60 25
Cheyenne, Wyo.	25,000	17 32	19 33	21 35	23 37	24 27	27 31	30 34	33 37	32 20	36 23	38 24	40 25	39 16	44 18	47 19	50 21

Select Proper Horizontal Storm Drain Piping

Table II is similar to Table I but is used in determining the size of the building storm drain. Use the same flow rate established for sizing the vertical leaders to size the storm drain. Count the total number of notches feeding any one drain or branch to the drain. Enter the Table at the total number of notches and under the proper storm drain slope select the column that gives a flow rate equal to or larger than the established notch flow rate. Read the storm drain size required at the top of this column.

TABLE II—Suggested Relation of Horizontal Storm Drain Size to Zurn Control-Flo Roof Drainage
(Based on National Plumbing Code ASA-A40.8 Data on Horizontal Storm Drains w/⅛", ¼", and ½" per foot slope)

Total No. of Notches Discharging to Storm Drain	MAX. FLOW PER NOTCH IN GPM								MAX. FLOW PER NOTCH IN GPM								MAX. FLOW PER NOTCH IN GPM							
	Storm Drain Size ⅛" per ft. slope								Storm Drain Size ¼" per ft. slope								Storm Drain Size ½" per ft. slope							
	3	4	5	6	8	10	12	15	3	4	5	6	8	10	12	15	3	4	5	6	8	10	12	15
1	34	60*	—	—	—	—	—	—	48	60*	—	—	—	—	—	—	60*	—	—	—	—	—	—	—
2	17	39	60*	—	—	—	—	—	24	55*	60*	—	—	—	—	—	34	60*	—	—	—	—	—	—
3	11	26	46	60*	—	—	—	—	16	37	60*	—	—	—	—	—	22	52*	60*	—	—	—	—	—
4	8	19	34	55	60*	—	—	—	12	28	49	60*	—	—	—	—	17	39	60*	—	—	—	—	—
5	—	15	28	44	60*	—	—	—	—	22	39	60*	—	—	—	—	13	31	60*	—	—	—	—	—
6	—	13	23	37	60*	—	—	—	—	18	33	52*	60*	—	—	—	11	26	46	60*	—	—	—	—
7	—	11	20	32	60*	—	—	—	—	16	28	45	60*	—	—	—	—	22	39	60*	—	—	—	—
8	—	—	17	28	60*	—	—	—	—	14	25	39	60*	—	—	—	—	19	36	55*	60*	—	—	—
9	—	—	15	25	53	60*	—	—	—	12	22	35	60*	—	—	—	—	17	30	49	60*	—	—	—
10	—	—	14	22	48	60*	—	—	—	—	20	31	60*	—	—	—	—	15	27	44	60*	—	—	—
11	—	—	12	20	43	60*	—	—	—	—	18	29	60*	—	—	—	—	14	25	40	60*	—	—	—
12	—	—	—	18	40	60*	—	—	—	—	16	26	56	60*	—	—	—	13	23	37	60*	—	—	—
13	—	—	—	17	37	60*	—	—	—	—	15	24	52*	60*	—	—	—	12	21	34	60*	—	—	—
14	—	—	—	16	34	60*	—	—	—	—	14	22	48	60*	—	—	—	—	19	31	60*	—	—	—
15	—	—	—	15	32	57	60*	—	—	—	13	21	45	60*	—	—	—	—	18	29	60*	—	—	—
16	—	—	—	14	30	54	60*	—	—	—	—	20	42	60*	—	—	—	—	17	27	60*	—	—	—
17	—	—	—	13	28	51	60*	—	—	—	—	18	40	60*	—	—	—	—	16	26	56	60*	—	—
18	—	—	—	12	26	48	60*	—	—	—	—	17	37	60*	—	—	—	—	15	24	53	60*	—	—
19	—	—	—	—	25	45	60*	—	—	—	—	16	35	60*	—	—	—	—	14	23	50	60*	—	—
20	—	—	—	—	24	43	60*	—	—	—	—	16	34	60*	—	—	—	—	13	22	47	60*	—	—
23	—	—	—	—	20	37	60*	—	—	—	—	14	29	53*	60*	—	—	—	12	19	41	60*	—	—
25	—	—	—	—	19	34	55*	60*	—	—	—	13	27	49	60*	—	—	—	—	17	38	60*	—	—
30	—	—	—	—	16	28	46	60*	—	—	—	—	22	40	60*	—	—	—	—	14	31	57	60*	—
35	—	—	—	—	13	24	39	60*	—	—	—	—	19	35	56	60*	—	—	—	12	27	49	60*	—
40	—	—	—	—	12	21	34	60*	—	—	—	—	17	30	49	60*	—	—	—	—	23	43	60*	—
45	—	—	—	—	—	19	31	55*	—	—	—	—	15	27	44	60*	—	—	—	—	21	38	60*	—
50	—	—	—	—	—	17	27	49*	—	—	—	—	13	24	39	60*	—	—	—	—	19	34	55	60*
55	—	—	—	—	—	15	25	45*	—	—	—	—	—	22	35	60*	—	—	—	—	17	31	50	60*
60	—	—	—	—	—	14	23	41*	—	—	—	—	—	20	32	58*	—	—	—	—	15	28	46	60*
65	—	—	—	—	—	13	21	38*	—	—	—	—	—	18	30	54*	—	—	—	—	14	26	42	60*
70	—	—	—	—	—	12	20	35*	—	—	—	—	—	17	28	50*	—	—	—	—	13	24	39	60*

*Maximum flow obtainable from 1 notch.

