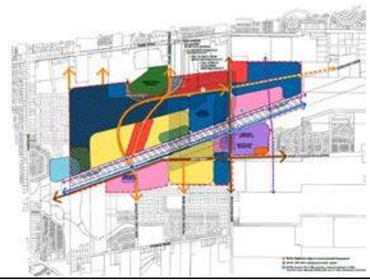
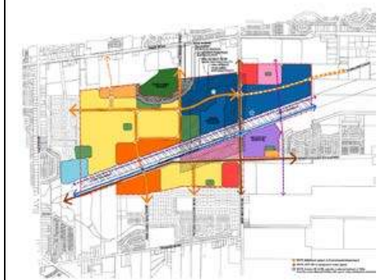
Appendix I

	Terms describing:		Definitions
	Negative Impacts	Positive Impacts (i.e., Benefits)	
Most Preferred	Negligible/ Low	Greatest	The impact exists, but is of a magnitude small enough that it has little effect, or is of limited benefit; or has the least impact compared to all the alternatives. Greatest compliance, contribution or benefit.
	Slight	Good	The impact exists and is of relatively low magnitude. Provides a moderate effect or contribution or benefit.
	Some	Reasonable	The impact exists and has an effect that is of a moderate magnitude. Provides a measurable contribution or benefit.
Least Preferred	Greatest	Limited	The impact exists and has an effect that is relatively large, or has the most impact when compared to other alternatives. Little to no contribution or benefit

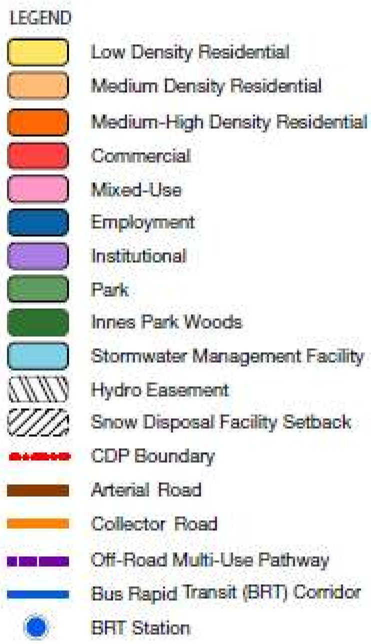
The impact Description Table above was used to assess which definition best fits each impact. Use of the corresponding description terms was incorporated in the rationale/description of the impact whether it be positive or negative. Based on where the impact sits in the scale, the preferred option for the specific criteria was identified.

Category	Criteria/Objective	Option 1	Option 2	Option 3
				
Natural and Physical Environment	Connectivity within the natural heritage system	• Isolation of Innes Park Woods • Stepping stone pattern of park areas from Innes Park Woods to the stormwater pond • Some negative impact	• Isolation of Innes Park Woods • Greatest negative impact	• Isolation of Innes Park Woods • Stepping stone pattern of park areas from Innes Park Woods to the stormwater pond • Some negative impact
	Preferred	✓		✓
	Amount of greenspace (parkland)	• Some greenspace	• Least amount of greenspace	• Most amount of greenspace
	Preferred			✓
	Hibernacula	• Some impact from the extension of Frank Bender Street	• Greatest impact from the extension of Frank Bender Street	• Some impact from the extension of Frank Bender Street
	Preferred	✓		✓
	Species at Risk	• Maintains Least Bittern habitat (around existing temporary stormwater management pond) but habitat would likely not remain following area development • Loss of bobolink habitat, mitigation required	• Loss of bobolink habitat, mitigation required	• Loss of bobolink habitat, mitigation required
	Preferred	✓		

	Protection of recharge areas	• Some protection (Location and size of community and neighbourhood parks protect some areas with greatest recharge potential)	• Less protection (Mostly employment/commercial uses on areas with greatest recharge potential)	• Most protection (Location and size of community/neighbourhood parks and environmental setback areas protect the greatest amount of areas with greatest recharge potential)
	Preferred			✓
Social Environment	Maximize access to community amenities/services	• Largest amount and best distribution of commercial • Proposes a commercial hub at the intersection of two collector roads • Proposes additional commercial along the south side of the Vanguard extension. • Proposes commercial abutting the existing commercial along Innes Road, east of Frank Bender Street	• Moderate amount and moderate distribution of commercial • Proposes a commercial Main Street • Proposes commercial abutting the existing commercial along Innes Road, east of Frank Bender Street	• Lowest amount and poorest distribution of commercial • Proposes one new commercial block, which is well spaced from the existing commercial along Innes Road.
	Preferred	✓		
	Total area and distribution of parkland	• Moderate amount of parkland • Parkland concentrated West of Frank Bender Street	• Moderate amount of parkland • Parkland proposed both East and West of Frank Bender Street	• Most amount of parkland and best distribution throughout the community
	Preferred			✓
	Provide appropriate mix of land uses considering ongoing snow disposal operations	• Most appropriate (Commercial and employment land uses proposed adjacent to snow disposal facility, some mixed use to the South	• Least appropriate (Residential, commercial, employment and parkland proposed adjacent to snow disposal facility)	• Moderately appropriate (Employment and parkland adjacent to snow disposal facility, some mixed use to the South)
	Preferred	✓		

Transportation	Minimize traffic infiltration through the community	• Direct North-South route proposed through residential area could result in traffic intrusions to residents. • Does not segment employment / commercial traffic from residential areas.	• Direct North-South route proposed through residential area could result in traffic intrusions to residents. • Does not segments employment / commercial traffic from residential areas.	• The North-South route is not direct, which minimizes cut-through traffic through residential area. • Segments employment / commercial traffic from residential areas.
	Preferred			✓
	Efficiency of road network	• Provides good integration between roads and land uses as the majority of commercial/employment land uses front major roads. • Provides four connections to major arterial roads. • Better efficiency due to grid / straight road network • Collector road connection to abutting lands to immediate West	• Provides integration between roads and land uses but less than Option No.1. • Lowest - Provides five connections to major roads with additional intersections along Innes that could result in more traffic signals and traffic interruption. • Curved alignment is not desirable and too close to another North-South collector road. (intersections on either end on curved alignment) • Local road connection only to abutting lands to immediate West	• Provides good integration between roads and land uses as the majority of commercial/employment land uses front major roads. • Provides four connections to major arterial roads. • Better efficiency due to grid / straight road network • Collector road connection to abutting lands to immediate West
	Preferred	✓		✓
	Permit/facilitate an efficient transit system	• Provides good compatibility with high density/employment near transit stations/BRT (Mer Bleue Road and Brian Coburn Boulevard). • Collector roads can provide good coverage of transit services.	• Provides moderate compatibility with high density/employment near transit stations/BRT (Mer Bleue Road and Brian Coburn Boulevard). • Collector roads can provide moderate coverage of transit services/.	• Provides good compatibility with high density/employment near transit stations/BRT (Mer Bleue Road and Brian Coburn Boulevard). • Collector roads can provide good coverage of transit services.
	Preferred	✓		✓

	Create active accessible neighbourhoods	• Access connections from arterial roads to Multi-Use Pathway in the south • No neighbourhood connection to planned Multi-Use Pathway in the East • Low neighbourhood connectivity to planned Hydro corridor Multi-Use Pathway	• Access connections from arterial roads to Multi-Use Pathway in the south • Mixed use connection to planned Multi-Use Pathway in the East • Best neighbourhood connectivity to planned Hydro corridor Multi-Use Pathway	• Access connections from arterial roads to Multi-Use Pathway in the south • Parkette and mixed use connection to planned Multi-Use Pathway in the East • Moderate neighbourhood connections to planned Hydro corridor Multi-Use Pathway
	Preferred		✓	
Servicing (SWM, Sanitary, Water)	Reduce construction, maintenance and operations requirements SWMF	• Greatest maintenance and operation costs for maintenance and operation of two ponds	• Less maintenance and operation costs for maintenance and operation of one pond	• Less maintenance and operation costs for maintenance and operation of one pond
	Preferred		✓	✓
	Reduction of construction and operations requirements for sanitary servicing (length of very deep sewer systems)	• Less length of deep sewers for major road network	• Most length of deep sewers for major road network	• Less length of deep sewers for major road network
	Preferred	✓		✓
Economics	Minimize front ending costs and allow for efficient area development	• Good potential to phase collector roads.	• Collector roads are difficult to phase	• Good potential to phase collector roads.
	Preferred	✓		✓
	Total number of preferred criteria	9	2	11
	Preferred			✓


LEGEND
Low Density Residential
Medium Density Residential
Medium-High Density Residential
Commercial
Mixed-Use
Employment
Institutional
Park
Innes Park Woods
Stormwater Management Facility
Hydro Easement
Snow Disposal Facility Setback
CDP Boundary
Arterial Road
Collector Road
Off-Road Multi-Use Pathway
Bus Rapid Transit (BRT) Corridor
BRT Station

Other factors were considered in the evaluation but did not results in a distinguishing difference between the alternatives. These included:

- Provision of Libraries
- Parks adjacent to SWMP
- Mix of uses adjacent to BRT station
- Loss of water courses
- Minimizing upgrades to existing water system requirements
- Compatibility with existing and future municipal infrastructure
- Impacts to existing downstream flood levels
- Disruptions of natural habitat (loss / fragmentation)
- Opportunities for infiltration
- Capital costs for infrastructure (subsurface)

Based on the evaluation, Option 3 is the preferred Option. Where other option(s) were preferred for a specific criteria, the benefits provided by that option will be considered in a refinement of Option 3. This includes potential opportunities to create active accessible neighbourhoods.

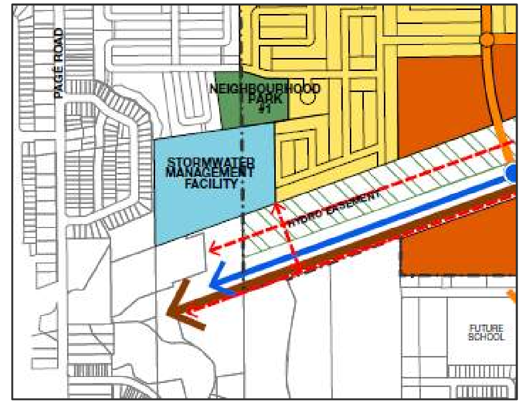
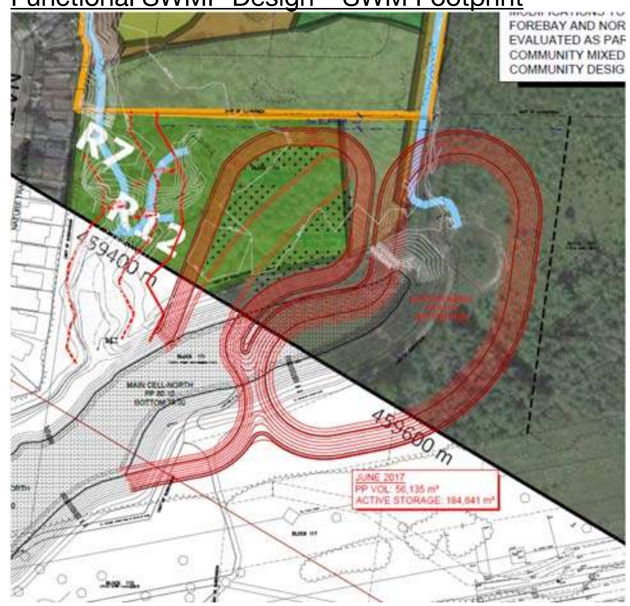
COMMENTS FROM TAC MEETING #4 (JAN 17 2018)
EUC MUC CDP

Commenter	Comment	Response
A. Hydro One Networks Inc. (HONI)	The following should be included in the Site Plan Agreement: 1. The developer must contact Greg Gowan, Real Estate Coordinator at (905) 946-6232 to discuss all aspects of the site plan design, ensure all of HONI's technical requirements are met to its satisfaction, and acquire the applicable agreements.	Noted
	2. Prior to HONI providing its final approval, the developer must make arrangements satisfactory to HONI for lot grading and drainage. Digital PDF copies of the lot grading and drainage plans (true scale), showing existing and proposed final grades, must be submitted to HONI for review and approval. The drawings must identify the transmission corridor, location of towers within the corridor and any proposed uses within the transmission corridor. Drainage must be controlled and directed away from the transmission corridor.	Noted. Conceptual road grading to be prepared as part of Master Servicing Study (MSS).
	3. Any development in conjunction with the site plan must not block vehicular access to any HONI facilities located on the transmission corridor. During construction, there must be no storage of materials or mounding of earth, snow or other debris on the transmission corridor.	Noted
	4. The costs of any relocations or revisions to HONI facilities which are necessary to accommodate this site plan will be borne by the developer. The developer will be responsible for restoration of any damage to the transmission corridor or HONI facilities thereon resulting from construction of the site plan.	Noted
	5. HONI's easement rights must be protected and maintained.	Noted
	6. In addition, HONI requires the following be conveyed to the developer as a precaution: The transmission lines abutting the subject lands operate at either 500,000, 230,000 or 115,000 volts. Section 188 of Regulation 213/91 pursuant to the Occupational Health and Safety Act, require that no object be brought closer than 6 metres (20 feet) to an energized 500 kV conductor. The safe vertical distance for 230 kV conductors is 4.5 metres (15 feet), and for 115 kV conductors it is 3 metres (10 feet). It is the developer's responsibility to be	Noted

Commenter	Comment	Response
	aware, and to make all personnel on site aware, that all equipment and personnel must come no closer than the safe vertical distance specified in the Act. All parties should also be aware that the conductors can raise and lower without warning, depending on the electrical load placed on the line.	
B1. Rideau Valley Conservation Authority (RVCA) 2018 Comments	**Natural Heritage** 1. Watercourses It is our understanding that an Environmental Management Plan was not undertaken for this study area, but rather an existing conditions report was prepared for the EUC MUC in 2015. There are several watercourses within the study area which were identified in the 2015 report "Draft Natural Environmental Existing Conditions Report – East Urban Centre CDP, Part Lots 8 & 9, Concession 1, City of Ottawa" dated February 12th, 2015, prepared by Niblett Environmental Associates Inc. The report had undertaken some of the work required for a Headwater Drainage Features Assessment (HDFA) but did not provide the full information required to make a classification on each watercourse. The report had also made a recommendation that the headwater drainage features reporting could be done as part of an Environmental Impact Statement (EIS) at the individual site development stage. In the Rideau Valley Conservation Authority's (RVCA's) comments to the City dated March 9th, 2015, Ms. Chandler had advised the City that "this response is not acceptable to the RVCA". At the CDP/Master Servicing Study (MSS) stage, there is a reasonable expectation that the natural features such as watercourses and setbacks have been appropriately assessed with the necessary recommendations. The RVCA has not received any additional information/correspondence since these comments were released to demonstrate that these issues have been adequately addressed. The Conservation Authority cannot underscore the importance of having these features appropriately assessed at this stage prior to the CDP moving forward. **A proper assessment of the watercourses under the Headwater Drainage Features Protocol needs to be completed** in order to determine whether	Several of the watercourses have already been studied and Headwater Drainage Features Assessment (HDFA) recommendations brought forward and approved under site specific development applications for lands within and surrounding the CDP. Niblett prepared a memo summarizing the HDFA works/recommendations completed to date (including a map of the watercourses for which compensation has been provided) (dated March 28, 2018). The memo was circulated to Rideau Valley Conservation Authority (RVCA) and South Nation Conservation Authority (SNCA) staff for comment. RVCA and SNCA both provided individual responses on April 3, 2018 noting that they accept the findings and recommendations of Niblett's report. RVCA provided an additional letter dated April 18, 2018 confirming that they have no objection to the Preferred Land Use Plan and Demonstration Plan.

Commenter	Comment	Response
	these watercourses can be altered as assumed by the CDP and/or whether certain watercourses must be maintained with development setbacks. The outcome of this assessment may require a change to the proposed CDP. Not only is this assessment important for the assumptions being made by the CDP, but the results will also help inform the requirements for the Master Servicing Study (MSS). As an example, some of the mitigation requirements that result from an Headwaters Drainage Features Assessment (HDFA) may require specific measures that must be implemented/incorporated as part of the overall stormwater management design. It has been our experience, that in situations where the headwater drainage features assessments have been deferred to the site specific design stage, several problems often arise. Often the mitigation requirements are not feasible based on the assumptions in the approved CDP/Master Servicing Study (MSS) and can result in lengthy delays during the application process and complete deviations from the approved MSS. In our opinion it also places an unnecessary burden on the developers/applicants to resolve an issue that should have been addressed up front during the CDP/MSS stage.	
	Natural Heritage 2. Innes Road Woods The Rideau Valley Conservation Authority (RVCA) had previously noted that the **boundary around the Innes Park Woods** warranted additional consideration due to the bedrock outcrops and fractures making it sensitive to groundwater impacts from development and stormwater. **Additional information as to how the proposed boundary was established** and whether it included additional input from the biological, hydro-geological and the geotechnical consultants is required.	The boundary of the Innes Park Woods is per the legal survey limits for PIN 044040537 and 044040540 under ownership of the City of Ottawa. The extent of the rock barren were staked and surveyed by AOV in 2017, using as a marker were the rock outcrop changes to vegetation at the surface. A 30m setback was then applied beyond the limit of the rock barren, followed by an additional 5m buffer per discussions with Niblett, Ministry of Natural Resources and Forestry (MNRF) and City Environmental Planning staff. (See Note 1). Note 1: Niblett did provide some rationale surrounding a recommended 30m buffer around Innes Park Woods in a Memo dated October 12, 2017 regarding Snake Hibernacula. Based on confirmation of reptile hibernacula, the vicinity surrounding Innes

Commenter	Comment	Response
		Park Woods is considered Significant Wildlife Habitat and is afforded the appropriate protection as per Ministry of Natural Resources and Forestry (MNRF) and City of Ottawa policies. Mitigation and protection measures will require compliance with the City Official Plan. Paterson prepared a memo (April 2, 2018) which concludes that the 35 metre setback from the Rock Barren and the Innes Parks Woods is more than adequate to protect the sensitive area from groundwater impacts as a result of the nearby development. In their April 18, 2018 letter, RVCA confirmed that they accept Paterson's conclusion of and have no further comment.
	Stormwater Management Block 3. We note that the proposed **stormwater management block is an area that was outside the original study area** and therefore not covered by the existing conditions report. While this area was not covered by the existing conditions report, watercourses in this area were classified in an Headwater Drainage Features Assessment (HDFA) prepared for an adjacent plan of subdivision to the north of the site. The report "Headwater Drainage Feature Assessment – 3490 Innes Road Development" dated July 27th, 2017, prepared by Kilgour & Associates Ltd. had **identified two watercourses within this Block**. The first watercourse, referred to as Reach 7 was classified as 'Protection' and is situated along the most westerly portion of the Block. It is characterized by a valley that in some instances is 15 metres wide and 3 metres deep. Therefore, **a development setback is required from this feature.** The second watercourse identified was referred to as Reach 12 and was classified as 'Conservation'. Reach 12 runs through the Block. While it is understood that some of the details regarding this Block would be addressed through the MSS, it is important to note that based on the classification, **the watercourse is a constraint**. It is unknown if once the constraints are accounted for, whether the proposed Block will yield sufficient area for a proposed stormwater management pond. Therefore, further discussion on this issue is warranted as it will have a huge impact on the assumptions being made in the CDP and the future Master Servicing Study (MSS).	Kilgour & Associates Ltd. will remain the biological consultant for this block and co-ordination and data sharing will be undertaken between the 3490 Innes Rd and CDP project teams. A development setback is required from Reach 7. Rideau Valley Conservation Authority (RVCA) has clarified that a 15m setback from Normal High Water Mark (NHWM) is likely acceptable. A development setback is required from Reach 12. RVCA has clarified that a 15m setback from NHWM is likely acceptable. The stormwater management pond (SWMP) block shown on the Land Use Plan is a placeholder and was provided for illustrative purposes only (see figure below). The functional design for the SWMP proposes a smaller footprint and avoids the headwater features and retains trees where possible (see figure below). The SWMP is in the stages of detailed design. A detailed pond footprint will be developed based on the approved Land Use Plan and environmental features and will be circulated to City and RVCA staff for comment. In their April 18, 2018 letter, the RVCA noted that they recently met with DSEL and based on some initial findings, it appears that the constraints can be addressed. Therefore, the Conservation Authority is satisfied that the details regarding the stormwater management block can be addressed through the MSS stage.