SPECIAL CONSIDERATIONS FOR STRUCTURAL SAFETY

RIGID ROOF DESIGN

Normal Practice of Roof Design is Based on 30-lbs. Per Sq. Ft. . . . therefore this factor should definitely be kept in mind as a prime requirement for assuring a structurally sound roof. Otherwise, roof deflection may minimize the advantages of a well-designed roof drainage system.

Failure to recognize the adverse effects of roof deflection, even with conventional roof drainage, may lead to roof failure. With the new concept of "Control-Flo" Roof Drainage, the design condition of deflection is equally important. If severe deflection is permitted, rain water will simply seek low areas, thus intensifying the degree of deflection. Thus it is extremely important that flat roofs are designed in accordance with normal load factors so that deflection will be slight enough in any bay to prevent progressive deflection which could cause water depths to load the roof beyond its design limits.

SCUPPERS AND OVERFLOW DRAINS

Roofing members and understructures, weakened by seepage and rot resulting from improper drainage and roof construction can give away under the weight of rapidly accumulated water during flash storms. Thus, it is recommended, and often required by building codes, to install scuppers and overflow drains in parapet-type roofs. Properly selected and sized scuppers and overflow drains are vital to a well-engineered drainage system to prevent excessive loading, erosion, seepage and rotting.

APPENDIX

B

- FIRE UNDERWRITERS SURVEY – FIRE FLOW CALCULATION FOR BUILDING AND ADDITION
- WATER DEMAND CALCULATION
- UPDATED BOUNDARY CONDITION

Fire Flow Design Sheet (FUS)
6401 Renaud Road
City of Ottawa
WSP Project No. 221-09207-00
Date: 19/10/2022

Existing School and Addition
Fire Flow Requirements Based on Fire Underwriters Survey (FUS) 2020

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 **Type V** Wood Frame Construction
0.8	for **Type IV-A** Mass Timber Construction
0.9	for **Type IV-B** Mass Timber Construction
1.0	for **Type IV-C** Mass Timber Construction
1.5	for **Type IV-D** Mass Timber Construction
1.0	for **Type III** Ordinary Construction
0.8	for **Type II** Noncombustible Construction
0.6	for **Type I** Fire resistive Construction

A =2-b) The single largest Floor Area plus 25% of each of the two immediately adjoining floors

A = 9910 m^2
C = 0.8
F = 17520.6 L/min

rounded off to 18,000 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 18,000 = 15,300 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 15,300 = -6,120 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	0%

Side 1	60	0%	north side
Side 2	35	5%	east side
Side 3	40	5%	south side
Side 4	45	5%	west side
		15%	(Total shall not exceed 75%)

Increase due to separation 15% x 15,300 = 2,295 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	11,000	L/min	(Rounded to nearest 1000 L/min)
or	**183**	**L/sec**	
or	2,906	gpm (us)	
or	2,420	gpm (uk)	

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 2020
by Fire Underwriters Survey

Fire Flow Design Sheet (FUS)
6401 Renaud Road
City of Ottawa
WSP Project No. 221-09207-00
Date: 30/09/2022

Existing School
Fire Flow Requirements Based on Fire Underwriters Survey (FUS) 2020

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 **Type V** Wood Frame Construction
0.8 for **Type IV-A** Mass Timber Construction
0.9 for **Type IV-B** Mass Timber Construction
1.0 for **Type IV-C** Mass Timber Construction
1.5 for **Type IV-D** Mass Timber Construction
1.0 for **Type III** Ordinary Construction
0.8 for **Type II** Noncombustible Construction
0.6 for **Type I** Fire resistive Construction
A =2-b) The single largest Floor Area plus 25% of each of the two immediately adjoining floors

A = 8586 m^2
C = 0.8
F = 16308.5 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	0%

Side 1	110	0%	north side
Side 2	160	0%	east side
Side 3	68	0%	south side
Side 4	83	0%	west side
		0%	(Total shall not exceed 75%)

Increase due to separation 0% x 13,600 = 0 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 8,000 L/min (Rounded to nearest 1000 L/min)
or **133 L/sec**
or 2,113 gpm (us)
or 1,760 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 2020
by Fire Underwriters Survey

Water Demand Calculation Sheet

Project:	**6401 Renaud Road**	**Date:**	**19/10/2022**
Location:	**City of Ottawa**	**Design:**	**VT**
WSP Project No.	**221-09207-00**	**Page:**	**1 of 1**

Proposed Buildings	Residential Units			School per Student	Non-Residential			Average Daily Demand (l/s)			Maximum Daily Demand (l/s)			Maximum Hourly Demand (l/s)			Fire Demand (l/min)
	SF	APT	ST		Industrial (ha)	Institutional (ha)	Commercial (ha)	Res.	Non-Res.	Total	Res.	Non-Res.	Total	Res.	Non-Res.	Total	
Existing School									0.00	0.00		0.00	0.00		0.00	0.00	8,000
Existing and Addition				1340					3.26	3.26		4.89	4.89		8.79	8.79	11,000

Population Densities

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

Average Daily Demand

Residential	280	l/cap/day
Industrial	35000	l/ha/day
Institutional	28000	l/ha/day
Commercial	28000	l/ha/day
School	70	l/day/student

Assume: 8 hours of operating day

Maximum Daily Demand

Residential	2.5	x avg. day
Industrial	1.5	x avg. day
Institutional	1.5	x avg. day
Commercial	1.5	x avg. day

Maximum Hourly Demand

Residential	2.2	x max. day
Industrial	1.8	x max. day
Institutional	1.8	x max. day
Commercial	1.8	x max. day

APPENDIX

C

- STORM DRAINAGE AREA PLAN C06
- ROOF PLAN
- FLOW CONTROL ROOF DRAINAGE DECLARATION (TO BE PROVIDED BY MECHANICAL AND STRUCTURAL ENGINEER)
- STORMWATER MANAGEMENT CALCULATIONS
- DWG C03 – GRADING PLAN
- DWG C04 - SERVICING PLAN

College Catholique Mer Bleue Addition
6401 Renaud Road
Project: 221-09207-00
Date: October 2022

TABLE 3 - Proposed Roof Drains

Allowable Release Rate

Total Roof Area = 0.106 Ha
Total Roof Ponding Area = 846.384 m²
Ponding Depth = 0.150 m
The flow rate through each Roof Drain will be = 30.000 gpm
1.893 L/s
Number of Roof Drains = 3
Total flow rate = 5.67 L/s

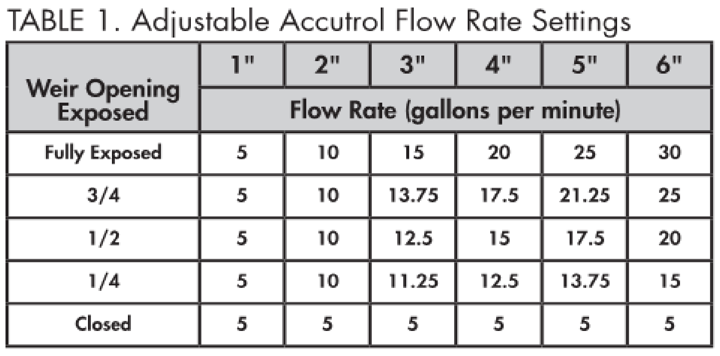


TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	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	5	5	5	5	5

Post Dev run-off Coefficient "C"

			2 & 5 Year Event		100 Year Event	
Area	**Surface**	**Ha**	**"C"**	**C_{avg}**	**"C" x 1.25**	**$C_{100\ avg}$**
Total	Asphalt		0.90	**0.90**	0.99	**0.99**
0.106	Roof	0.106	0.90		0.99	
	Grass		0.25		0.31	

*Areas are approximate based on Architectural site 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

0.106 **= Area(ha)**
0.90 **= C**

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Runoff To Be Stored (L/s)	Storage Req'd (m^3)	Storage Available* (m^3)
5 YEAR							
	10	104.19	27.58	5.67	21.91	13.15	42.32
	20	**70.25**	**18.60**	**5.67**	**12.93**	**15.51**	**42.32**
	30	53.93	14.28	5.67	8.61	15.49	42.32
	40	44.18	11.70	5.67	6.03	14.46	42.32
	50	37.65	9.97	5.67	4.30	12.89	42.32