Commenter	Comment	Response
		Land Use & Demonstration Plan– SWMP Block  Functional SWMP Design – SWM Footprint 

Commenter	Comment	Response
	Natural Hazards 4. Slope Stability/Erosion As previously noted, the watercourse along the western boundary of the study area (Reach 7) is characterized by a valley, while Reach 12 also exhibits some valley characteristics. Therefore, a **slope stability analysis will be required to determine the geotechnical constraints within the proposed Stormwater Management Block.** For some reference, the slope stability analysis accepted for the subdivision to the north required a geotechnical setback of 10 metres from the top of slope for Reach 7. Reach 12 was not evaluated. In addition, Reach 7 is known as being erosive and therefore consideration for the ability of Reach 7 to accommodate flows will need to be accounted for as part of the MSS including erosion thresholds. We also note that the City's Mud Creek Cumulative Impact Study is currently underway as well as the EA for the Brian Coburn Extension. These studies may provide additional information and/or recommendations which may be useful for the CDP, and more specifically the future Master Servicing Study (MSS).	The CDP study area does not include the watercourses noted. A geotechnical consultant will complete the slope stability analysis for these reaches and provide limit of hazard lands recommendations, which will be reflected in the CDP documents. It should be noted that the limit of hazard lands and the existing watercourses do not impact the CDP study area. In their April 18, 2018 letter, the RVCA noted that they recently met with DSEL and based on some initial findings, it appears that the constraints can be addressed. Therefore, the Conservation Authority is satisfied that the details regarding the stormwater management block can be addressed through the MSS stage.

Commenter	Comment	Response
	Natural Hazards 5. Organic Soils In our comments dated March 9th, 2015, the Rideau Valley Conservation Authority (RVCA) had identified that **additional test pit/borehole locations in the geotechnical report may be required** to provide additional information on organic soils, bedrock at surface and potential karstic elements/formations. To our knowledge these comments were never adequately addressed. This information is particularly important around the Innes Park Woods.	Paterson has prepared a memo (dated April 2, 2018) which addresses the comments contained within Rideau Valley Conservation Authority's (RVCA's) March 29, 2018 email, which is summarized below: • It is the RVCA's understanding that the EUC MUC CDP options provide for the protection of the Rock Barren and the Innes Park Woods with a total of a 35 metre buffer which was determined in consultation with the City. Based on this understanding of the protection being afforded to this area, we would ask for an opinion/confirmation from the geotechnical engineer and/or biological consultant/hydro-geological engineer as to whether the buffer provided is sufficient for the protection of the features from groundwater impacts from development and stormwater without further field work required. • It is the RVCA's understanding that the geotechnical engineer has already completed some test pit/boreholes within the study area. Please provide confirmation from the geotechnical engineer that there are no Organic Soils present on site and that no further test pits/boreholes are required. In their April 18, 2018 letter, the RVCA noted that they have accepted the conclusion of Paterson's April 2, 2018 memo and have no further comment.
	Conservation Authority Regulations 6. All of the watercourses within the Rideau Valley Conservation Authority (RVCA) watershed of the study area are subject to Ontario Regulation 174/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" under Section 28 of the Conservation Authorities Act. The prior written permission of the Conservation Authority is required for any alteration, straightening, changing, diverting or interfering in any way with any watercourse. Therefore, until such	Noted

Commenter	Comment	Response
	time that a proper assessment of each watercourse is completed, it is unknown whether a permit from the Conservation Authority could be issued for the alterations required to accommodate the proposed CDP.	
B2. Rideau Valley Conservation Authority (RVCA) <u>2015</u> Comments	1. DSEL Servicing Report October 2014: Pg.13/14 regarding Billberry Creek erosion thresholds. Please clarify that the review for erosion thresholds will also consider the sensitivity of the reaches downstream from CFB7. Conclusions and Recommendations section: Please make reference to the Palmer's Hydrogeological and Water Budget report and expected future recommendations regarding LID servicing designs that result from it.	The existing conditions report phase of the CDP is complete. If there is additional work, it can reside in the CDP or Master Studies or be a requirement of development applications. A review of the Billberry Creek Subwatershed has already been completed by the City of Ottawa via the *Billberry Creek Geomorphic Systems Master Implementation Plan* (GHD, May 2014) and includes recommended areas for rehabilitation to address the erosive nature of the existing Creek. Although erosion thresholds are provided in the study to be used for stormwater retrofit efforts in the overall subwatershed as acceptable limits that should prevent an increase in channel erosion and deposition beyond natural rates, the reported critical discharge rates (e.g. critical discharge (m3/s) for entrainment of 0.07 for B6/B9) are well below the reported 2yr flows in the Creek (e.g. 12.68 m3/s 2-yr flow at B6) and the report notes that under existing conditions, '*based on the modelled shear stresses, at least 50% of the bed materials would be mobilized under bankfull flow conditions for all reaches. In the majority of cases, the bankfull shear stress substantially exceeds the critical threshold, indicating that the bulk of bed (and bank) materials are mobilized.*' Furthermore, no specific recommendations were given in the *Billberry Creek Geomorphic Systems Master Implementation Plan* (GHD, May 2014) for stormwater control for the CDP development or any new development. It is unclear if the study considered the urbanization of the CDP lands in the study, despite development being planned for the CDP area since before 2006 and despite urbanization of the lands being already included in the design of the Wildflower/Preswick stormwater outlet to Billberry Creek. The project team does not intend to analyse erosion in Billberry Creek as part of the MSS. If required, the project team proposed to include the following in the Master Servicing Study (MSS): "*During detailed site-specific review of future detailed development applications, the currently established quantity*

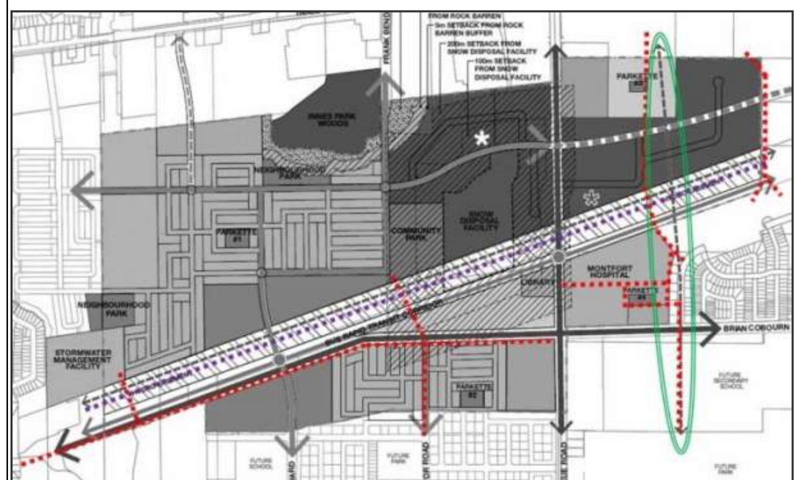
Commenter	Comment	Response
		controls (50 L/s/ha for development lands and 100 L/s/ha for roadways) will be reviewed by the City and RVCA relative to the estimated erosion thresholds and erosion characteristics of Billberry Creek outlined in the 'Billberry Creek Geomorphic Systems Master Implementation Plan' (GHD, May 2014). The review will assess whether the proposed control level is sufficient for the particular development application or whether there would be any added benefit to further control given the small portion of tributary area the Study Area holds to Billberry Creek."
	2. Paterson Geotechnical Report October 24, 2014: The additional boreholes have been constructed as per the drawing PG3130-2 dated 08/2014. The Rideau Valley Conservation Authority (RVCA) did provide comments September 10, 2014 suggesting that additional test pit/borehole locations may be required to provide additional information on organic soils, bedrock at surface and potential karstic elements/formations. This does not appear to have been considered in the field work or updated report. Based on the objective to "determine the subsurface soil and groundwater conditions" , we would expect to see information and refined mapping with boundaries indicating the presence and location (if any) of organic soils, Karstic rock, depths of bedrock at or near surface and expected groundwater depths. This is particularly important around the Innes Park Woods. Section 3.2 references the Gull River Formation which is not consistent with the geology as reported in the Palmer report. Clarification, confirmation and delineation is required. S. 4.4 refers to a **perched water table within a sandy soil deposit. Where is this deposit?**	Paterson has prepared a memo (dated April 2, 2018) which addresses the comments contained within Rideau Valley Conservation Authority's (RVCA's) March 29, 2018 email, which is summarized below: 1. It is the RVCA's understanding that the EUC MUC CDP options provide for the protection of the Rock Barren and the Innes Park Woods with a total of a 35 metre buffer which was determined in consultation with the City. Based on this understanding of the protection being afforded to this area, we would ask for an opinion/confirmation from the geotechnical engineer and/or biological consultant/hydro-geological engineer as to whether the buffer provided is sufficient for the protection of the features from groundwater impacts from development and stormwater without further field work required. 2. It is the RVCA's understanding that the geotechnical engineer has already completed some test pit/boreholes within the study area. Please provide confirmation from the geotechnical engineer that there are no Organic Soils present on site and that no further test pits/boreholes are required. In their April 18, 2018 letter, RVCA confirmed that they accept Paterson's conclusion of and have no further comment.

Commenter	Comment	Response
	3. Palmer's Hydro-geological and Water Budget Report (Preliminary Findings) Dec 19, 2014: Comments were provided Feb 19, 2015. It is our expectation that Palmer will be further consulted on recommendations regarding servicing for stormwater management in the design stage.	Palmer is to provide input into the stormwater management plan to be detailed in the Master Servicing Study (MSS).
	4. Niblett's Natural Environment Existing Conditions Report Feb 12, 2015: General: A Department of Fisheries and Oceans (DFO) authorization and compensation (Brewer Park) were undertaken to allow the closure of some watercourses within the EUC area. **A map and information on which watercourses were considered compensated for is required.** There are some parts of this report that are difficult to make sense of for the purpose of guiding the CDP and future development parametres (serving, constraint areas etc). At the CDP / Master Servicing Study (MSS) stage, it is expected that natural features such as watercourse will be assessed and recommendations regarding retention will be forthcoming. This allows setbacks to be established and servicing plans to consider requirements. Further, a permit under the Conservation Authorities Act is required for undertaking any alterations or closures to the watercourses, and a CDP would not be able to presume these actions without an indication from the Conservation Authorities whether or not these actions would be supported. pg. 76 All watercourses: What does Niblett's 'standard' recommendation mean? Where are the field sheets for the watercourse assessments? pg. 75-78 There are 4 rows that refer to various watercourse constraints. It is not clear why these categories are divided as they are presented or how to interpret the recommendations from Niblett (in the context of the watercourse values) for each identified watercourses. Please table the watercourses, provide their values/constraints and provide recommendations for management.	Several of the watercourses have already been studied and Headwater Drainage Features Assessment (HDFA) recommendations brought forward and approved under site specific development applications for lands within and surrounding the CDP. Niblett prepared a memo summarizing the HDFA works/recommendations completed to date (including a map of the watercourses for which compensation has been provided) and Rideau Valley Conservation Authority (RVCA) and South Nation Conservation Authority (SNCA) confirmed that they accept Niblett's findings and recommendations. The boundary of the Innes Park Woods is per the legal survey limits for PIN 044040537 and 044040540 under ownership of the City of Ottawa. The extent of the rock barren were staked and surveyed by AOV in 2017, using as a marker were the rock outcrop changes to vegetation at the surface. A 30m setback was then applied beyond the limit of the rock barren, followed by an additional 5m buffer per discussions with Niblett, Ministry of Natural Resources and Forestry (MNRF) and City Environmental Planning staff. The vicinity surrounding Innes Park Woods is considered Significant Wildlife Habitat and is afforded the appropriate protection as per MNRF and City of Ottawa policies. Mitigation and protection measures will require compliance with the City OP. Paterson prepared a memo (April 2, 2018) which concludes that the 35 metre setback from the Rock Barren and the Innes Parks Woods is more than adequate to protect the sensitive area from groundwater impacts as a result of the nearby development. In their April 18, 2018 letter, RVCA confirmed that they accept Paterson's conclusion of and have no further comment.

Commenter	Comment	Response
	pg. 81: S. 7.3 Which watercourse is this recommendation related to ? We would expect, given the combination of information from the Niblett and Palmer reports, that the area around the Innes Park Woods would have natural values, that when combined with the nature of the exposed bedrock, would warrant a degree of protection in the recommendations. A detailed map with a refined boundary around the woodlot would be helpful to assist the CDP land use considerations. APPENDIX VII responds to the Rideau Valley Conservation Authority (RVCA) review comments regarding the requirement for Headwater Drainage Feature Guideline reporting, and suggests that it can be done at an EIS stage. The body of the existing conditions report however does appear to have undertaken part of the Headwaters Guideline assessment work. We disagree with the position that watercourse assessments can be completed at the individual development application stage, as per our comment above. The guidelines assess the natural features and functions associated with each watercourse. This comprehensive assessment process results in recommendations for each watercourse. Without this information, a concept plan for the CDP cannot be prepared. This response is not acceptable to the RVCA. The statement "the watercourse is not directly connected to a waterbody that supports a recreational, aboriginal or commercial fishery" persists in the report without a rational.	The statement "the watercourse is not directly connected to a waterbody that supports a recreational, aboriginal or commercial fishery" is related to the Fisheries Act and is directly related to the Department of Fisheries and Ocean's (DFO's) project review criteria. The Fisheries Act and DFO project requirements will be addressed in the updated HDF report.
	5. Concept Plans: The boundary around the Innes Park Woods requires additional consideration. The bedrock outcrops and fractures make it sensitive to groundwater impacts from development and stormwater. The nature of development, if any, permitted in this area requires more direct input from the biological and hydro-geological and possibly geotechnical consultants (Niblett, Palmer, Paterson) in consultation with municipal staff and the Conservation Authority. Further discussion on this area is warranted.	The boundary of the Innes Park Woods is per the legal survey limits for PIN 044040537 and 044040540 under ownership of the City of Ottawa. The extent of the rock barren were staked and surveyed by AOV in 2017, using as a marker were the rock outcrop changes to vegetation at the surface. A 30m setback was then applied beyond the limit of the rock barren, followed by an additional 5m buffer per discussions with Niblett, Ministry of Natural Resources and Forestry (MNRF) and City Environmental Planning staff. The vicinity surrounding Innes Park Woods is considered Significant

Commenter	Comment	Response
		Wildlife Habitat and is afforded the appropriate protection as per MNRF and City of Ottawa policies. Mitigation and protection measures will require compliance with the City OP. The land uses shown adjacent to the area (i.e. park, low density residential and employment), were agreed to in principle with City staff. The limits of the surveyed rock barren (excluding the additional 30m setback and 5m buffer) looks to coincide with the infiltration area identified in the existing conditions water budget (Palmer, December 2014). Through the CDP process additional discussions will be had with key consultants and agencies to introduce policy to ensure the rock barren is protected, impacts due from adjacent land uses are minimized and infiltration/recharge is maintained. Paterson prepared a memo (dated April 2, 2018) which concludes that the 35 metre setback from the Rock Barren and the Innes Parks Woods is more than adequate to protect the sensitive area from groundwater impacts as a result of the nearby development. In their April 18, 2018 letter, RVCA confirmed that they accept Paterson's conclusion of and have no further comment.
C. City of Ottawa-Transit	1. Existing transit in the vicinity of the CDP area includes: • Frequent Transitway (Rt. 94) service on Innes Rd. • Connexion service along Brian Coburn, parts of Mer Bleue, and Fern Casey (south of Brian Coburn) • Local service on Brian Coburn, east of Mer Bleue, and along Mer Bleue between Brian Coburn and Innes	The existing transit services within the study area are noted. Fotenn has produced a Transit Facilities Map which identifies existing and proposed transit routes.
	2. We are supportive of the comments made by Steven Boyle on Jan. 31, 2018 regarding revisions to the multi-use pathways (MUPs) shown on the concept and demonstration plans.	Noted
	3. For any additional pedestrian/cycling crossings over the Cumberland Transitway identified through the EUC MUC CDP, **all crossings must be grade-separated**. This is in keeping with the crossing currently shown in the *Cumberland Transitway West of Navan Road to East of Tenth Line Road, Preliminary Design Report* (Sept. 2014), it maintains transit priority along the dedicated transit facility and ensures pedestrian/cyclist safety (particularly during evening hours as the Transitway will not be a lit facility).	The *Cumberland Transitway Preliminary Design Report* (Sept. 2014) was reviewed and it was noted that within the CDP study area: • Fern Casey (former Belcourt Blvd) has at-grade crossing with the future Transitway; • Mer Bleue has a grade separated crossing; and • there is a potential grade separated crossing 900 east of Mer Bleue.