QUANTITY STORAGE REQUIREMENTS - 100 Year

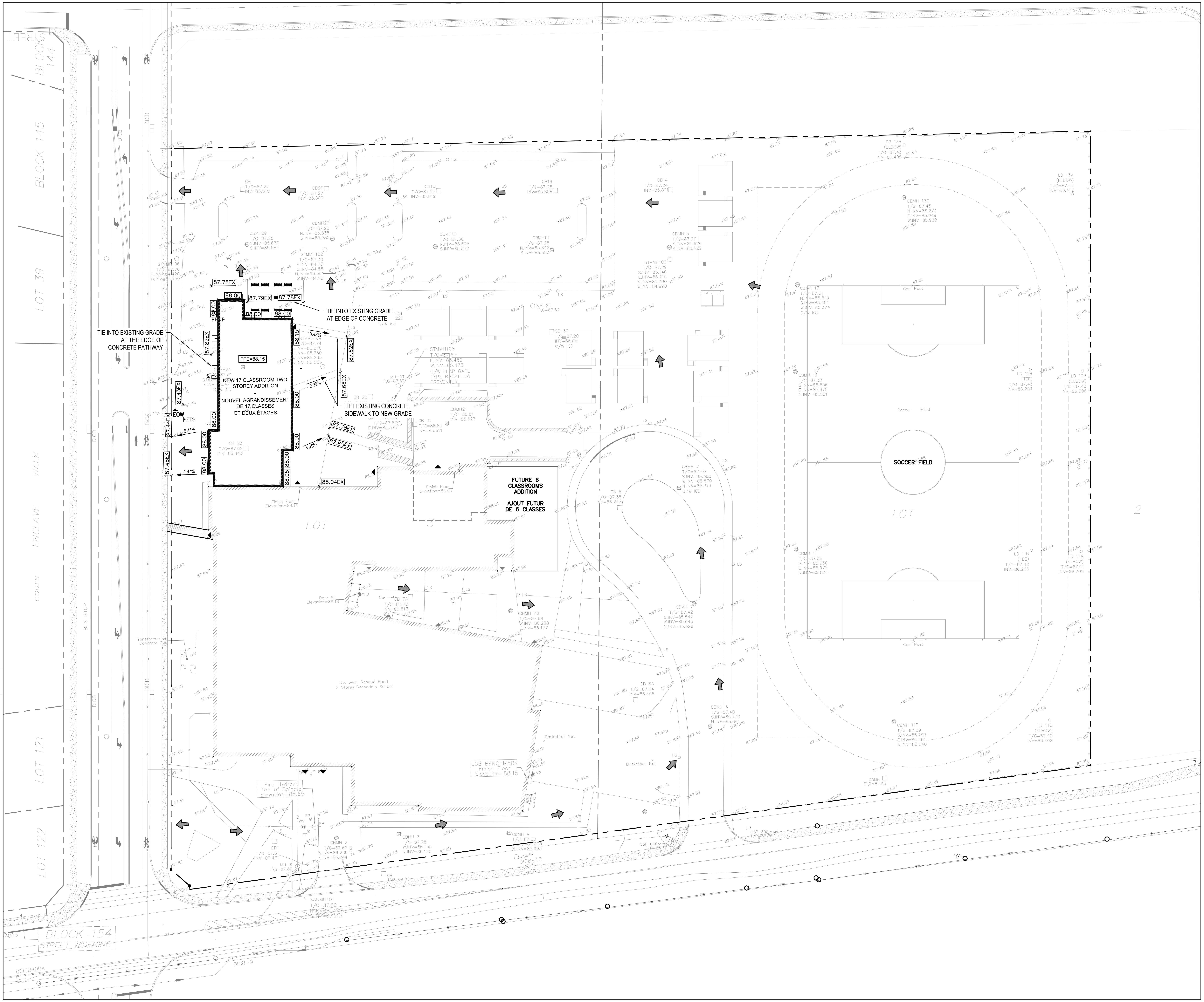
0.106 **= Area(ha)**
0.99 **= *C**

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Runoff To Be Stored (L/s)	Storage Req'd (m^3)	Storage Available (m^3)
100 YEAR							
	10	178.56	51.99	5.67	46.32	27.79	42.32
	20	119.95	34.93	5.67	29.26	35.11	42.32
	30	91.87	26.75	5.67	21.08	37.94	42.32
	40	**75.15**	**21.88**	**5.67**	**16.21**	**38.91**	**42.32**
	50	63.95	18.62	5.67	12.95	38.86	42.32
	60	55.89	16.28	5.67	10.61	38.18	42.32
	70	49.79	14.50	5.67	8.83	37.08	42.32

*Storage available is calculated using roof ponding area mulitplied by the maximum ponding depth, and divided by 3 for a conical pond.
**Refer to roof drains area and storage volume table on DWG C13 for details

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



Écoles catholiques Centre-Est

1		22/10/21	ISSUED FOR SPA
ISSUE NO.	REV. NO.	DATE YY/MM/DD	ISSUE

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D. B. YANG
100230568
2022-10-21

EDWARD J. CUHACI
& ASSOCIATES ARCHITECTS Inc.
171 Slater St, Suite 100, Ottawa, Ontario, K1P 5H7
Fax: (613) 236-1944 Telephone: (613) 236-7135 E-mail: info@cuhaci.com

PROJECT TITLE/TITRE DU PROJET
COLLÈGE CATHOLIQUE
MER BLEUE - ADDITION
6401 RENAUD RD, OTTAWA, ON, K1W 0H8

CONSEIL DES ÉCOLES CATHOLIQUES
DU CENTRE-EST
4000, RUE LABELLE, OTTAWA, ON K1J 1A1

DRAWING TITLE/TITRE DU DESSIN

GRADING PLAN

SCALE ÉCHELLE 1:500
PROJ. No 221-09207-00
ISSUE No 1
REV. No 0
DRAWN BY DESSINÉ PAR J.T
CHECKED BY VÉRIFIÉ PAR D.Y.
DATE 2022-10-21
DRAWING/DESSIN **C03**
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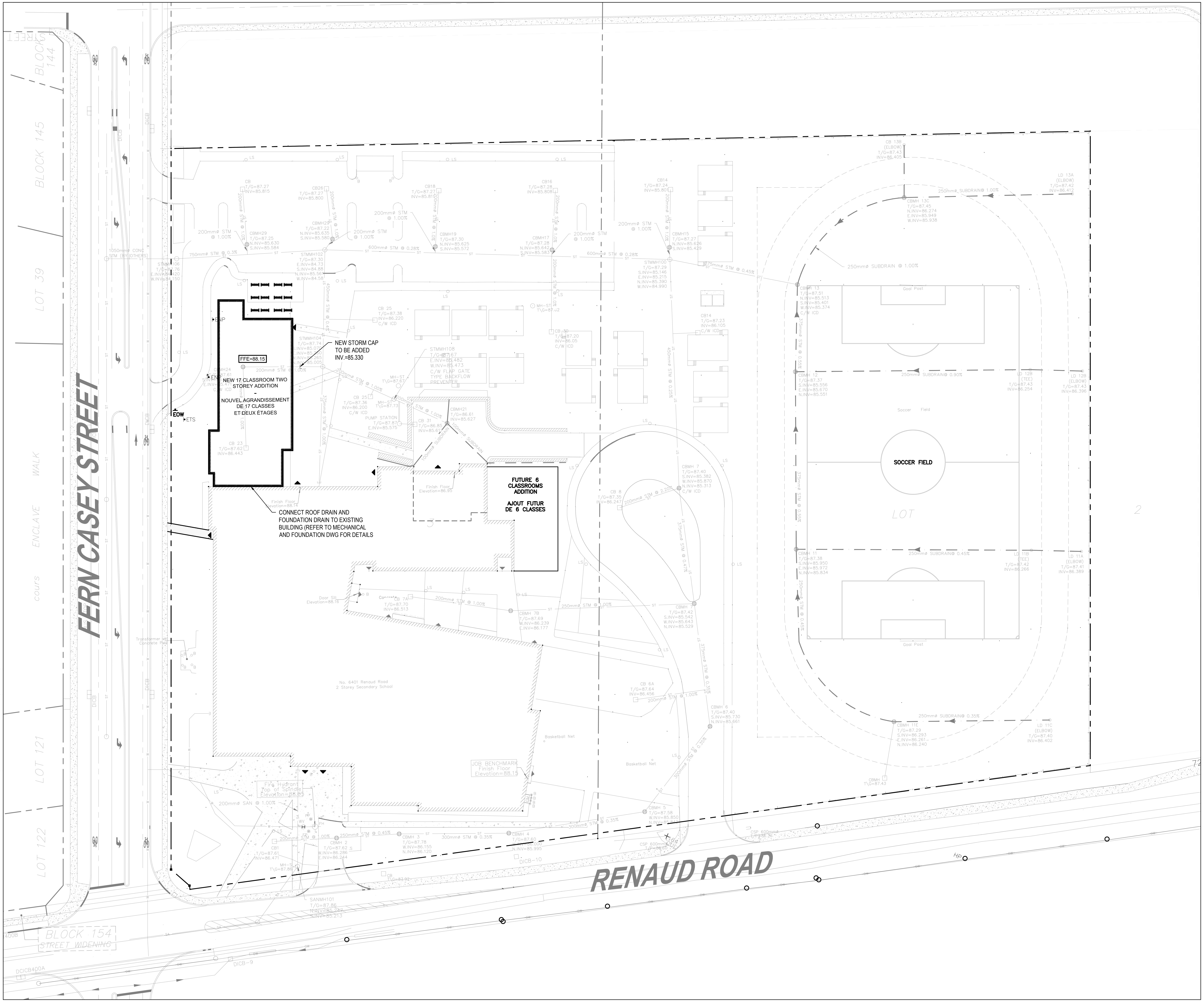

Écoles catholiques Centre-Est

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D. B. YANG
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2022-10-21

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COLLÈGE CATHOLIQUE
MER BLEUE - ADDITION
6401 RENAUD RD, OTTAWA, ON, K1W 0H8

CONSEIL DES ÉCOLES CATHOLIQUES
DU CENTRE-EST
4000, RUE LABELLE, OTTAWA, ON K1J 1A1

DRAWING TITLE/TITRE DU DESSIN

SERVICING PLAN

SCALE ÉCHELLE 1:500	PROJ. No 221-09207-00	ISSUE No 1	REV. No 0	
DRAWN BY DESSINÉ PAR J.T	DRAWING/DESSIN			
CHECKED BY VÉRIFIÉ PAR D.Y.	**C04**			
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Écoles catholiques
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N

LICENSED PROFESSIONAL ENGINEER
D. B. YANG
100230568
2022-10-21
PROVINCE OF ONTARIO

EDWARD J. CUHACI
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6401 RENAUD RD, OTTAWA, ON, K1W 0H8