Commenter	Comment	Response
	• As well, all grade-separated pedestrian/cycling crossings must consider the bridge approaches in the design. • in the interim and prior to the construction of the Transitway, pedestrian/cycling crossings can be constructed at-grade.	It should be noted that: • any additional crossings such as the Multi-use Pathways (MUPs) would likely come before the Bus Rapid Transit (BRT) corridor and so would be constructed at grade; and • where a MUP is proposed to cross the BRT, it must ensure it is a 'safe crossing" when the BRT is constructed. At the time of the detailed design of the Bus Rapid Transit (BRT), a detailed assessment should be undertaken to identify grade separated crossing locations (where feasible) through the CDP area.
	4. **All multi-use pathways and pedestrian/cycling connections must be shown in all the plans** (CDP, Transportation Plan, Park Network Plan) as well as within the text of the CDP, Transportation Plan/Study and Parks Plan	The MUP and cycling connection are illustrated through conceptual alignments on the CDP plan. Fotenn has prepared a Pedestrian and Cyclist Facilities Plan.
	5. The *Cumberland Transitway West of Navan Road to East of Tenth Line Road, Preliminary Design Report* (Sept. 2014), plans for: • a 3.0m multi-use pathway on the north side of the future Transitway (within the transit right-of-way) through the limits of the CDP area • potential grade-separated crossing approx. 900m east of Mer Bleue Road • from discussion with Transportation Planning, the **City would most likely only have one east-west MUP (transit corridor versus hydro corridor**). Whether it is a transit corridor MUP or a hydro corridor MUP will be dependent upon timing, land ownership and funding. • as noted in the first bullet point, we support the east-west MUP shown in the concept and demonstration plans	Noted. Castleglenn to review *Cumberland Transitway Preliminary Design Report* (Sept. 2014) and comment.
	6. The **collector roads** (including Vanguard Dr. Extension) shown in the concept/demonstration plans should also be **identified as 'Potential Transit Streets'** • the provision of transit through the CDP would enable transit to better meet its service standards	It is envisioned that Vanguard Drive extension through CDP will potentially include transit services. Fotenn has produced a Transit Facilities Plan which identifies existing and proposed transit routes.
	7. For stronger overall connectivity, as well as transit connectivity/operations, it is **recommended Fern Casey connect directly from Brian Coburn, through the CDP, to Innes Road**	The alignment of Fern Casey from Innes to Frank Bender (through the CDP) was designed with City planning staff using the Building Better and Smarter Suburbs (BBSS) design principles.

Commenter	Comment	Response
	8. Given the proximity of the Employment zone to the future Mer Bleue Transitway Station, **recommend the types of employment uses planned for the Employment zone do not include warehousing/distribution, manufacturing and storage uses,** which generally require larger development parcels but have a lower number of employees	It is assumed that there will be an overall higher job density within 400 metres of the BRT station than beyond 400 metres. However, this may be achieved via a combination of different higher and lower density employment uses. We do not feel the need to prohibit specific uses given that the intent of the Urban Employment Area designation is to accommodate: noxious uses; uses that are incompatible with other uses due to noise, lights, round the clock operation, etc.; and prestigious uses with a signature address and a desire to locate among other similar uses.
D. City of Ottawa-Transportation	1. This is a follow up on your below e-mail requesting comments on the CDP's draft concept and demonstration plans. Last week a meeting was held and e-mails exchanged, by those persons cc'ed this current e-mail, concerning the Multi-Use Pathways (MUPs) shown on those plans. We recommend revisions to the MUPs as shown in red and purple on the below plan. The changes needed would be: • A **realignment of the north-south MUP** in the green ellipse to the position shown in red, together with some MUP links through the Montfort health centre site • A **realignment of the east-west hydro corridor MUP more towards the centre of the corridor** • **Adding the existing MUP along Brian Coburn Boulevard** • Adding the already planned north-south MUP at the eastern end of the plan • **Adding two new north-south MUP connections in the centre and western part of the plan** We realize that commenting on these plans is occurring in isolation, at this point, from seeing any text of the future CDP document. On or before your February 2nd comment deadline please expect to likely see further more detailed separate comments coming from Development Review, Urban Design, Transit Services and Transportation Planning possibly related to MUPs and also the need for the CDP to have a further plan showing the sidewalk, multi-use pathway and parks networks.	A follow-up meeting was held with Staff on Feb 12th to discuss the proposed Multi-Use Pathways (MUPs) within the CDP. The MUPs to be included in the CDP are illustrated in the figure below and are reflected in the Pedestrian and Cyclist Facilities Plan prepared by Fotenn. 
	2. Earlier concepts for this area (even those before this CDP exercise) had road network options showing a more curvilinear and direct connection (one roadway, not two or three) along a so-	Noted

Commenter	Comment	Response
	called Belcourt extension between Innes Road and Renaud Road. The current design of the collector roadways has a more block grid pattern requiring use of the now called Fern Casey Boulevard, one or two of the east-west collectors, and the extension of Frank Bender Street or a new collector to the west. The one street concept with a curvilinear design would facilitate a quick cut through of traffic north-south across this area. Does one really want to engage that in a community? The proposed network does not and its design sends a message that if you want to speed through your option is not to do so but instead go and use the nearby arterial roads of either Mer Blue to the east or Orleans Boulevards to the west. We have **no objection to this grid road collector network design** that promote a more community focused design versus an over emphasizes of some past planning to accommodate a speedy and most direct possible traffic movement on collector roadways.	
	3. The current plans shows only a collector road network, not a collector and major collector road network. In looking at the network density of collector, major collector and arterial roadways in Orléans (and in other outside the Greenbelt urban communities) there **should be a major collector identified in this CDP plan**. It would seem appropriate that it be Fern Casey Boulevard, the section of the Vanguard Drive extension between Fern Casey and Frank Bender, and Frank Bender Street from the Vanguard Drive extension to Innes Road. Or, in lieu of Frank Bender to the east, might the major collector link to Innes be the west one, no name yet, as it is spaced more evenly between Mer Bleue Road and Orleans Boulevard?	Further discussion is required with Staff to confirm the physical and functional differences between Major Collectors and Collectors. Fotenn has produced a Street Hierarchy Plan.
	4. Park and Facilities Planning has already provided the comment that "There should be a '**Park and Pathway' plan in the document, highlighting the greenspace network of parks, pathways, open spaces and greenspaces**." When you develop the body of the CDP document, you should also have a **plan/figure that shows proposed sidewalks, multi-use pathways and the cycling network**.	The Community Transportation Study (CTS) and CDP will include figures such as typical cross-sections of collector roadways, Multi-Use Pathway (MUP) alignment locations and potential cycling tracks that connect to existing facilities within the study area. Fotenn has produced a Pedestrian and Cyclist Facilities Plan, which will identify the elements noted in the comment.
	5. Continue to **maintain the proposed higher density land uses, both employment and residential uses, along the BRT corridor and its two stations**. Although the Bus Rapid Transit (BRT) is not planned for construction until post-2031 it is important to not have these areas given over to lower density	Noted

Commenter	Comment	Response
	development in the years prior to development of the rapid transit network.	
E. City- Parks Planning	1. Provided the lands on the west side of the Snow Disposal Facility are not required for another industrial / employment use, this is a **satisfactory location for the Community Park**. Noise and lights from the potential organized sports facilities will not disturb residential areas and there may be potential for shared parking. The location is also convenient for access from residential areas and the hydro corridor multi-use pathway system. The park would have good visibility and access from this community as well as the communities to the south.	Noted
	2. If the parks are to be numbered on the CDP plans, they should reflect the numbering system used in the Area Parks Plan (APP). Alternatively, to make updating the multiple plans and documents easier, and to keep them coordinated, **consider not numbering the parks**. They could simply be referred to as 'Community Park, Neighbourhood Park and Parkette'. A **note could be added to the legend referencing the 'APP' for further details on the parks.**	The CDP and Area Parks Plan (APP) park numbers are consistent.
	3. The **park 'APP' must be referenced in and appended to the final CDP**, prior to Council approval.	Noted
	4. The CDP written document must refer to the new 'Park Development Manual' (currently available from City staff, but soon to be posted on-line) and the landowners cost sharing agreement for parks, as noted in Planning Committee Report 13: http://app05.ottawa.ca/sirepub/mtgviewer.aspx?meetid=6408&doctype=MINUTES	Noted. Fotenn has a copy of the revised document.
	5. All the parks on the plan must be eligible for O1 zoning.	Noted
	6. Specific Area Parks Plan (APP) comments will be in a separate email.	Comments have been received and will be addressed separately.
F. City- Infrastructure Planning	1. The size of the block allocated to the Stormwater Management (SWM) Facility remains to be confirmed based upon the recommendations of the required MSS that, in turn, is to be informed by the recommendations of the on-going Mud Creek cumulative impacts study. This could have an impact on the adjacent residential block. In absence of any supporting documentation, we are currently not in a position to provide further comments.	DSEL will continue to share information with the City's Infrastructure Planning group as the Master Servicing Study (MSS) process proceeds.

Commenter	Comment	Response
	2. As previously flagged to the proponents, it is anticipated that some combination of lot level and conveyance stormwater management measures (LIDs) will be required on-site to achieve runoff volume reduction targets that will be confirmed by the on-going Mud Creek study. Without further supporting analyses, it cannot be confirmed at this stage that the forthcoming runoff volume control targets will not have impacts on, for example, right-of-way widths.	Noted that the City has requested that LIDs be implemented within the CDP area that is subject to the Mud Creek study. The right-of-way (ROW) widths proposed in the CDP are consistent with City standards.
G. City-Environmental	I will need to see how the issue of the storm pond expansion vs. the southwestern woodlot is being addressed in the MSS. I have recently provided comments to Caivan and Richcraft regarding their (premature and incomplete) Tree Conservation Report for the removal of a large portion of that woodlot. They will need to undertake spring surveys to properly assess its ecological functions and determine whether there is in fact significant wildlife habitat and/or habitat for SAR on site. The Master Servicing Study (MSS) (as the Environmental Assessment vehicle for this study area) needs to demonstrate the need for the pond expansion and the rationale for its expansion into the woodlot rather than in some other direction, as well as identify appropriate mitigation measures to ensure no negative impacts on the potential significant wildlife habitat and/or SAR habitat associated with the woodlot.	Noted. Kilgour & Associates Ltd. will remain the biological consultant for the stormwater management pond block as it pertains to the Headwater Drainage Feature Assessment (HDFA), Species at Risk (SAR) and Tree Conservation Report (TCR). Findings of Kilgour's work will be included in the CDP, Master Servicing Study (MSS) and supporting studies.
	I remain unconvinced about the necessity or feasibility of the collector road crossing the rock barren. The City's decisions must be consistent with the Provincial Policy Statement, which states that no development or site alteration shall be permitted within or adjacent to significant wildlife habitat unless it can be demonstrated that there will be no negative impacts on the feature or its ecological functions. No information has been presented to show how the construction and operation of this urban collector road can occur without substantial negative impacts to the hibernaculum and its functions. Although roads have been built through habitat for species at risk snakes in southern Ontario, this typically requires expensive design measures such as elevating the road to enable snakes to pass safely underneath it. We can readily avoid the need for such measures here by rerouting the road. The concept plan already includes a potential collector road connecting Vanguard and Innes to the west of the woods. I recommend that this western alignment be carried forward, and the direct road connection to	At the request of the City, a transportation analysis was completed to qualify the need for and impact of eliminating this right-of-way (ROW). The analysis concluded that the ROW is needed to facilitate community connectivity and not worsen the level of service in the area. The impact of the proposed road alignment on the snake hibernaculum will be addressed through discussions with the engineers and City staff. Options for a wildlife structure and alternative designs for limiting road mortality will be examined. The construction of the watermain, municipal services and utilities may require blasting and/or excavation. Niblett will assist in providing timing windows and mitigation measures to avoid impacts to overwintering snakes or emerging snakes.

Commenter	Comment	Response
	Frank Bender be replaced with a gravel path. This would provide local pedestrian/cycling access to the shopping centre, as well as a service access for the watermain that apparently needs to pass through the rock barren. It would also be consistent with the expressed desire in the matrix to deter cut-through traffic, which a direct connection to Frank Bender would encourage. I am somewhat less concerned about the watermain traversing the rock barren. The construction of the watermain will need to be carefully planned and executed of course, but it does not represent the same risk of ongoing lethal impacts during operation. Provided that the installation (and any future planned maintenance) is done outside of the sensitive timing window for the hibernaculum, and that the disturbance to the site is minimized to the extent possible, any negative impacts should be temporary. The same cannot be said for the road, which would represent an ongoing lethal threat to the snakes.	
	Finally, as noted by Steven during the meeting, the hydro corridor should be better addressed in the concept plan – what land uses will it include? If it is intended to provide open space, due to the easement constraints, then it should be shown as such. This could also assist with the ecological connectivity issues in this CDP area.	Aside from the Multi-Use Pathway (MUP) pathway proposed by City staff within the Hydro Corridor, there are no plans to program or develop the corridor at this time.
H. Smart Centres	Our only comment/request is that due to the mixed use nature of our Arterial Mainstreet zoning, we would like the small parkette removed from the CDP land use plan. Due to the uncertainty of the type of development that will occur on these lands, it makes sense to provide Cash in Lieu of Parkland which would support the larger parks in the CDP.	Parks staff do not want to accept cash-in-lieu for parks on the site because a park will be needed in proximity to residential land uses proposed for the site. City Staff have proposed that we keep the park as shown (a basic green block) and address in the CDP that location / size will be adapted as required.
I. Taillefer (represented by Novatech)	1. We are **concerned that the preferred land use plan will significantly erode or eliminate the already reduced Mixed Use Centre** designation in the Official Plan. We are not convinced that this is good land use planning, or consistent with the Provincial Policy Statement (PPS).	Noted
	2. We are concerned with respect to the "options" that will be/could be evaluated in the Environmental Assessment (EA) report. Only one of the options circulated recently respects the land use changes now in full force and effect from the approval of Official Plan Amendment (OPA) 180. It seems entirely	Concepts 1 and 2 have been modified into 1A and 1B and 2A and 2B to reflect the re-designations resulting from Official Plan Amendment (OPA) 180.

Commenter	Comment	Response
	unreasonable to be evaluating options that do not conform to the in force Official Plan (save and except for the Mixed Use Centre designation which is the subject of the MUC study). With respect to the lands east of Mer Bleue Road, all options should either conform to the in force Official Plan (which includes a Mixed Use Centre designation on a portion of the lands) or should be consistent with council's decision with respect to OPA 180 noting our appeal with respect to the Taillefer and Black Sheep lands.	
J. Blacksheep Developments (represented by Holzman Consultants)	1. On behalf of Black Sheep Developments, we echo and support Murray's comments	Noted
K. Evaluation Matrix Comments (City-Environmental)	Page 2, Note 1: General: This evaluation would be more credible if at least one other real option were included. Options 1 and 2 were developed in a public workshop before the planning framework for the area changed substantially - they are not viable options today, although some of this public input may have been carried forward in the later options developed by the study team.	Concepts 1 and 2 have been modified into 1A and 1B and 2A and 2B to reflect the re-designations resulting from Official Plan Amendment (OPA) 180.
	Page 2, Note 2: Connectivity within the natural heritage system: The stormwater pond is not part of the NHS; the Mud Creek significant valleyland and the Urban Natural Feature adjacent to the pond are. Will the hydro right-of-way (ROW) also provide ecological connectivity?	The uses proposed in the hydro right-of-way (ROW) may provide for some connectivity across the landscape. However road crossings and parking lots may create gaps in the contiguous nature of the ROW, lessening the effectiveness as a corridor.
	Page 2, Note 3: Hibernacula: City's decisions must be consistent with PPS: no negative impact to significant wildlife habitat. How can this be achieved?	See comment above regarding assessing options for road crossings in snake habitat.
	Page 2, Note 4: Species at Risk: What about the Least Bittern habitat? Need to address it here and in Option 3.	The Least bittern was discussed with Ministry of Natural Resources and Forestry (MNRF) staff. The continued presence of least bittern would need to be confirmed prior to changes/removal of the pond. MNRF was not sure if stormwater management ponds are covered under the Environmental Site Assessment (ESA) and what permitting/compensation would be required. Further detailed discussion with MNRF is required to understand how the ESA applies.
	Page 3, Note 1: Protection of Recharge Areas: Can this be quantified at all (hectares of areas with greatest potential preserved)?	DSEL can quantify number of hectares where low-intensity land uses (e.g. enviro buffer, parks) intersect with areas of greatest recharge potential, if requested by project team. However, please note that many park and development areas will be subject to grade raises, thereby inherently changing the post-development

Commenter	Comment	Response
		infiltration pattern in these areas.
	Page 3, Note 2: Total Area and Distribution of Parkland: As above, can this be quantified? (Recognise that given City requirements there may not be much difference in quantities here).	Concept 1A/1B: 64,935 m^2 of parkland Concept 2A/2B: 66,570 m^2 of parkland Concept 3: 91,829 m^2 of parkland

MEETING MINUTES
EUC PHASE 3 AREA CDP- TAC #5

Meeting/Project Name: East Urban Community (EUC) Phase 3 Area Community Design Plan (CDP) Technical Advisory Committee (TAC) Meeting #5

Date of Meeting: January 28, 2019 **Time:** 10:00 am to 4:30 pm

Location: City Hall, Festival Room

Meeting Objective

To discuss the draft CDP, Area Parks Plan (APP), Transportation Master Study (TMS) and Master Servicing Study (MSS).

Attendees

Name	Representing	Email
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Regrets

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Meeting Minutes

Morning Session (Planning, Parks, Environment)

/ Genya (OC Transpo) noted that OC Transpo currently uses Viseneau Drive as a transit route and therefore would prefer that a collector street run north from the Vanguard Drive extension to Innes Road in the location of Viseneau Drive. Genya noted that use of the "potential local street" through Richcraft's lands would provide greater transit service coverage and ridership through the community, however transit would require full movement at its intersection with Innes Road. The project team explained that the connection of the local street to Innes Road would have to be right-in/right-out due to the traffic lights that currently exist or have been approved to be added to this stretch of Innes Road (e.g. on the Caivan lands).

/ Genya (OC Transpo) requested that a legend item on the Transit Facilities Plan be changed from "Potential Local Transit Route" to "Potential Transit Street". **Fotenn to revise the Transit Facilities Plan.**

/ Royce (City- Employment) does not think the lands located to the northwest of the Mer Bleue BRT station will ever be developed- should they be netted out of the employment calculations? Richcraft owns these lands and expects them to be developed in the future.

/ Royce (City- Employment) indicated that the snow disposal facility will remain, therefore redevelopment of the land should not be assumed in the CDP or supporting documents.

/ Royce (City- Employment) noted the policy established by OPA 180 which requires a minimum density of 200 jobs per hectare within 400 metres of the Mer Bleue BRT station. Julie (Fotenn) noted that a motion was passed when OPA 180 was approved by Council which states this density target is permitted to be modified through the CDP process.

/ Royce (City- Employment) questioned whether the Blacksheep Developments OPA 180 appeal settlement contained a minimum density requirement. Royce subsequently confirmed that there was no minimum density assigned to these lands.

/ Mike (Glenview) questioned if an Employment designation is the best designation for the snow disposal facility.

- Susan (Minto) noted that the block located southwest of Brian Coburn Boulevard and Fern Casey Boulevard is a registered block. It was questioned whether parkland dedication has already been provided for this block (in which case it should be removed from the CDP parkland calculations). Michael (City- Planning) confirmed after the TAC meeting that this block is part of an approved plan of subdivision, for which parkland dedication has been provided in the EUC Phase 1 Area. **Fotenn to revise APP to exclude this block from parkland dedication calculation in EUC Phase 3 Area.** It was suggested that the three circles (5 min walking distance) shown from parks located outside of the CDP study area should be removed from the CDP Parks Area Plan to avoid confusion. They were recently added to demonstrate that the majority of the CDP study area is served by existing or proposed parkland. **Fotenn will remove the circles from the plan.**

- Julie Lebrun (City- Planning) asked if end caps (units oriented towards the street) could be added along the west side of the collector street abutting the Community Park, so that homes face the park and more units have driveways onto the collectors to slow down traffic. Genya (OC Transpo) noted that driveways and bus stops will need to be strategically placed at the time of subdivision so that buses are not stopping in front of driveways or homes.

- Julie Lebrun (City- Planning) noted that the official name for the Montfort site is "Orléans Health Hub by Santé Montfort". **Fotenn to include the official name in the CDP and ensure all references are consistent.** Julie Lebrun noted that the Institutional CDP designation (which only applies to the Montfort site) should reflect the uses permitted in the existing zoning, including accessory uses. **Fotenn to revise the CDP accordingly.**

- Julie Lebrun (City- Planning) noted that the Multi-Use Pathways (MUP) on the Montfort site have been revised. Julie Lebrun subsequently provided the revised locations; **Fotenn will update the Pedestrian & Cyclist Plan accordingly.**

- Ingrid (City- Parks) noted that the parkette on the Montfort site has been revised slightly. **Fotenn to update the Parks Area Plan in the CDP and the APP accordingly.**

- Ingrid (City- Parks) requested that language be added to the CDP which requires the sidewalk (on select local streets) to be located on the same side as the park. **Fotenn to add this language.**

- Ingrid (City- Parks) requested that the Pedestrian and Cyclist Facilities Plan be modified so that a MUP extends along the northern edge of the stormwater management pond block to the Caivan subdivision. Ingrid also questioned the extension of the MUP through the Neighbourhood Park that abuts the stormwater management pond block. A MUP is 3.0 metres wide and requires heavy duty asphalt, which would come out of the park budget (which is already constrained). It was suggested that the MUP continue as a recreational trail through the Neighbourhood Park, which would only require a 1.8 metre wide, light duty asphalt path and would not be winter maintained. The tennis court on the Facility Fit Plan would need to be moved eastwards so that the pathway can be extended northwards from the pond block to the northern edge of the park. **Fotenn to revise the APP and Pedestrian and Cyclist Facilities Plan accordingly.**

- Ingrid (City- Parks) requested that the disclaimer on the **Facility Fit Plan for Neighbourhood Park #1 be revised to note that an example of a facility that may be added in the future (in lieu of a facility currently shown) is an off-leash dog area**.

- It was questioned how the north-south MUPs will cross the hydro corridor. Genya (OC Transpo) noted that the crossing has to be grade-separated after the BRT is developed (**Fotenn will add text to the CDP**). The BRT corridor will not be lit (only the stations themselves). The Mer Bleue BRT station is planned to be grade-separated and the western BRT station is planned to be at-grade in the "Cumberland Transitway, West of Navan Road to East of Tenth Line Road, Preliminary Design" (Stantec, September 2014).

/ The existing pathway through Innes Park Woods was discussed. The pathway is wide and flat.

/ It was noted that the references to "Mixed Use Centre" need to be removed from the APP. **Fotenn to revise.**

/ Amy (City- Environment) noted that it is very difficult to keep snakes off of roads. Ideally there would not be a road proposed through the rock barren (Provincially Significant Habitat). It was noted that even if there was not a road proposed, a trunk watermain must be constructed in the same location given that the water tower is located to the immediate north of Innes Park Woods. Amy noted that it must be demonstrated that the road construction will have no negative impacts. One suggestion to achieve this is to build a snake hibernaculum in the stormwater management (SWM) pond block using rock (must go below the frost line and be relatively dry). Further, the road construction should occur outside of the winter months (late October to April), when the snakes are hibernating. The design process will be an expensive endeavour. It is not a Development Charge-funded road. It was noted that a graphic showing the proposed snake crossing design is included in the appendix of the MSS. It was noted that unless a road design is related to an Environmental Assessment project, Amy is not circulated.

/ Amy (City- Environment) noted that **the reference to a "30 m buffer" in the CDP text and plans needs to be revised to "**30 m of land adjacent to rock barren". The "5 m setback" terminology is ok.

/ **Inge (Ottawa Public Health)** noted that she has some questions regarding the snow disposal facility, which she **will provide to Robin**.

Afternoon Session #1 (Transportation)

/ Julie (City- Planning) questioned the proper right-of-way (ROW) width for window streets. Is a 14 m ROW sufficient, or is 14.5 m or 14.75 m required? It was noted that window streets are only shown on the Demonstration Plan for lands located south of Brian Coburn Blvd. Fairouz (Richcraft) confirmed after the TAC meeting that the window streets on the Demonstration Plan have been designed with a 14.5 m ROW.

/ Frank (City- Transportation/EA) noted that he has requested that **Castleglenn prepare a memorandum that addresses the road and transit infrastructure that will ultimately be required for South Orléans.** Frank has also requested that **Castleglenn make minor changes to the TMS**.

- The memorandum will not address funding/timing of the infrastructure (which is the role of the City's Transportation Master Plan (TMP)), it will simply identify the infrastructure that will be required to serve full build-out of all urban lands considered in the catchment area.

- It was noted that road/transit projects must be added to the City's TMP before they will be considered for inclusion in the list of Development Charge-funded projects.

/ Kornel (City- Servicing) questioned why double sidewalks and double cycle tracks are not proposed for the new collector streets. He is ok with MUPs, but they present a challenge at intersections as they do not allow for safe cyclist crossings.

- Fairouz (Richcraft) noted that the 24 m wide ROW width could not accommodate double sidewalks/double cycle tracks due to the required setbacks for tree planting in sensitive clay soils, utility locations within the ROW, and municipal infrastructure setbacks. Fairouz noted that the proposed collector cross-sections match the cross-sections of the collector streets that are approved for the Caivan subdivision to the immediate west.

- Mike (Glenview) asked if reducing the pavement width within the 24 m ROW could be the solution. Genya (OC Transpo) confirmed that the existing pavement width (3.5 m/lane) is the minimum that buses require, therefore the pavement width cannot be reduced.

Afternoon Session #2 (Servicing)

- It was discussed that **DSEL will revise the MSS to assume that the snow disposal facility will not be redeveloped in the future**.

- John (City – Servicing) noted that from a cursory review, he has no issues with the wastewater or water infrastructure as proposed.

- Laurent (City- Servicing) provided an update on the Mud Creek Cumulative Impacts Study.

  - Future development will be required to manage the first 10 mm of rainfall on-site, maximizing infiltration through the use of Low Impact Development (LID) measures.

  - The consultant (Stantec) is working on a conceptual design for improvements to Mud Creek and cost estimates will be available within the next few weeks. The cost estimates are expected to be within the $4 to $6 million range, with approximately 60% to be paid for by future development (approximately 40% is a benefit to existing development).

  - The City will be meeting with the National Capital Commission (NCC) soon as the Mud Creek improvement works would be undertaken on NCC lands. **Fairouz (Richcraft) asked if landowners could either attend the meeting with the NCC or meet with City Staff beforehand to go over what will be discussed at the meeting with the NCC**. Laurent suggested a working group meeting be set up.

  - Laurent noted that DSEL had been asked to provide a water budget for future and existing conditions, and that Laurent had reviewed and approved the Terms of Reference for the water budget approach. Work is underway.

- The northeast corner of the CDP study area was discussed. An MSS was approved for this area in 2006 and the recommendations of the 2006 MSS were carried forward in the EUC Phase 3 Area CDP MSS. Darlene (City- Servicing) and Ted (City- Servicing) noted that the MSS is out of date and Bilberry Creek has had major slope failures recently that resulted in residents being evacuated from their homes. Jeff (City-Planning) acknowledged that Development Review were processing applications under the approved 2006 MSS. Fairouz (Richcraft) suggested that 'supplementary' stormwater management to address erosion issues in Bilberry Creek be addressed through the individual Site Plan Control or Plan of Subdivision applications. If the City requires an update to the 2006 MSS, it is beyond the scope of the EUC Phase 3 Area CDP MSS and these lands should be removed from the MSS study area so that they do not hold up the CDP.

- The outlet (Mud Creek) for the existing SWM pond, which is proposed to be expanded, was discussed, as the City identified a potential concern with legal status of the outlet at a project meeting in December 2018. The legal outlet matter is to be discussed internally by City staff and should be addressed with the NCC as well, as they are thought to own substantial portions of Mud Creek. Charles (MOECP) indicated that he was not aware of any legal issues with the existing outlet and acknowledged that the ECA for the existing SWM pond includes the approximately 100 ha area historically approved to be diverted from McKinnon's Creek to Mud Creek via the existing SWM pond.

/ The use of sump pumps in the southwest corner of the study area was discussed. Michel (City- Servicing) noted that if sump pumps are to be included as an option in the MSS, then justification per the City's Sump Pump Guidelines should be addressed in the MSS (i.e. HGL, soil type, grade raise restrictions, surcharge efforts, etc.); no requirement to do long term monitoring is required.

/ The City's peer review of Paterson's geotechnical reports was discussed. The City often undertakes peer reviews when geotechnical reports are used in an MSS. The peer review will include reviewing Golder's June 2018 report. It was noted that Paterson prepared a memo addressing permissible grade raise exceedances, a copy of which was provided to the City by Richcraft.

/ The footprint of the stormwater management pond expansion was discussed.

- o There was concern about the proximity of the corners of the SWM pond to the existing watercourse from the Caivan development to the west, to the existing Caivan outlet pipe, and to the City's snow disposal facility outlet pipe. **Ted (City- Servicing) requested detailed cross sections and geotechnical info for the valley banks, since they will act like a dam**. DSEL indicated that Golder prepared a slope stability analysis for this watercourse, which established the setbacks to the SWM pond. Richcraft provided the City with a copy of the Golder report, and it is also included in the MSS and the Paterson geotechnical report as an appendix.

- o **Amy (City- Environment) would like confirmation from City engineering staff that the pond footprint is not likely to change** (so that trees are not cut down unnecessarily to accommodate the pond expansion). Amy has reviewed the Tree Conservation Report/Environmental Impact Statement that was submitted specific to the proposed pond expansion and only has a few comments, which will be provided to the study team upon confirmation of pond footprint. **Laurent (City- Servicing) will check the volumes required and the pond footprint**.

- o Natasha (City- Servicing) would like to see a functional design for the pond expansion (location of access roads, sediment storage area, etc.) to see how it fits into existing constraints. **DSEL will update the figures in the MSS accordingly**.

- o It was noted that the sediment storage area is located within the hydro corridor on original design drawings for the SWM pond, but it is not known how the City manages sediment removal for the existing pond. It was asked if the sediment storage area is located on the transmission water main (possible). Natasha noted that the City typically likes to own the lands on which the sediment is being stored. In this case, the City would want sign-off from Hydro One. **Laura (DSEL) and Natasha will meet to discuss, along with Amy**, who has suggested that a snake hibernacula be created in the stormwater pond block.

- o It was questioned whether the hydro corridor lands, identified as Open Space on the CDP plans, will be dedicated to the City or to Hydro One. **Richcraft to comment on their long-term intensions with the hydro corridor.**

/ Jamie (RVCA) noted that RVCA has approved Niblett's headwater drainage features study. **RVCA requests that the MSS detail hydration of any maintained headwater features** with the use of LIDs or other measures, so that there are no problems when it comes to detailed design.

/ Charles (MOECP) noted that there is a concern that implementing LIDs in the CDP area would introduce unacceptable levels of chlorides in groundwater.

/ Laurent (City- Servicing) requested a major system drainage plan and responses to other preliminary comments on the stormwater portion of the MSS. **Laura (DSEL) and Laurent will meet to discuss.**

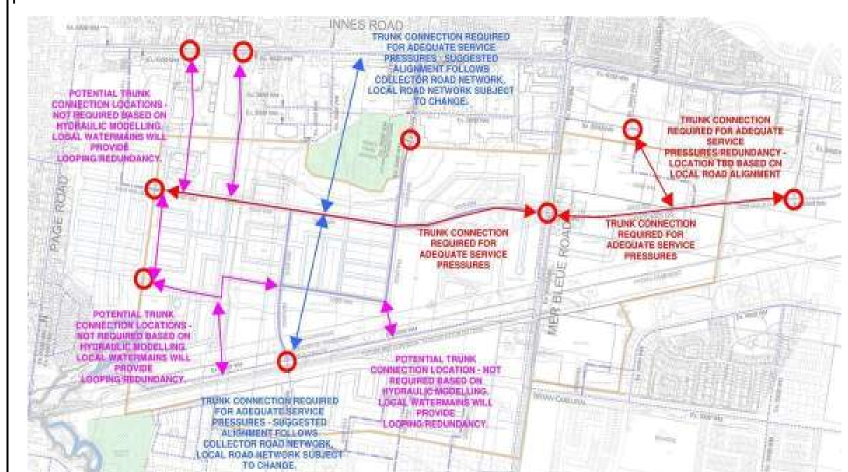
/ It was noted that there is a small stormwater management facility located within the CDP study area, behind the Canadian Tire. City staff are to provide historical approval information about the design of the pond, then discuss how the pond ought to be addressed in the MSS.