CONSEIL DES ÉCOLES CATHOLIQUES
DU CENTRE-EST
4000, RUE LABELLE, OTTAWA, ON K1J 1A1

DRAWING TITLE/TITRE DU DESSIN

DRAINAGE AREA PLAN

SCALE ÉCHELLE	1:500	PROJ. No 221-09207-00	ISSUE No 1	REV. No 0
DRAWN BY DESSINÉ PAR	J.T	DRAWING/DESSIN		
CHECKED BY VÉRIFIÉ PAR	D.Y.	**C06**		
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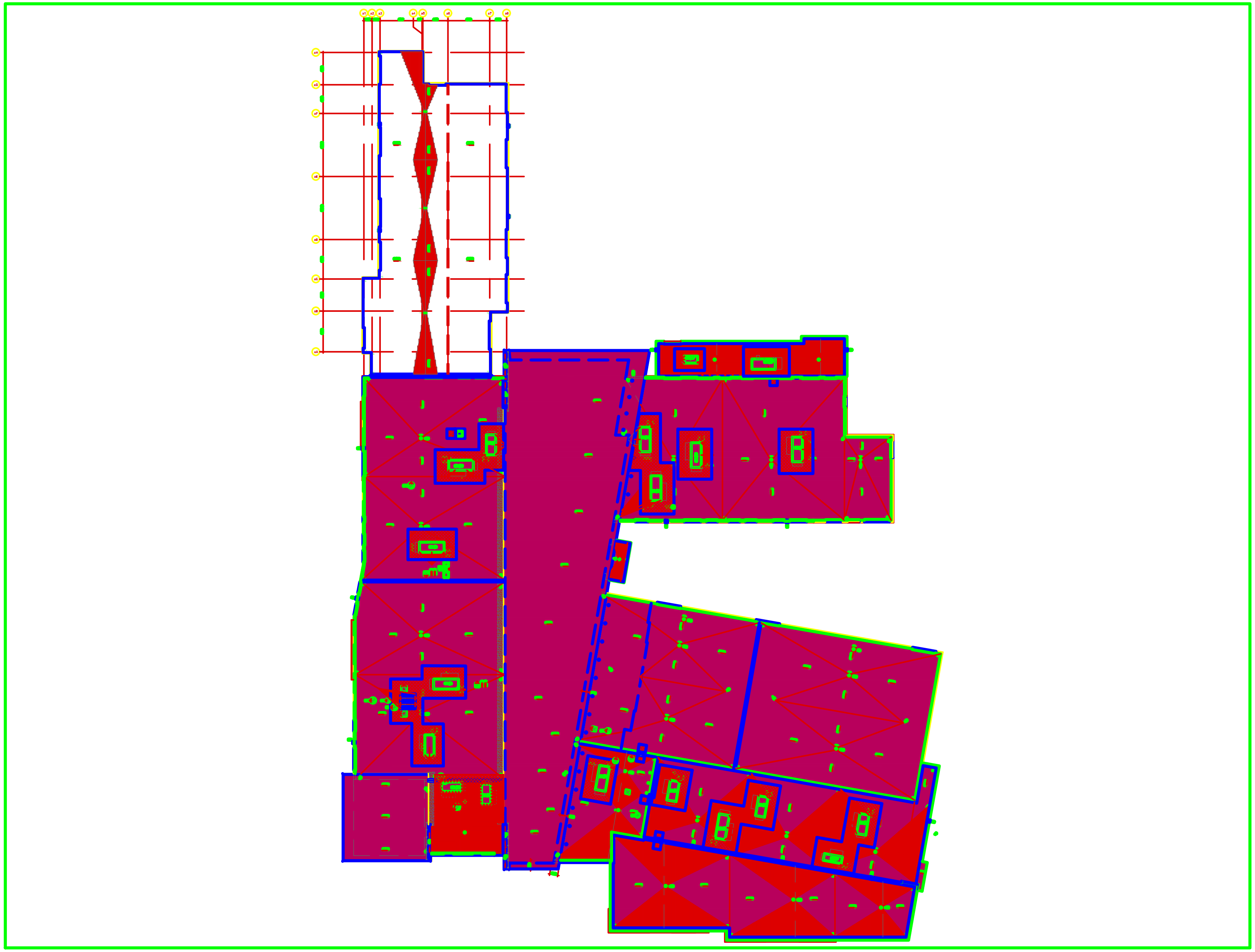
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RD-100

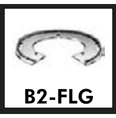
Tag: ____________

Large Capacity Roof Drain

Components:


B2


B2-DM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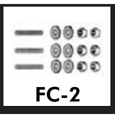

FC-2

SPECIFICATION: Watts Drainage Products RD-100 epoxy coated cast iron roof drain with deep sump, wide serrated flashing flange, flashing clamp device with integral gravel stop and self-locking polyethylene (standard) dome strainer.

Order Code: RD-10☐☐-☐-☐

Ex. RD-102P-K

Pipe Sizing (Select One)

Suffix	Description	
2	2"(51) Pipe Size	☐
3	3"(76) Pipe Size	☐
4	4"(102) Pipe Size	☐
5	5"(127) Pipe Size	☐
6	6"(152) Pipe Size	☐
8	8"(203) Pipe Size	☐

Outlet Type (Select One)