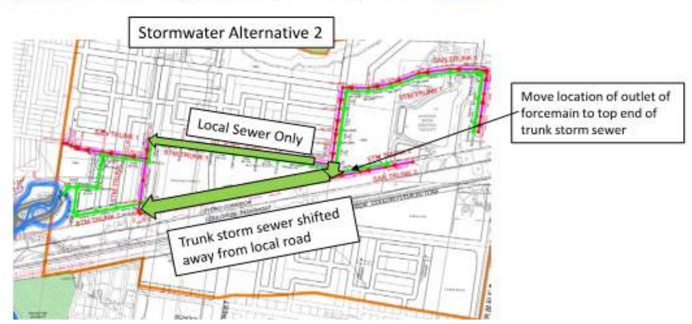
14-733 EUC Phase 3 Area CDP
Prepared by DSEL
28-Oct-19

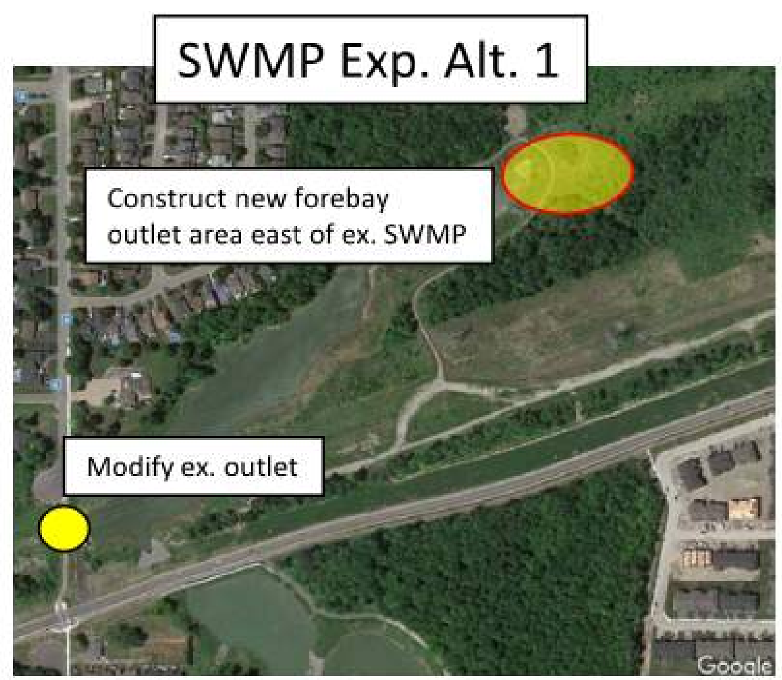
Comment Source	Comment Type	Commer	Comment	
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Major System	1	Peak flow and depth of flow along the major system for the 100-year storm are to be provided for all road sections of the major system to ensure compliance with Sewer Design Guidelines criteria.	Most areas in the NW and SW quadrants have been designed with either 100-year capture, or sufficient surface storage to fully contain the excess 100-year major system flows, such that the static storage may be up to 35 cm deep, and there is no dynamic overflow depth above the static storage during the 100-year storm. However, for those areas with negligible surface storage and less than 100-year capture, the maximum flow and flow depth along a typical road cross-section has been calculated as attached to demonstrate conformance with City of Ottawa standards. See **Attachment A**. Note that these areas include Mer Bleue Road (10-year capture, excess major system flows to external system), and any potential development blocks draining overland to the street or an open ditch. The actual major system flows on Mer Bleue Road and on these development blocks are to be determined at the detailed design stage; however, as a preliminary estimate, the major system flows and flow depths have been estimated based on example 100-year flows less minor system capture. An 8.5 m wide road cross-section has been assumed for the purpose of these preliminary calculations. As may be seen in the attached, the 100-year dynamic flow depth on the EUC portion of Mer Bleue Road to Pond 1 is estimated as 7.1 cm maximum at the gutter. Similarly, the 100-year dynamic flow depth in any of the potential development blocks without 100-year capture or surface storage is estimated as 16.8 cm maximum at the gutter.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Major System	2	A major system drainage plan is required. Cross sections and hydraulic capacity calculation should be provided for any major system conveyance feature (e.g. swales, open ditches and culverts).	Overland drainage directions are depicted in **Drawing 2**. It should be noted that local surface storage of 100-year flows less minor system capture is to be provided for the majority of the site on roads and in development blocks, except for the specific exceptions for capture and storage depicted on **Drawing 4.** As such, the major system flow areas in the attached figure indicate the direction of safe overland flow conveyance only in the event of a greater than 100-year storm, blockage, or emergency conditions. An open ditch in the hydro corridor will convey excess flows beyond the 100-year storm from several development blocks to the pond. Based on SWMHYMO modelling, the estimated 1.446 cms 100-year flow + 20% stress test could be conveyed at a maximum depth of 22 cm in a trapezoidal ditch with 20 m bottom width, 3H:1V side slopes, 0.20% longitudinal slope, and an assumed Manning's roughness coefficient of 0.05. This estimate and ditch sizing is presented in Appendix E, and should be confirmed at a later design stage. Also note that a culvert is to be installed under the collector road crossing the hydro corridor in order to allow safe conveyance of flows in the ditch to the pond, and will be sized as needed.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Major System	3	The report should include a table to specify the major system storage requirements per land use in cubic meter per hectare.	Unit 100-year storage volumes for those areas with on-site surface storage are summarized in **Attachment B.** Please note that the volumes simulated do not define surface storage requirements, but simply the preliminary modelling approach used to estimate attenuation provided by both surface and sub-surface storage and routing. Actual surface volumes used are to be evaluated at the detailed design stage. High-level calculations of surface storage requirements on typical roads were prepared for the May 2014 Stormwater Management Guidelines for New Developments Draft Report for the City of Ottawa by JFSA, and were adapted in **Attachment B** to demonstrate that sufficient surface storage could be provided on the EUC lands to retain the 100-year flows (less minor system capture) within road ponding areas. Roads within the EUC development to Pond 1 generally have high point to high point slopes of 0.10% to 0.15%. Per the October 2018 EUC memo, 100-year minor system capture was set to 114% of the minimum capture requirement (e.g. 2-year flows + 14%) to account for additional capture through standard catchbasins and / or ICDs under the higher head over the grate and lead pipe. The attached high-level calculations show that sufficient surface storage can be provided in a 35 cm deep static ponding area on a local road, at 0.10% or 0.15% high point to high point slope, to retain the 100-year flows less 2-year + 14% or 5-year + 14% minor system capture.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Minor System	4	The scale of the conceptual storm servicing plan should be revised to improve legibility (a separate plan should be provided for each quadrant).	The DSEL storm servicing plan is a full size Arch D drawing showing all four quadrants. The JFSA storm servicing is scaled to Arch E paper for the hard copy MSS.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Minor System	5	A Plan and Profile should be provided for each street segments within the CDP area (i.e. for all four quadrant). The scale of the profiles should be revised to improve legibility.	In the MSS, trunk infrastructure and associated street profiles are shown for the NW quadrant, as these are the subject of the MCEA. Local road profiles are not provided in the MSS, as the road network is subject to change as part of future Planning Act approvals. Per the scope of the MSS study, the information for the other quadrants is based on extensions of existing services defined in background studies - profiles for these areas can be found in the associated studies (e.g. Stantec MSU, DSEL report for Trails Edge, etc.). The scale of the profile for the NW quadrant has been set for Arch E paper for the hard copy MSS.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Minor System	6	The following information should be shown on the profiles: existing ground elevation, bedrock elevation, the 100-yr HGL, road crossings, any other major utility crossing (sani, water, gas).	The requested info has been included in the Plan and Profiles for the NW quadrant.

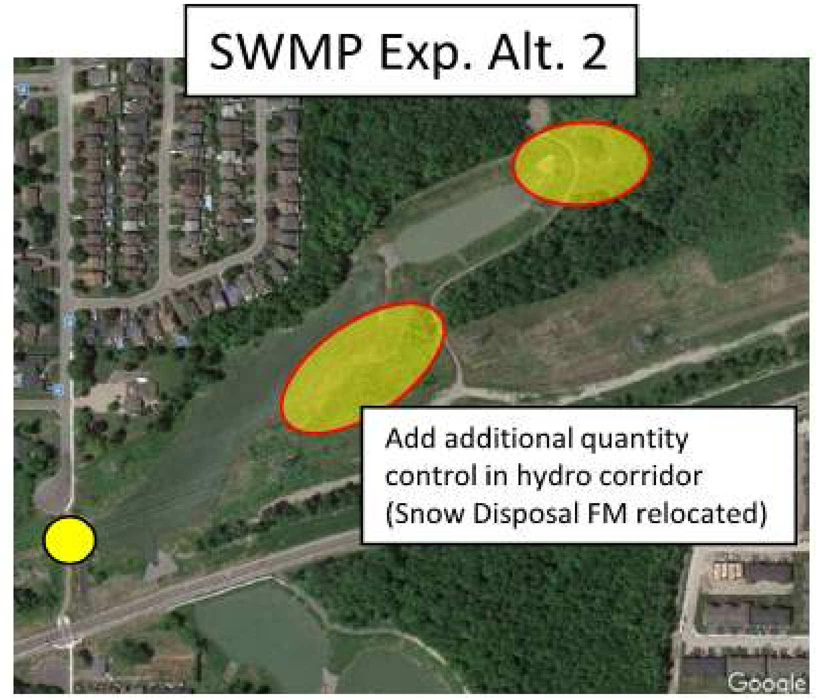
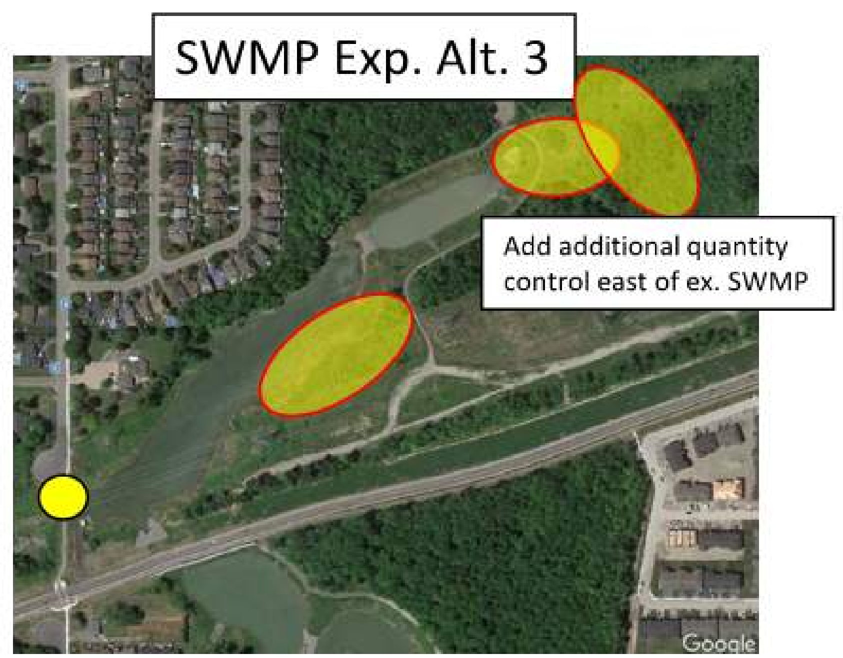
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Runoff Volume Control Target (RVCt) for the west quadrants	7	A water budget for existing and future conditions should be provided using a continuous modeling approach. The report should demonstrate how the runoff from the first 10 mm of runoff will be managed on-site following the RVCt hierarchy presented in the draft MOECC LID Manual.	Through coordination with the City of Ottawa, it is understood that the target that the first 10mm of rainwater infiltrate the site through Low Impact Development measures was a target that was discussed in early stages of the Mud Creek Cumulative Impacts Study, but is not being carried forward due to the limited infiltration potential of the soils, insufficient clearance to groundwater table and bedrock in a significant portion of the study area, and insignificant differences to downstream erosion protection measures whether or not the LID target were to be implemented. As such, continuous post development modeling has not been provided.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Runoff Volume Control Target (RVCt) for the west quadrants	8	A concept plan should be provided to identify the type and location of Low Impact Development (LID) measures for different land use. Typical cross sections should be provided to demonstrate how LID measures will be integrated within the ROW.	Through coordination with the City of Ottawa, it is understood that LIDs within the ROW are not being pursued in the EUC CDP area, given the limited infiltration potential of the soils, insufficient clearance to groundwater table and bedrock in a significant portion of the study area, and the City's operation and maintenance concerns. This does not preclude their implementation in the study area, should the City implement city-wide measures through City Standards, etc.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Runoff Volume Control Target (RVCt) for the west quadrants	9	Conceptual calculation should be provided to show the benefits of LID measures (captured drainage area, retention/retention volume, flow attenuation) assuming different soil and ground water conditions. A working group meeting should be put in place to discuss/review the proposed LID conceptual plan.	See response to Comment 7 & 8.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - Runoff Volume Control Target (RVCt) for the west quadrants	10	The report should include a section on RVCt and LIDs that documents the LID selection rational.	See response to Comment 7 & 8.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - EUC Pond 1	11	A functional-level design should be provided to support the proposed changes to the EUC Pond1 (sediment drying area, access road, inlet structures)	See the revised EUC Pond 1 Figure 3 & 3A for details.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - JFSA EUC/Preliminary HGL Analysis and Pond Design	12	The minor system HGL calculation and the EUC Pond 1 operating characteristics should also be provided for the 12-hr SCS storm event.	The original pond design & associated downstream outflow targets is based on the 24-hour SCS storm. The MSS uses this design storm for comparison purposes, and alternate storm events have not been included in the MSS.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - JFSA EUC/Preliminary HGL Analysis and Pond Design	13	Additional clarifications are required to support the minor system capture and major system storage assumption made for the different drainage areas. For example, a 5-year minor system capture rate with on-site storage should be provided for the medium density blocks (dry storage will likely be required). On-site storage should be provided for the mid-high density block.	The capture rates and storage requirements have been updated to address City comments. See **Drawing 4** and the June 2019 JFSA report in Appendix E for details.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - JFSA EUC/Preliminary HGL Analysis and Pond Design	14	Is there a permission from Hydro to use their corridor to convey the major system flow to the pond?	Hydro One will be notified of the proposed open ditch as well as all infrastructure proposed in/near the corridor. Currently the affected lands are owned by Richcraft Homes and the City of Ottawa, with easements or agreements in favour of Hydro One.
Laurent Jolliet - Email Correspondence dated 2018-12-28	Preliminary Storm Comments - North East Quadrant	15	An enhanced level of protection (80% TSS removal) is required for the North East quadrant, in addition to water quantity control. In order to meet these objectives and reduce erosion impacts on the downstream receiving system, it would seem logical for the servicing solution to include a SWM wet pond (as opposed to multiple end-of-pipe units and on-site controls). This 30 ha area should be treated similar to other urban development areas in Ottawa of similar sizes.	The MSS has been updated based on coordination with City staff. 80% TSS removal is specified for the NE quadrant. It is acknowledged that there are erosion issues in Bilberry Creek, and that the City will address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area. The MSS acknowledges that the City may choose to divert some flows away from Bilberry Creek (e.g. flows in the Northeast Quadrant, south of Vanguard Drive, may be redirected towards existing infrastructure within the McKinnon's Creek watershed). This may involve incorporating infiltration measures, surface or underground storage measures, etc., within the lands in the Northeast Quadrant.
TAC - Julie Lebrun - 2019-01-28 Meeting Minutes	Transportation	16	Is a 14 m ROW sufficient, or is 14.5 m or 14.75 m required for window streets? It was noted that window streets are only shown on the Demonstration Plan for lands located south of Brian Coburn Blvd.	Per the TAC meeting minutes, window streets are only shown on the Demonstration Plan for lands located south of Brian Coburn Blvd (Richcraft lands). Richcraft has confirmed after the TAC meeting that the window streets on the Demonstration Plan have been designed with a 14.5 m ROW.
TAC - 2019-01-28 Meeting Minutes	Servicing	17	It was discussed that the snow disposal facility should be assumed to not be redeveloped in the future.	DSEL has revised the MSS to assume that the snow disposal facility will not be redeveloped in the future for sizing of servicing infrastructure. However, some notes are provided in the MSS to explain that sufficient capacity exists in the downstream systems for future development, provided the restrictions detailed in the updated MSS are met (e.g. on-site quality control provided, limited to existing max release rate or another rate defined via future studies, etc.).
TAC - John Bougadis - 2019-01-28 Meeting Minutes	Servicing	18	No issues with the wastewater or water infrastructure as proposed.	Noted.
TAC - Laurent Jolliet - 2019-01-28 Meeting Minutes	Servicing	19	Future development will be required to manage the first 10 mm of rainfall on-site, maximizing infiltration through the use of Low Impact Development (LID) measures.	See response to Comment 7 & 8.
TAC - Laurent Jolliet - 2019-01-28 Meeting Minutes	Servicing	20	Stantec is working on a conceptual design for improvements to Mud Creek and cost estimates will be available within the next few weeks. The cost estimates are expected to be within the $4 to $6 million range, with approximately 60% to be paid for by future development (approximately 40% is a benefit to existing development).	Detailed cost breakdown has been requested from City staff to better understand the contributions assigned to the EUC CDP area. Results are to be included in the upcoming Financial Implementation Plan.
TAC - Laurent Jolliet - 2019-01-28 Meeting Minutes	Servicing	21	The City will be meeting with the National Capital Commission (NCC) soon as the Mud Creek improvement works would be undertaken on NCC lands. Richcraft asked if landowners could either attend the meeting with the NCC or meet with City Staff beforehand to go over what will be discussed at the meeting with the NCC. City suggested a working group meeting be set up.	Noted. DSEL met with City staff prior to their Summer 2019 meeting with NCC.

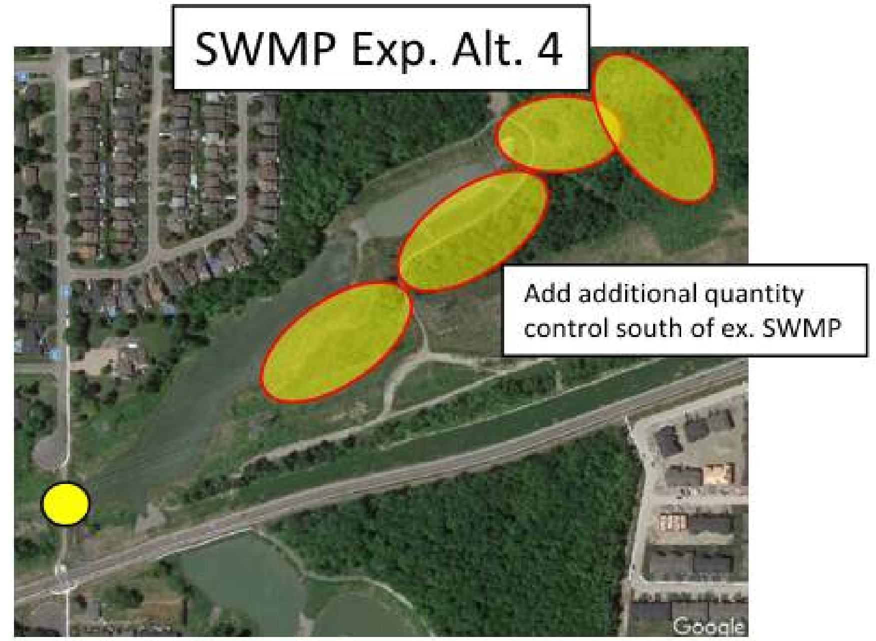
TAC - Laurent Jolliet - 2019-01-28 Meeting Minutes	Servicing	22	DSEL had been asked to provide a water budget for future and existing conditions, and that City had reviewed and approved the Terms of Reference for the water budget approach.	See response to Comment 7 & 8.
TAC - Darlene Conway & Ted Cooper - 2019-01-28 Meeting Minutes	Servicing	23	The MSS is out of date and Bilberry Creek has had major slope failures recently that resulted in residents being evacuated from their homes.	Per the TAC meeting minutes, City- Planning acknowledged that Development Review was processing applications under the approved 2006 MSS. During the TAC meeting, Richcraft suggested that 'supplementary' stormwater management to address erosion issues in Bilberry Creek be addressed through the individual Site Plan Control or Plan of Subdivision applications within the NE quadrant. It was discussed that if the City requires an update to the 2006 MSS, it is beyond the scope of the EUC Phase 3 Area CDP MSS. See response to Comment 15.
TAC - 2019-01-28 Meeting Minutes	Servicing	24	The outlet (Mud Creek) for the existing SWM pond, which is proposed to be expanded, was discussed, as the City identified a potential concern with legal status of the outlet at a project meeting in December 2018.	Per the TAC meeting minutes, the legal outlet matter was to be discussed internally by City staff and with the NCC, as they are thought to own substantial portions of Mud Creek. The MECP indicated that they were not aware of any legal issues with the existing outlet and acknowledged that the ECA for the existing SWM pond includes the approximately 100 ha area historically approved to be diverted from McKinnon's Creek to Mud Creek via the existing SWM pond.
TAC - Michel Kearney - 2019-01-28 Meeting Minutes	Servicing	25	If sump pumps are to be included as an option in the MSS, then justification per the City's Sump Pump Guidelines should be addressed in the MSS (i.e. HGL, soil type, grade raise restrictions, surcharge efforts, etc.); no requirement to do long term monitoring is required.	Note that sump pumps are recommended to be advanced for future consideration for detailed design of residential areas in the Southwest quadrant. As shown in Section 11.4.5 of the MSS, Paterson Group has indicated that the requirements laid out in ISTB-2018-04 apply (e.g. HGL cannot be lowered due to outlet restrictions, area is underlain with clay soils subject to grade raise restrictions, etc.).
TAC - 2019-01-28 Meeting Minutes	Servicing	26	The City's peer review of Paterson's geotechnical reports was discussed. The City often undertakes peer reviews when geotechnical reports are used in an MSS. The peer review will include reviewing Golder's June 2018 report.	Per the TAC meeting minutes, it was noted that Paterson prepared a memo addressing permissible grade raise exceedances, a copy of which was provided to the City by Richcraft.
TAC - 2019-01-28 Meeting Minutes	Servicing	27	There was concern about the proximity of the corners of the SWM pond to the existing watercourse from the Caivan development to the west, to the existing Caivan outlet pipe, and to the City's snow disposal facility outlet pipe. City- Servicing requested detailed cross sections and geotechnical info for the valley banks, since they will act like a dam.	Golder has provided an updated slope stability analysis for the pond and adjacent watercourses, which established the setbacks to the SWM pond. The updated report is included in Appendix H. Additional cross sections are provided in **Figure 3A.**
TAC - Amy MacPherson - 2019-01-28 Meeting Minutes	Servicing	28	Would like confirmation from City engineering staff that the pond footprint is not likely to change (so that trees are not cut down unnecessarily to accommodate the pond expansion). I have reviewed the Tree Conservation Report/Environmental Impact Statement that was submitted specific to the proposed pond expansion and only has a few comments, which will be provided to the study team upon confirmation of pond footprint.	The pond footprint has been modified since the time of the TAC meeting. See response to Comment 11 & associated figures.
TAC - Natasha Baird - 2019-01-28 Meeting Minutes	Servicing	29	Would like to see a functional design for the pond expansion (location of access roads, sediment storage area, etc.) to see how it fits into existing constraints.	See response to Comment 11 & associated figures.
TAC - 2019-01-28 Meeting Minutes	Servicing	30	It was noted that the sediment storage area is located within the hydro corridor on original design drawings for the SWM pond, but it is not known how the City manages sediment removal for the existing pond. It was asked if the sediment storage area is located on the transmission water main (possible). Natasha noted that the City typically likes to own the lands on which the sediment is being stored. In this case, the City would want sign-off from Hydro One.	According to legal PIN information, the identified sediment management area is on City owned lands. Assuming the City's agreements with Hydro One are similar to agreements by other land owners in the area, the sediment management area is considered to be acceptable in this location provided it does not interfere with the safe and efficient operation of the Hydro One lines. Based on available City mapping, the existing 600mm dia. watermain and 150mm dia. forcemain run underneath the existing sediment management area, consistent with the original designs. The MSS proposes that the existing sediment management area serve the proposed pond just as it serves the existing pond. Additional details about the operation of the sediment management area are provided in the Stantec 2012 Operations and Maintenance Manual for existing EUC Pond 1.
TAC - Jamie Batchelor - 2019-01-28 Meeting Minutes	Servicing	31	RVCA has approved Niblett's headwater drainage features study. RVCA requests that the MSS detail hydration of any maintained headwater features with the use of LIDs or other measures, so that there are no problems when it comes to detailed design.	See RVCA responses, Comment 6.
TAC - Charles Goulet - 2019-01-28 Meeting Minutes	Servicing	32	There is a concern that implementing LIDs in the CDP area would introduce unacceptable levels of chlorides in groundwater.	Noted. Through coordination with the City of Ottawa, it is understood that LIDs are not being pursued in the EUC CDP area, given the MECP's concern and other constraints listed in the response to Comment 7 & 8.
TAC - Laurent Jolliet - 2019-01-28 Meeting Minutes	Servicing	33	Requested a major system drainage plan and responses to other preliminary comments on the stormwater portion of the MSS. DSEL and Laurent will meet to discuss.	See City Comment 2.
TAC - 2019-01-28 Meeting Minutes	Servicing	34	It was noted that there is a small stormwater management facility located within the CDP study area, behind the Canadian Tire. City staff are to provide historical approval information about the design of the pond, then discuss how the pond ought to be addressed in the MSS.	Per the First Innes Shopping Centres, Stormwater Management Report - Phase 3 Update (Stantec Feb 2006), the stormwater management facility is a permanent surcharge basin at the upstream end of the shopping centre's storm sewer system. The pond is required due to a restrictive release rate to the downstream sewers on Frank Bender Street. The 0.3. ha stormwater management facility is to be left as-is and the MSS has been updated accordingly.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	General	35	The MSS has been prepared with the intention of fulfilling documentation requirements of the MEA Class EA process. It is normal practice for the City to require documentation and evaluation of alternatives in the MSS prior to recommending the approval by Council of the preferred water, wastewater and stormwater servicing plans (I have attached excerpts from the Area 10 MSS that provides an example of the typical type of servicing alternatives considered / evaluated in an MSS).	Noted. The public consultation report (that will be published as a MCEA document alongside the existing conditions report, the MSS, the MTS, and the CDP) will describe the evaluation of alternative development scenarios and associated servicing options. A summary of the evaluation that was presented at TAC #4 (**Attachment D**) and the associated responses to City comments (**Attachment E**) are attached, and the MSS has been updated to include this information in Appendix I. Further information about the consideration of alternative designs is provided in the MSS, as detailed in the responses that follow.

IPU - Ted Cooper - Email Correspondence dated 2019-04-29	General	36	It is acknowledged that previous servicing plans have been approved in recent years in the Southeast and Southwest quadrants that need not be re-opened (unless affected by changes in development / servicing elsewhere in the EUCMUC). However, the Northwest quadrant is largely a greenfield area where servicing alternatives are not constrained. (For the Northeast quadrant, given the passage of time and change in environmental setting, should this area remain part of the EUCMUC study area, existing preferred servicing approaches would need to be re-confirmed or revised as appropriate).	Noted. Detailed servicing alternatives and designs are provided for the Northwest quadrant. For the Northeast quadrant, see response to Comment 15 above.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	General	37	We are not requesting an exhaustive development and evaluation of alternatives. We explain what would be helpful in our comments on water, wastewater and stormwater below.	Noted.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	General	38	The SWM approach and hydraulic modelling documentation included in the MSS was reviewed and found to be consistent with the City's master servicing and design guideline requirements.	Noted.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	Water	39	As per the Area 10 examples, it would be helpful to present alternative watermain networks and a discussion, for example, of how the various alternatives improve looping, simplify phasing/implementation, etc.	Consideration of alternative designs has been further described in the MSS. See snapshot below for alternative trunk watermain locations that were considered, based on available connection points to the City's existing watermain network. The network identified in the MSS represents the minimum amount of trunk infrastructure required to meet service pressures and to provide a redundant network. Additional connections could be pursued at detailed design, as part of phasing, but are not considered as critical infrastructure to the overall watermain network. The watermain network in the northeast quadrant will be defined as the internal road network is finalized for each development parcel. 

IPU - Ted Cooper - Email Correspondence dated 2019-04-29	Wastewater	40	Again, as per the Area 10 examples, alternative routing of trunk sewers should be presented. As noted in the EUCMUC MSS Alternatives attachment, there appears to be an opportunity to locate the deeper trunk sanitary sewer (Trunk 1) to the hydro corridor alignment (Trunk 2), which would avoid the need to construct the deeper trunk sewer on a local street within a narrow ROW.  	Consideration of the alternative designs has been further described in the MSS. Given the grade raise restrictions for the soils, the overall grading strategy is to keep the road grades as low as possible in the northwest quadrant. The sanitary sewer elevation drives the grading plan for the northwest quadrant. To keep sanitary sewers as flat as possible, the overall concept is to collect as much flow as possible into a main trunk sewer and have the alignment be as direct as possible to the existing outlet within the Orleans Village development. The sanitary sewer is expected to have a max cover of about 3.75m at the downstream end of the system.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	Stormwater (Sewers)	41	The EUCMUC MSS Alternatives attachment presents a storm sewer alternative similar to the alternative wastewater solution referred to above, whereby the deeper trunk storm sewer (Trunk 1) is relocated to the hydro corridor (Trunk 2), which would avoid the need to construct a deep trunk storm sewer on a local street within a narrow ROW. The terminus of the Snow Storage Facility FM could be relocated to outlet to this storm trunk.  	Consideration of the alternative designs has been further described in the MSS, with the example alternative designs included in Appendix I. The updated servicing design relocates the trunk storm sewer towards the Hydro One corridor as suggested, to minimize the extent of large storm sewers within local roads, which will contribute to ease of maintenance. The updated servicing design restricts capture and requires storage up to the 100-year design event on development blocks other than low density residential areas. Note that there is a proposed 2.7m dia. storm trunk sewer within the local ROWs surrounding the pond. The attached memo from Paterson (**Attachment F**) confirms that the construction of a storm sewer up to 3m dia. is acceptable in this area, including where the storm trunk sewer runs parallel to the sanitary trunk sewer. Per the City's direction at TAC #5, the snow disposal facility is assumed to remain in place (e.g. no future development) with its forcemain directly connected to EUC Pond 1, like in existing conditions.

IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	42	The MSS identified the need to expand the existing EUC Pond 1. The MSS did not present / evaluate alternatives that were considered as to how / where the SWMP was to be expanded. The only approach presented included expansion of the SWMP into the woodlot surrounding the existing pond, part of which is subject to the City's Significant Woodland Guidelines. Application of the Significant Woodland Guidelines must follow the mitigation hierarchy outlined below, which lends itself well to the normal evaluation process requirements of MSSs / Class EAs previously approved by Council. As is outlined in the Guidelines, environmental reports must explicitly address how the mitigation hierarchy has been applied in the proposed development or site alteration. *The mitigation hierarchy is a widely accepted approach in conservation and land use planning for guiding decisions on protection of the natural environment. It categorizes and prioritizes protective measures according to their general type and effectiveness:* *Priority 1 - Avoidance: redirection of the proposed action away from the natural feature.* *Priority 2 - Minimization: reduction of the magnitude of the proposed action, either in space, time, or both.* *Priority 3 - Mitigation: protection of the feature from the proposed action, through measures such as changes in design, physical barriers, and modified operating procedures.* *Priority 4 - Compensation: off-setting of the impacts through replacement of the feature and its ecological functions elsewhere, typically at a ratio greater than 1:1 to reflect the greater risks.* The current draft of the MSS has focused entirely on Priority 4 – proposing compensation of only 0.5 ha of tree planting for every 1 ha of loss of woodland around EUC Pond 1. There will be a need to demonstrate why Priorities 1-3 cannot apply if there is a need to expand the SWM Pond into the Significant Woodlands at the perimeter of EUC Pond 1.	Noted. The attached memo from Kilgour (**Attachment G**) clarifies the extent of the significant woodland based on current City guidelines. Based on the new woodland definition and the updated predicted storm inflows (including exclusion of future development of the snow dump), a revised draft pond footprint was submitted for City review in June 2019. This footprint has been carried forward in the MSS.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	43	Four alternative SWM pond expansion concepts have been presented in the EUCMUC MSS Alternatives attachment. The alternatives present incremental pond expansion approaches:	Noted.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	44	1) Construct new sediment forebay at east end of existing SWMP, and modify existing outlet structure to more closely discharge pre-development flows so as to minimize peak quantity control storage requirements;  	Per discussions with City staff regarding the Mud Creek CIS study, the project team has previously been directed to keep the existing EUC Pond 1 outflows that were approved under the existing ECA for EUC Pond 1. It is understood that the Mud Creek Cumulative Impacts Study may specify changes to the EUC Pond 1 outlet in order to mitigate against downstream erosion. The EUC Pond 1 expansion has been designed so that there is flexibility for changes to operational water levels associated with future recommendations related to the pond outlet, and the design of the pond has been shared with the City's Mud Creek Cumulative Impacts study team for coordination.

IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	45	2) If additional quantity control is required beyond Alternative 1, expand existing SWMP into hydro corridor to the south;  	Per the approved EUC Pond 1 design drawings, the Hydro One corridor is the location of the sediment management area for EUC Pond 1.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	46	3) If additional quantity control is required beyond Alternative 2, expand SWMP to the east of the existing SWMP;  	Noted. This option has not been pursued, as the pond footprint is considered appropriately sized in its current form. Additional expansion would encroach on the existing sediment management area or the proposed development lands within the CDP area.

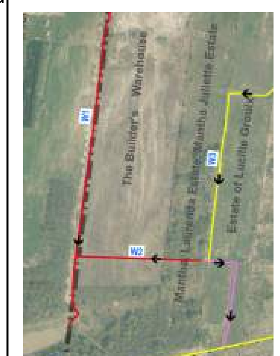
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	47	4) If additional quantity control is required beyond Alternative 3, expand existing SWMP into area south of existing SWMP.  	See response to Comment 46.
IPU - Ted Cooper - Email Correspondence dated 2019-04-29	SWM Pond Expansion	48	If there is no means to satisfy quantity and quality control requirements with Alternative 4, then the SWMP could be expanded to the north into the Significant Woodland providing acceptable compensation is agreed to.	Noted. Under the updated definition of the Significant Woodland boundary, no encroachment into the Significant Woodlot is expected to be required.

List of Attachments:

Attachment A	Road Flow Conveyance Depths (JFSA, Feb 28, 2019)
Attachment B	Unit Storage Results (JFSA, Feb 28, 2019)
Attachment C	Typical 100-Year Ponding Requirements (JFSA, Feb 28, 2019)

14-733 EUC Phase 3 Area CDP
Prepared by DSEL
28-Oct-19

Comment Source	Comment Type	Commen	Comment	Response
Conservation Partners - Terry K. Davidson - Slope Stability Assessment Reach 7 and 12, Storm Water Management Pond Block letter dated 2019-02-11	Slope Stability Assessment	1	The report appears to have been completed primarily for the purpose of determining the stability of the existing slope along ravines and establishing a Limit of Hazard Lands for developable lands. The analysis and supporting field work have been carried out an appropriate level of detail for that purpose. The report has documented the present geometry of the slope in sufficient detail, and suitable methods have been used to characterize the soil characteristics. The report from the consultant makes reference to reviewing, the lands along the slope as "Hazard Lands, as defined by the "MNR Technical Guide for River and Stream Systems: Erosion Hazard Limit" as the primary technical reference for delineating hazard lands and addressing the natural hazards provisions of the Provincial Policy Statement under the Planning Act.	Noted.
Conservation Partners - Terry K. Davidson - Slope Stability Assessment Reach 7 and 12, Storm Water Management Pond Block letter dated 2019-02-11	Slope Stability Assessment	2	The report from the consultant indicates that they analyzed the site at seven (7) locations. The results of the analysis indicated a Factor of Safety less than 1.5. The consultant has indicated the Limit of Hazard Lands for two areas as follows: Reach 7 and Reach 12 as identified on the Site Plan by Golder date June 7, 2018.	Noted.
Conservation Partners - Terry K. Davidson - Slope Stability Assessment Reach 7 and 12, Storm Water Management Pond Block letter dated 2019-02-11	Slope Stability Assessment	3	For Reach 7, the consultant has indicated the Limit of Hazard Lands as a 11 metre setback, and was based on the following: -A stable slope allowance based on stability analysis using the Morgenstern Price method of 6 metres. -A toe erosion allowance of 5 metres was determined based on "Table: Minimum Toe Erosion Allowance" of the "Natural Hazards Technical Guide". -No 6 metre access erosion allowance was required. However, the RVCA is not prepared to accept this assumption as no legal property survey was provided indicating development restrictions or setbacks at this time.	An update to the report has been completed (Golder, June 2019) and is provided in Appendix H of the MSS. Please note that in the updated MSS, the pond footprint has shifted so as to provide additional clearance between Reach 7 and the pond side slopes. The stable slope allowance has been updated to 0m based on the analysis of the report. The factor of safety against global instability of the SWMP side walls sloped at an inclination of 3H:1V are greater than 1.5 and 1.1, respectively, and therefore will not need any additional measures to reduce the risk of slope failure from a geotechnical point of view. The Erosion Access Allowance section has been updated and states: "The Access Allowance included in the MNR procedures for determining the Limit of Hazard Lands is intended to provide a corridor of sufficient width across the table land that equipment could access the site of a future slope failure to undertake a repair. The width of the Access Allowance that will need to be provided on this site will be 6 metres."
Conservation Partners - Terry K. Davidson - Slope Stability Assessment Reach 7 and 12, Storm Water Management Pond Block letter dated 2019-02-11	Slope Stability Assessment	4	For Reach 12, the consultant has indicated the Limit of Hazard Lands as a 3 metre setback, and was based on the following: -A stable slope allowance based on stability analysis using the Morgenstern Price method of 2 metres. -A toe erosion allowance of 1.0 metres was determined based on "Table: Minimum Toe Erosion Allowance" of the "Natural Hazards Technical Guide". The consultant indicated there was no evidence of active erosion on August 28, 2017. -No 6 metre access erosion allowance was required. However, the RVCA is not prepared to accept this assumption as no legal property survey was provided indicating development restrictions or setbacks at this time.	An update to the report has been completed (Golder, June 2019) and is provided in Appendix H of the MSS. Please note that in the updated MSS, the pond footprint has shifted so as to provide additional clearance between Reach 12 and the pond side slopes. The stable slope allowance has been updated to 0m based on the analysis of the report. The factor of safety against global instability of the SWMP side walls sloped at an inclination of 3H:1V are greater than 1.5 and 1.1, respectively, and therefore will not need any additional measures to reduce the risk of slope failure from a geotechnical point of view. The Erosion Access Allowance section has been updated and states: "The Access Allowance included in the MNR procedures for determining the Limit of Hazard Lands is intended to provide a corridor of sufficient width across the table land that equipment could access the site of a future slope failure to undertake a repair. The width of the Access Allowance that will need to be provided on this site will be 6 metres."