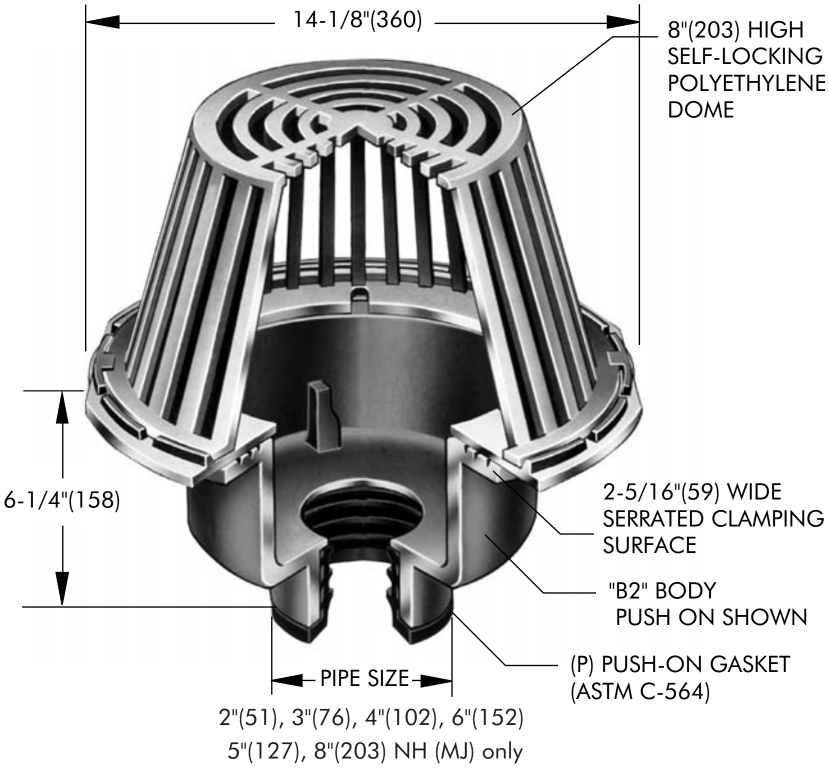
Suffix	Description	
NH	No Hub (MJ)	☐
P	Push On	☐
T	Threaded Outlet	☐
X	Inside Caulk	☐

Options (Select One or More)

Suffix	Description	
-A	Accutrol weir (specify # 1-6 slots)	☐
-B	Sump Receiver Flange	☐
-BED	Sump Receiver, Adj Ext., Deck Clamp	☐
-C	Secondary Membrane Clamp	☐
-D	Underdeck Clamp	☐
-E	Adjustable Extension	☐
-GSS	Stainless Steel Ballast Guard	☐
-H	Adj. to 6" IRMA Ballast Guard	☐
-K	Ductile Iron Dome	☐
-K80	Aluminum Dome	☐
-L	Vandal Proof Dome	☐
-R	2" High External Water Dam	☐
-SO	Side Outlet**	☐
-V	Fixed Extension (1-1/2",2",3",4")	☐
-W	Adj. Water Level Regulator	☐
-W-1	Waterproofing Flange	☐
-Z	Extended Integral Wide Flange	☐
-5	Sediment Bucket	☐
-12	Galvanized Dome	☐
-13	All Galvanized	☐
-83	Mesh Covered Dome	☐
-113M	Special Epoxy from 3M Range	☐

Optional Body Material (NH Only)

Suffix	Description	
-60	PVC Body w/Socket Outlet	☐
-61	ABS Body w/Socket Outlet	☐



Free Area Sq. In.
137

Deck opening 10" (254) with sump receiver 13-1/4" (337)

** Side Outlet (-SO) option only available in 2"(51), 3"(76), 4"(102) pipe sizes. Underdeck Clamp (-BED and -D options) are not available when -SO is selected.

Job Name ____________ Contractor ____________

Job Location ____________ Contractor's P.O. No. ____________

Engineer ____________ Representative ____________

CANADA

CANADA: 5435 North Service Road, Burlington, ON, L7L 5H7 TEL: 905-332-6718 TOLL-FREE: 1-888-208-8927 Website: www.wattsdrainage.ca

(Dimension) Denotes Millimeters

Adjustable Accutrol Weir

Tag: ____________________

Adjustable Flow Control for Roof Drains

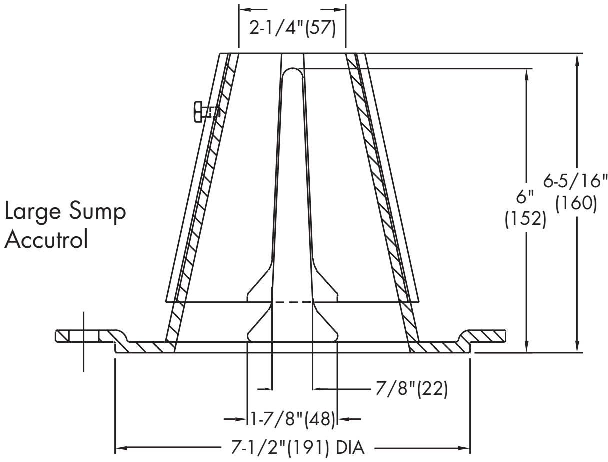
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

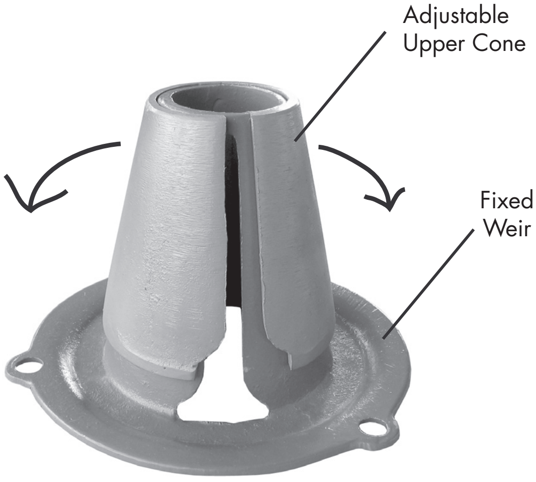
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol.
The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the 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.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	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	5	5	5	5	5

Job Name ____________________

Contractor ____________________

Job Location ____________________

Contractor’s P.O. No. ____________________

Engineer ____________________

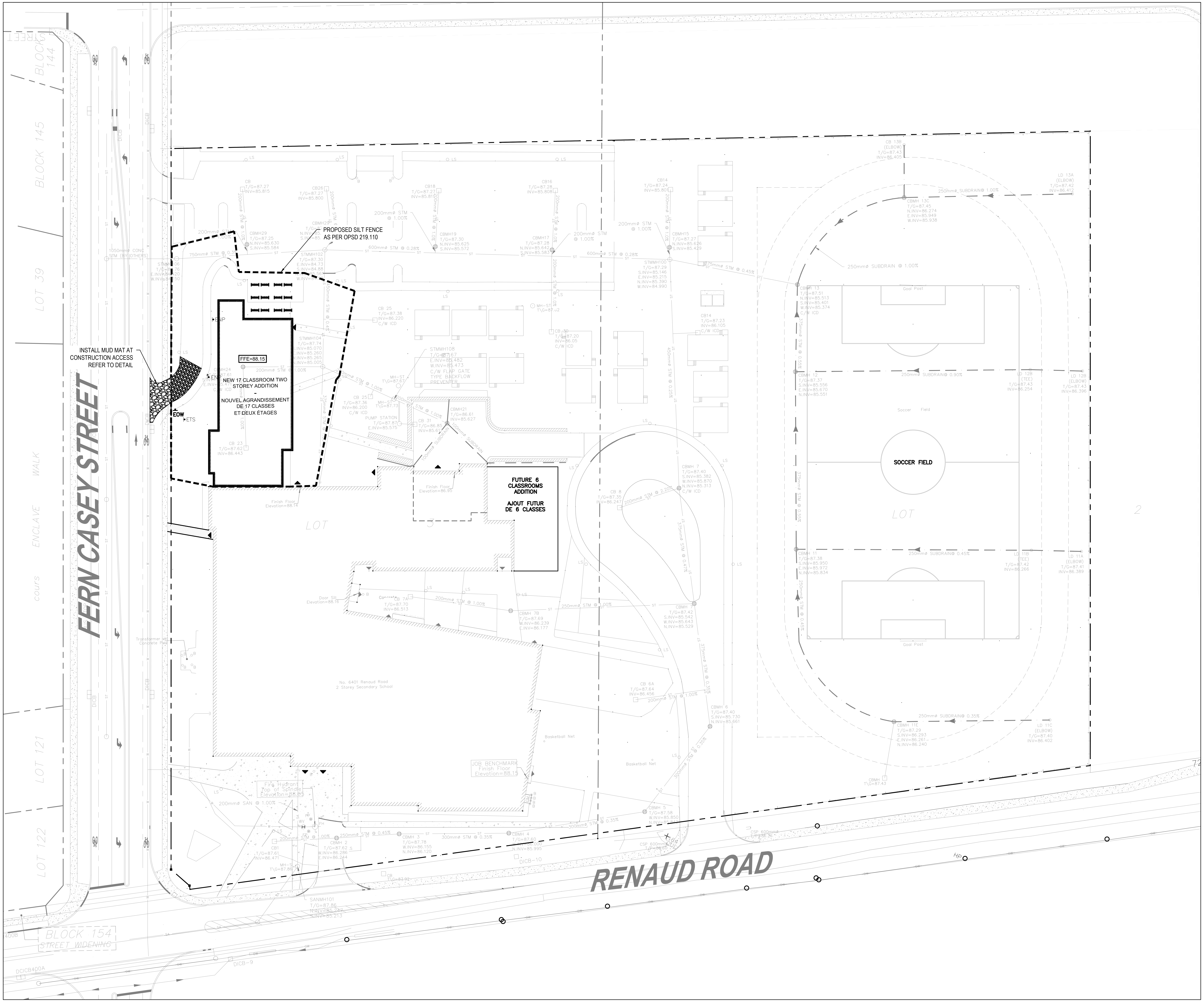
Representative ____________________

A Watts Water Technologies Company

APPENDIX

D

- EROSION AND SEDIMENTATION CONTROL PLAN C05



Écoles catholiques
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4000, RUE LABELLE, OTTAWA, ON K1J 1A1

DRAWING TITLE/TITRE DU DESSIN

EROSION AND SEDIMENTATION CONTROL PLAN

SCALE ÉCHELLE	1:500	PROJ. No 221-09207-00	ISSUE No 1	REV. No 0
DRAWN BY DESSINÉ PAR	J.T	DRAWING/DESSIN **C05**		
CHECKED BY VÉRIFIÉ PAR	D.Y.			
DATE	2022-10-21	FICHIER ACAD FILE: 221-09207-00_C.dwg		

APPENDIX

E

- SUBMISSION CHECK LIST