Conservation Partners - Terry K. Davidson	Slope Stability Assessment	5	In summary, the Report No. 1660030-03 and the Site Plan dated June 7, 2018 by GOLDER Associates has not provided the Limit of Hazard Lands which would include the 6 metre Access Allowance. Also, the policy of the Rideau Valley Conservation Authority is to require a minimum 15 metre setback from the crest of the slope for conservation of land, therefore the consultant should be required to delineate this on the Site Plan.	In the updated MSS, the pond footprint has shifted so as to provide additional clearance between Reach 7 & 12 and the pond side slopes. Greater than 15m is proposed, as shown in Figure 3 and as shown in the cross sections in Figure 3A.
Conservation Partners - Terry K. Davidson - Slope Stability Assessment Reach 7 and 12, Storm Water Management Pond Block letter dated 2019-02-11	CDP Section 4.1 - Study Area Constraints Pg. 13	6	The first paragraph acknowledges that assessments have been completed on the headwater drainage features. However, the paragraph does not acknowledge that there were some mitigation measures required for some of the headwater features. There needs to be a reference in this section that all headwater drainage features which require mitigation measures will be implemented as part of the Master Servicing Study. Recommended Wording : Headwater drainage features which require mitigation measures as identified in the Niblett Environmental Associates Inc. memo dated March 12th, 2018 shall be implemented through the Master Servicing Study. While geotechnical constraints in reference to grade raises have been identified, the section does not acknowledge that there are environmental and geotechnical setbacks which would be a constraint for the stormwater management block, specifically as it relates to Reach 7 and Reach 12 (Kilgour & Associates Ltd. report). The report "Environmental Impact Statement for SWM Expansion in the East Urban Community Mixed Use Center" dated September 5th, 2018, prepared by Kilgour & Associates Ltd. Has specified environmental setbacks for Reach 7 and Reach 12, while the geotechnical report by Golder Associates Ltd. has provided recommendations on geotechnical setbacks. This section must reference these requirements.	CDP has been updated to address the requested wording. Headwater W1 and W2 are assigned a mitigation classification in the Niblett March 28/2019 memo, based on earlier work by Kilgour for the 3490 Innes Road site (Kilgour & Associates, July 2017). W1 in Niblett memo is the same feature as R1-R5 in the Kilgour report. The Kilgour report explains that the feature drops into a catchbasin, before contributing flows to the stormwater management pond. The stormwater management pond has an existing outlet structure that controls outflows to the downstream watercourses. The Kilgour report explains that the feature is not required to be maintained, but its functionality must be replaced by replicating outlet flows to the downstream feature - the stormwater management pond. In this case, the development of the study area includes sending all stormwater flows in the northwest quadrant to the stormwater management pond so the function of the headwater can be considered to be replicated, e.g. there is no concern that the stormwater management pond will receive insufficient flows due to the closure of the headwater feature. Swales and perforated pipes in residential rear yards and parks will provide an additional opportunity to introduce vegetated swales within the northwest quadrant. 
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	CDP Section 5.2.8 - Stormwater Management Facilities	7	This section should acknowledge that there are mitigation measures required as a result of the Headwater Drainage Feature Assessments that must form part of the stormwater management strategy.	CDP has been updated to address the requested wording.
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	CDP Section 7.10 - Permitting Requirements Pg. 56	8	In the "Timing/Process/Permits and Approval" section in the table for Headwater Drainage Features, there should be reference to the specific regulation requirements: Recommended wording: Approvals under Ontario Regulation 174/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" under Section 28 of the Conservation Authorities Act (RVCA Watershed).	CDP has been updated to address the requested wording.
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	Slope Stability Assessment	9	The RVCA has completed a review of the report "Slope Stability Assessment - Reaches 7 and 12, Stormwater Management Pond Block, 3490 Innes Road Development, Ottawa, Ontario" dated June 2018, prepared by Golder Associates Ltd. The review was completed by Terry K. Davidson, P.Eng, RVCA Director of Regulations (see memo attached). Based on the review, it appears that the assessment has not included a 6.0 meter access erosion allowance on the assumption that the access to the slope will be unrestricted. While it is acknowledged that the adjacent lands will form part of the stormwater management block, the 6.0 meter access erosion limit of 6.0 meters needs to be included to ensure that the location of the proposed stormwater management pond will not interfere with the access. For example, on Figure 1 it appears that the proposed stormwater management pond would be within the 6.0 meter access erosion allowance near cross section "D" thereby impeding access to the slope. A figure which clearly delineates the geotechnical hazard limits (including the access erosion allowance) and the setbacks as recommended by Kilgour & Associates Ltd. is required. We note that the pond shape differs between the Golder Report and the Kilgour report. Therefore, clarification in this regard is also required.	See RVCA Comments 3 and 4 for erosion access allowance response & reference to updated Golder report (June 2019). An updated memo from Kilgour has been completed related to the significant woodland near the stormwater management pond (June 14, 2019). See Appendix H of the MSS. Figure 3 and Figure 3A in the MSS show the hazard limits in relation to the proposed new pond footprint. Adequate setbacks are provided from headwater features, given the pond has been modified to protect the significant woodland boundary.

<table>
<tr>
<td>Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07</td>
<td>Master Servicing Study - General</td>
<td>10</td>
<td>The RVCA has completed a preliminary review of the draft master servicing study. It is our understanding that the report is to include the recommendations made in the Mud Creek Cumulative Impact Study. Based on the most recent information provided, one of the recommendations coming from the study is to have the first 10mm of rainwater infiltrate the site through Low Impact Development techniques. The draft report does not provide any details as to how this will be achieved. Therefore, the report needs to be amended to incorporate this recommendation.
As noted in our comments for the Community Design Plan, the mitigation measures for the watercourses assessed in the Headwater Drainage Feature Assessment needs to be implemented through the MSS. Specifically, Reaches 7 and 12 require hydration to be maintained. It is acknowledged that some of the hydration issues for Reach 7 were dealt with as part of an adjacent plan of subdivision, however the MSS must make reference to how these issues were dealt with and weather additional measures are required for the portions of Reach 7 not within the plan of subdivision. In addition, there needs to be a strategy for maintaining hydration to Reach 12. Therefore, the MSS needs to be amended to include these components and any necessary recommendations. Any loss of flows (%) needs to be included as part of any amendment to the MSS.</td>
<td>Through coordination with the City of Ottawa, it is understood that the Mud Creek Cumulative Impacts Study may specify changes to the EUC Pond 1 outlet in order to mitigate against downstream erosion. The EUC Pond 1 expansion has been designed so that there is flexibility for changes to operational water levels associated with future recommendations related to the pond outlet, and the design of the pond has been shared with the City's Mud Creek Cumulative Impacts study team for coordination.

Through coordination with the City of Ottawa, it is understood that the target that the first 10mm of rainwater infiltrate the site through Low Impact Development measures was a target that was discussed in early stages of the project, but is not being carried forward due to the limited infiltration potential of the soils, insufficient clearance to groundwater table and bedrock in a significant portion of the study area, and insignificant differences to downstream erosion protection measures whether or not the LID target were to be implemented. However, best management practices for infiltration are being recommended in the MSS, such as no development within significant ground recharge areas around the Innes Park Woods, infiltration at the lot level via residential swales/perforated pipes, etc.

Flow management for Reach 7 and Reach 12 were addressed through Planning Act approvals related to 3790 Innes Road, adjacent to the CDP area. The CDP is outside of the contributing drainage area for these reaches, and therefore no comment on adequacy of their hydration is provided in the MSS.</td>
</tr>
<tr>
<td>Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07</td>
<td>Master Servicing Study - EUC Pond 1</td>
<td>11</td>
<td>The report makes reference to the proposed level of water quality protection being normal (70% TSS Removal). The report also cites that this is approved by the RVCA. While the RVCA did accept normal level of protection for the recent works undertaken to the South Main Cell and South Forebay, it was done so reluctantly only after it was demonstrated that it was not reasonably feasible to amend the design to the current water quality standard of enhanced (80% TSS Removal). Given the large scope of the proposed North Cell and Main Cell expansion, the RVCA recommends that the design should explore ways to achieve the current standard of enhanced (80% TSS removal).</td>
<td>Per the East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design (JFSA, June 2019), EUC SWM Pond 1 is proposed to have a total drainage area of 367.308 Ha with and average imperviousness of 65%. EUC SWM Pond 1 was originally designed & approved for construction based on providing normal protection (70% long-term average TSS removal based on the provided permanent pool volumes). Based on the drainage areas and permanent pool volume, this target is being met as the overall TSS removal rate for the drainage area is 74%. As shown in Table 1 below, a 78% TSS removal rate is provided for the drainage areas to the proposed north main cell and forebay.

TABLE 1:TSS REMOVAL PROVIDED BY EUC SWM POND 1
<table>
<tr><th>Component</th><th colspan="2">Drainage Area</th><th colspan="3">Provided Permanent Pool</th></tr>
<tr><th></th><th>Area (ha)</th><th>Imperviousness (%)</th><th>Volume (m^3)</th><th>Volume (m^3/ha)</th><th>TSS Removal (1) (%)</th></tr>
<tr><td>South (Main+Forebay)</td><td>180.435</td><td>61</td><td>13140</td><td>72.82</td><td>69</td></tr>
<tr><td>North (Main+Forebay)</td><td>186.873</td><td>69</td><td>31372</td><td>167.88</td><td>78</td></tr>
<tr><td>Total</td><td>367.308</td><td>65</td><td>44512</td><td>121.18</td><td>74</td></tr>
</table>
(1) Interpolated based on MOE Standards for Normal (70% TSS) and Enhanced (80% TSS) Levels of Protection. Based on provided permanent pool volume plus 40 m3/ha active quality control component.

It is our understanding that areas draining directly to the main cells of the pond should have separate quality treatment, outside of the pond’s provided treatment, as they do not benefit from the pre-treatment that occurs in the forebays. As such, these areas have been removed from the TSS removal removals calculations in the Table 2 below. The areas that are draining directly to the main cells and have been removed from the calculations below can be seen highlighted in the attached markup.

TABLE 2: TSS REMOVAL PROVIDED BY EUC SWM POND 1 (EXCLUDING AREAS DRAINING DIRECTLY TO THE MAIN CELLS)
<table>
<tr><th>Component</th><th colspan="2">Drainage Area</th><th colspan="3">Provided Permanent Pool</th></tr>
<tr><th></th><th>Area (ha)</th><th>Imperviousness (%)</th><th>Volume (m^3)</th><th>Volume (m^3/ha)</th><th>TSS Removal (1) (%)</th></tr>
<tr><td>South (Main+Forebay)</td><td>143.623</td><td>64</td><td>13140</td><td>91.49</td><td>71</td></tr>
<tr><td>North (Main+Forebay)</td><td>169.541</td><td>71</td><td>31372</td><td>185.04</td><td>80</td></tr>
<tr><td>Total</td><td>313.164</td><td>68</td><td>44512</td><td>142.14</td><td>76</td></tr>
</table>
(1) Interpolated based on MOE Standards for Normal (70% TSS) and Enhanced (80% TSS) Levels of Protection. Based on provided permanent pool volume plus 40 m3/ha active quality control component.

As shown in Table 2 above, a 80% TSS removal rate is provided for the drainage areas to the north forebays under the latest pond design. This meets the TSS removal criteria of enhanced protection (80% long-term average TSS removal based on the provided permanent pool volumes). The overall TSS removal rate, when removing areas draining directly to the main cells is a blended rate of 76% considering the south forebay and south main cell.</td>
</tr>
</table>

Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	Master Servicing Study - North East Quadrant Preferred Stormwater Management Plan	12	The report makes reference to the MSU prepared by Stantec (2006) for this quadrant which directs flows to Bilberry Creek via a storm sewer on Wildflower Drive. The report acknowledges that there are existing erosion issues in Bilberry Creek, and may require mitigation measures greater then this MSS. The report also makes reference to reviewing established quantity control targets at the detailed design stage and possible mitigation measures outlined in the Bilberry Creek Geomorphic Systems Master Implementation Plan (GHD, May 2014). In 2017, there were several slopes failures within the Bilberry Creek valley lands which resulted in significant remedial measures required to render portions of the valley lands stable. The slope failures are an indications that the assumptions of the original MSU and the Geomorphic Systems Master Implementation Plan may no longer be valid and that the MSU study needs to be revisited to ensure that the slope and erosion issues along Bilberry Creek are not further aggravated as development proceeds within the quadrant. The MSS report needs to fully acknowledge the risks of proceeding under the current MSU and make recommendations within the context. We have some concerns with the assumption that this can be dealt with at the detailed design stage, as it is an issue that requires consideration of cumulative impacts which are more appropriately addressed through a larger scale study such as cumulative impacts which are more appropriately addressed through a large scale study such as an MSS or other applicable study. Given the significant risk to public health and safety along the Bilberry Creek valley system, development contributing flows to Bilberry Creek should be placed on hold until such time there is a full understanding of the risk and a proper assessment of the servicing strategy for this drainage area is developed.	The MSS has been updated based on coordination with City staff. It is acknowledged that there are erosion issues in Bilberry Creek, and that the City will address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area. The MSS acknowledges that the City may choose to divert some flows away from Bilberry Creek (e.g. flows in the Northeast Quadrant, south of Vanguard Drive, may be redirected towards existing infrastructure within the McKinnon's Creek watershed). This may involve incorporating infiltration measures, surface or underground storage measures, etc., within the lands in the Northeast Quadrant. The northeast and southeast quadrant were added to the CDP study area in 2013, beyond the scope of the original study, with the intention that the scope of the MSS be limited to review of infrastructure recommendations related to changes in land use at the CDP level. As such, an erosion assessment at the watershed level for Bilberry Creek and McKinnon's Creek was not undertaken as part of the MSS. This was communicated in the 2018 responses to TAC #4 comments. It seems that stormwater analysis of Billberry Creek is best addressed at the subwatershed level, such as in the City's Bilberry Creek Geomorphic Systems Master Implementation Plan and the Eastern Subwatersheds Stormwater Management Retrofit Study (of which the Northwest Quadrant is part of the study area), or another assessment directly related to stormwater alternatives for lands within the Northeast Quadrant.
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	General Comments	13	There has been very little detail on sediment storage areas, It is our experience that sediment storage areas are typically desired as part of the pond's operation and maintenance. Therefore, a better understanding as to where and how sediment storage areas will be dealt with needs to be identified. It is important that the location chosen does not interfere with the required environmental and geotechnical setbacks.	According to legal PIN information, the existing sediment management area is on City owned lands, within the Hydro One Corridor. Based on the available City mapping, the existing 600mm dia. watermain and 150mm dia. forcemain run underneath the existing sediment management area. The MSS does not propose any changes to the sediment management area as compared to the original Stantec 2008 design. Please refer to the Stantec 2012 Operations and Maintenance Manual for EUC Pond 1 for additional information on the operation of the sediment management area.
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	Associated Drawings for MSS	14	We note that the drawings illustrate the general location of the proposed pond expansion, and in Figure 3, the pond is shown at a larger scale. There are environmental and geotechnical setbacks required from Reach 7 and Reach 12 as noted in the Kilgour & Associates Ltd. and Golder Associated Ltd. reports. These constraints need to be clearly shown on Figure 3 to ensure that the pond is not encroaching into these setbacks save and expect the location where the pond ties into existing North Main Cell. This will also need to take into account for the need of the 6.0 meter access erosion allowance which the Golder Associates Ltd. has not provided in their report.	See response to RVCA Comments 3 and 4.
Conservation Partners - Jamie Batchelor - EUC Phase 3 CDP and MSS letter dated 2019-03-07	Conclusion	15	In conclusion, the RVCA has provided recommendations for the CDP and MSS for consideration. The RVCA asks to be kept informed of any amendments or revisions to each document so that we can continue our review. For any questions regrading the information contained in this letter, please feel free to contact me.	Noted.

Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Watercourses	16	In our previous letter to the City dated January 31st, 2018, we had identified several key issues in relation to the watercourses on site and their potential impact on the overall preferred Land Use Plan and Demonstration Plan. Since then, an additional report "Headwater Drainage Feature Assessment Summary - East Urban Community, Mixed Use Center, Community Design Plan (EUC MUC CDP) Part Lots 8 & 9, Concession 1, Ottawa, Ontario" dated March 28 th, 2018, prepared by Niblett Environmental Associates Inc. has been submitted. The report summarizes the existing conditions of each watercourse and provides management recommendations. Watercourses W1 and W2 were classified with a management recommendation of 'Mitigation', while watercourses W3 through W7 were classified as not requiring any management. The RVCA accepts the findings of the report as it relates to watercourses W1 through W7. It should be noted that the report also made management recommendations for watercourses within the South Nation Conservation watershed. We will rely on South Nation Conservation to provide comments on these watercourses. Based on the management recommendations provided in the report, the preferred Land Use Plan and Demonstration Plan will not require any changes due to the presence of the watercourses identified in the report. The mitigation management recommendations will need to be accounted for and addressed through the design of the stormwater management plan for the site as part of the Master Servicing Study stage.	Noted. See response to RVCA Comment 6 above.
Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Innes Road Woods	17	We were in receipt of a memo "Geotechnical Response to RVCA Comments - East Urban Community (EUC) Mixed Use CDP, Mer Bleue Road – Ottawa" dated April 2nd, 2018, prepared by Patterson Group Consulting Engineers to address our previous comments. The memo concludes that the 35 metre setback from the Rock Barren and the Innes Parks Woods is more than adequate to protect the sensitive area from groundwater impacts as a result of the nearby development. The Conservation Authority accepts the conclusion and has no further comment.	Noted.
Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Stormwater Management Block - Watercourse Setback	18	As noted in our previous letter, the stormwater management block was not included in the original study area for the CDP and therefore was not covered in the existing conditions reports. However, a Headwater Drainage Features Assessment was completed by Kilgour & Associates Ltd. for an adjacent subdivision. The report identified two watercourses within the block referred to as Reach 7 and Reach 12. Reach 7 was classified as 'Protection' and accordingly has been recognized for protection by the preferred Land Use Plan and Demonstration Plan. This watercourse is characterized by a valley that in some instances is 15 metre wide and 3 metres deep. A 15 metre setback from the normal high water mark of this watercourse will be required. Reach 12 was classified as 'Conservation' and runs through the stormwater management block. A similar setback will also be required from this feature.	See response to RVCA Comments 3 and 4.
Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Stormwater Management Block - Slope Stability/Erosion	19	As previously noted, the watercourse along the western boundary of the study area (Reach 7) is characterized by a valley, while Reach 12 also exhibits some valley characteristics. Therefore, a slope stability analysis will be required to determine the geotechnical constraints within the proposed stormwater management block. Recently, the RVCA met with staff from DSEL whom will be working on the stormwater management pond as part of the MSS stage. DSEL is aware of the setback/geotechnical constraints for each watercourse. Through discussions and based on some initial findings, it appears that the constraints can be addressed. Therefore, the Conservation Authority is satisfied that the details regarding the stormwater management block can be addressed through the MSS stage.	See response to RVCA Comments 3 and 4.

Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Natural Hazards - Organic Soils	20	The memo dated April 2nd, 2018 from Patterson Group Consulting Engineers concludes that based on the available subsoils information recovered during the previous geotechnical investigations and site visits, no Organic Soils such as peat, mart, etc., were encountered throughout the subject site and thus do not require additional test pits/boreholes. The Conservation Authority has accepted the conclusion and has no further comment. It is important to note that the study area is within an area that has been identified as having sensitive soils (seismic site class E). We will rely on the City to ensure that the geotechnical aspects surrounding the sensitive soils are adequately addressed.	Noted.
Conservation Partners - Jamie Batchelor - EUC MUC Community Design Plan letter dated 2018-04-18	Water Budget	21	It is our understanding that a new water budget report has been prepared by PECG. The Conservation Authority has not received a copy of this study. However, it is our understanding that City staff are currently reviewing the report. Therefore, we will defer comments on this report to City staff. We would ask that a copy of the report be forwarded to our office for our file.	Noted. It was clarified with RVCA staff that this comment was related to the water budget for 3790 Innes Road, which is outside of the CDP study area and therefore not addressed in the MSS.

List of Attachments:

Attachment D Markup of areas draining directly to the main cell of EUC Pond 1 (DSEL, 2019)

Attachment E Excerpt from the Stantec 2008 EUC Pond 1 design, showing the sediment management area (Stantec, 2012)

14-733 EUC Phase 3 Area CDP
Prepared by DSEL
28-Oct-19

Comment Source	Comment Type	Commen	Comment	Response
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	1	As you recall during the EUC Landowner's meeting on Dec 13, on behalf of Glenview, we raised the issue of the 3000mm dia storm sewer's routing through Glenview's BMR Lands, as depicted in the Draft MSS. Our client also raised this issue in late October 2018, before the Draft MSS was submitted to the City. Our main concerns are outlined below:	Noted.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	2	The 3000mm storm was sized and deepened to accommodate lands owned by Richcraft u/s of the BMR Lands. Although the routing through BMR is short, it does have cost and ROW implications for Glenview;	See response to Comment 6 below.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	3	The 3000mm storm size and its depth requires a 7.5m deep excavation in this area, and may warrant a high-level storm sewer for fronting units, above and beyond the sanitary high level sewer;	See response to Comment 6 below.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	4	The 3000mm storm depth and the probability of 2 high levels sewers would warrant a wider ROW (at this time, it was proposed to be 16.5m ROW to match Caivan's development to the west). Based on a such a depth, a 22m ROW may be required at minimum, and a 24m wide ROW would be desired;	See response to Comment 6 below.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	5	The ROW and high level sewer requirements have significant impact to Glenview's DP layout.	See response to Comment 6 below.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	6	It is our opinion that the 3000mm storm sewer should be re-routed through Richcraft's Lands, per the sketch below shown in red.  	The trunk storm sewer has been split so that the BMR lands are mainly serviced by one trunk sewer that minimizes the external drainage to be conveyed. The trunk storm sewer size has been reduced to a maximum 2700mm dia storm sewer, given changes related to the snow dump development assumptions, capture/storage for various land uses, etc. Paterson Group has confirmed that the excavation related to future maintenance on the trunk sewer is appropriate for the designated ROW widths. Trunk storm sewer depths have been set based on clearance from trunk sanitary sewers, which generally govern the road grading design. The depth of cover to trunk storm infrastructure within the BMR lands are expected to be just over 5m, and may be further reduced as part of detailed design. Per City standards, when a sewer is more than 4 or 5m deep, designers are expected to consider the option of installing a higher level local sewer as part of detailed design, by comparison of the cost effectiveness of making deep service connections vs the installation of a higher level sewer. Sanitary high level sewers are not expected within the BMR lands, as the depth of cover is not expected to exceed 3.75m for the trunk sanitary sewer.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	7	Such a routing may change the lotting and roadway layout within Richcraft, but will not affect overall yield potential. Notwithstanding, if the City allows for a decreased release from their Snow Dump lands per the Servicing TAC in late January, then connecting Trunk 1 to Trunk 2 u/s of its current location would provide a benefit to Richcraft and rationale to re-route Trunk 1 away from Glenview's lands, while maintaining the maximum pipe diameter of 3000mm. It is our understanding, that since the Draft MSS was submitted, you are refining your lotting within this area; therefore, it may be of benefit to consider the suggested routing at this time.	The trunk storm sewer has been split in a way so that Richcraft is not required to relot the area south of the BMR cul-de-sac.
Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	8	Notwithstanding, the 9.0m wide servicing block at the end of the BMR cul-de-sac will remain to be mutually beneficial for both landowners, for the following purposes: -Sanitary outlet for Richcraft's Lands; -Storm outlet for Glenview's Lands; -Emergency Overland flow route for Richcraft's upstream lands and Glenview's Lands.	Noted. The area contributing to the emergency overland flow route through BMR lands has been reduced under the latest grading strategy.

Novatech - Sam Bahia - Email Correspondence dated 2019-04-08	Trunk Storm Sewer Cost Sharing	9	We understand that you've directed DSEL to hold off on changes to the MSS until the City's comments are received in full. In order to advance Glenview's Draft Plan submission and ensure that the City can review a coordinated servicing approach per the Draft MSS, we would appreciate the following without an update to the MSS at this time: - Communication from Richcraft as the adjacent Owner to be in concurrence with the suggested and revised storm trunk routing; - Communication from DSEL as the Author of the MSS, that the suggested storm trunk routing can be accommodated and reflected in the next Draft or Final MSS.	Noted.

14-733 EUC Phase 3 Area CDP
Prepared by DSEL
28-Oct-19

Comment Source	Comment Type	Commer	Comment	Response
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-19	MSS	1	To remove references to the integrated process, and instead talk about a 'concurrent' process.	Wording in MSS has been updated to reference concurrent process.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-20	MSS	2	To update language for MCEA process - delete what is in the current report and replace with the text you provided in your email below.	The following wording has been added to the MSS: *The CDP process will comprise a coordinated Planning and Municipal Class EA and therefore all the studies has been prepared in accordance with the requirements of Class EA process. The integrated process allows proponents to coordinate the approvals, reviews and public consultations of both EA Act and the Planning Act so the requirements of both are met.* *The MCEA process recognizes the benefits of co-ordinating efforts under the Class EA and the Planning Act. Master Plans are defined in the Class EA as "long range plans which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles". Master Plans allow for an integrated process with other planning initiatives and provides streamlining opportunities for projects which have some common elements such as geography or function. There are four (4) approaches that Master Plan can follow to accomplish the various phases of the Class EA process. This MSS has followed Approach 4: Integrated under the Planning Act and was undertaken concurrently with the Community Design Plan to reflect interdependent decisions to benefit the overall community.* *Two Master Planning studies were initiated part of this CDP that include a Master Transportation Study (MTS) and a Master Servicing Study (MSS). These reports have been prepared in conjunction with the Community Design Plan (CDP) for lands within the study area.* *The required Class EA environmental planning tasks generally include:* *• Project need and opportunities;* *• Existing conditions;* *• Consultation with stakeholders;* *• Evaluation of alternatives;* *• Identification of effects and mitigation; and,* *• Documentation and completion of planning documents.* *This report presents the methodology, findings and conclusions of the MSS for the East Urban Community: Community Design Plan.*
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-21	MSS	3	To remove mention of Schedule A in the project listing. We had previously included this to take into account the case where projects may want to proceed in advance of EA when they are associated with development applications.	Wording removed in MSS.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-22	MSS	4	To delete culverts, noise walls, and utilities from the project listing.	Wording removed in MSS.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-23	MSS	5	To update project listing to add geographic reference to each project, e.g. to specifically reference the roadway that the project is underneath.	Streetnames not available at this stage in planning process. MSS report figures shows geographic location (DSEL, Oct 2019).
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-24	MSS	6	To add simple figures to show extents of each project in project listing.	See MSS report figures (DSEL, Oct 2019).
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-25	MSS	7	Considering the storm pipes and pond expansion as one project.	Wording updated in MSS.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-26	MSS	8	Acknowledging that appeals will be to MECP.	Wording updated in MSS.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-27	MSS	9	Summarizing each project in the applicable conclusion sections of the report (e.g. SW watermain conclusions, NE sanitary conclusions, etc.).	The following wording has been added to each conclusion section: *The MCEA project listing for the recommended infrastructure is provided in Section 13.1.*
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-28	MSS	10	Simplifying the language for the project listing – no need to quote the MCEA – and moving this towards the end of the report.	The listing has been moved to Section 13.1 and wording has been refined.

Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-29	MSS	11	Explaining that high-level servicing alternatives were considered as part of evaluation of the concept plans.	Wording added in MSS and detailed evaluation that was circulated to TAC added to Appendix I.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-30	MSS	12	Changing the wording of each 'design alternatives' section – where we talk about logical servicing following previous investments in infrastructure – to highlight that these are design implementation details.	Headings for all related sections changed to '*Consideration of Alternative Implementation Details for Servicing Designs*'.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-31	MSS	13	Add MECP climate change policy quote to SWM section.	The following wording has been added to the MSS: *"MECP has indicated a priority to prepare communities for the costs and impacts of climate change, including lowering the risk of basement flooding. As part of this MSS, the City of Ottawa's climate change stress test (100-year 3-hour Chicago storm plus 20%) has been applied and confirms that no basement flooding is expected in this test condition. "*
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-32	MSS	14	The list of mitigation measures should come before the summary table of impacts and mitigation measures as they describe what is listed in the table (p94) section 13.	Section 13.2 has been moved before Section 13.1 in the MSS.
Morrison Hershfield - Kelly Roberts - Email Correspondence dated 2018-12-33	MSS	15	Section 2.4 consider moving to end of report where other permits are as it makes more sense within the context of the projects you have identified.	Section 2.4 has been moved to combine with Section 13 (Permitting and Environmental Mitigation) in the MSS.

Calculation Sheet 4A: Flow Depth at Location with Highest 100-Year Peak Flow on a Typical Street in a Dev. Block

Sub-catchment(s)		A2201a	Comment
Location		Development Block	8.5 m wide road
$Q_{combined}$ (2)		1.488	for 100-year, 3-hour Chicago storm
Tr	(m)	4.250	
So	(m/m)	0.005	
W	(m)	0.000	
Sw	(m/m)	0.000	
T	(m)	8.405	
Sx	(m/m)	0.02	
n_{road}		0.013	
dc	(m)	0.15	
Se	(m/m)	0.035	
$n_{shoulder}$		0.025	
dw	(m)	0.000	
Ts	(m)	8.405	
ds	(m)	0.168	
d	(m)	0.168	
d_{crown}	(m)	**0.085**	
dd	(m)	**0.083**	dd < 0.15 m, the max. depth over road crown of an arterial road
de	(m)	**0.018**	
Te	**(m)**	**0.517**	Flow is contained within ROW
$Q_{area(A+B)}$	(m^3/s)	0.000	
$Q_{area(B)}$	(m^3/s)	0.000	
$Q_{area(A)}$	(m^3/s)	0.000	
$Q_{area(B+C+D)}$	(m^3/s)	0.877	
$Q_{area(D)}$	(m^3/s)	0.134	
$Q_{area(B+C)}$	(m^3/s)	0.743	
$Q_{area(E)}$	(m^3/s)	0.001	
$Q_{area(A+B+C+E)}$	(m^3/s)	0.744	
$\mathbf{Q_{two\ sides}}$	**(m^3/s)**	**1.488**	
d_{Flow} (3)	(m)	0.168	d_{flow} < 0.30 m, the maximum allowable depth of flow
$A_{flow\ two\ sides}$	(m^2)	1.077	
v	(m/s)	1.382	
v×d	**(m^2/s)**	**0.232**	v×d < 0.60 m^2/s

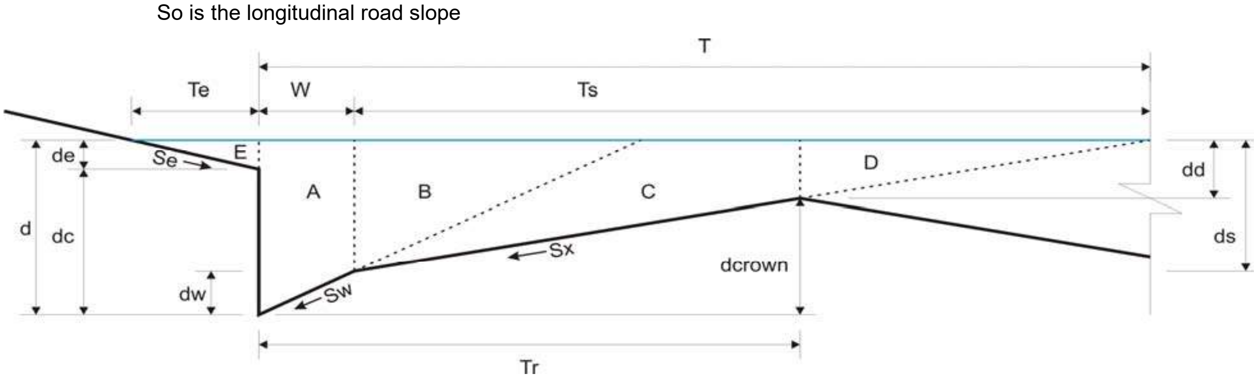
Notes:

(1) 100-year flow from DDSWMM model (Chicago storm).

(2) The computations assume that the total incoming flow is equally divided on both sides on the road.

(3) Computations based on methodology described in MTO Drainage Management Manual, 1997, Ch.4, pp. 59-60.

So is the longitudinal road slope



Equations:

$Q_{area(A+B)} = 0.375 \times So^{0.5} \times d^{2.667} / (n_{road} \times Sw)$

$Q_{area(B)} = 0.375 \times So^{0.5} \times (ds)^{2.667} / (n_{road} \times Sw)$

$Q_{area(B+C+D)} = 0.375 \times So^{0.5} \times (ds)^{2.667} / (n_{road} \times Sx)$

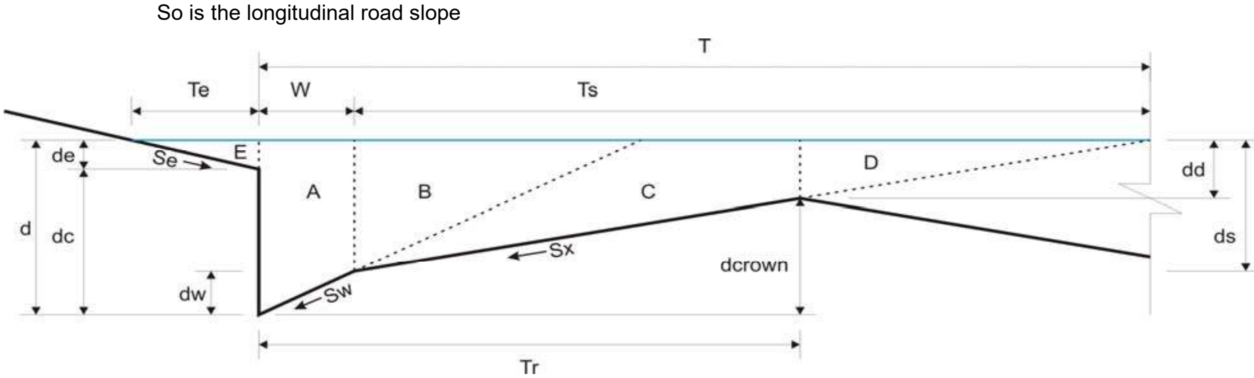
$Q_{area(D)} = 0.375 \times So^{0.5} \times (dd)^{2.667} / (n_{road} \times Sx)$

$Q_{area(E)} = 0.375 \times So^{0.5} \times (de)^{2.667} / (n_{shoulder} \times Se)$

Calculation Sheet 4B: Flow Depth at Location with Highest 100-Year Peak Flow on Mer Bleue Road

Sub-catchment(s)		A2044b	Comment
Location		Mer Bleue Road	8.5 m wide road
$Q_{combined}$ (2)		0.173	for 100-year, 3-hour Chicago storm
Tr	(m)	4.250	
So	(m/m)	0.005	
W	(m)	0.000	
Sw	(m/m)	0.000	
T	(m)	3.529	
Sx	(m/m)	0.02	
n_{road}		0.013	
dc	(m)	0.15	
Se	(m/m)	0.035	
$n_{shoulder}$		0.025	
dw	(m)	0.000	
Ts	(m)	3.529	
ds	(m)	0.071	
d	(m)	0.071	
d_{crown}	(m)	**0.085**	
dd	(m)	**0.000**	dd < 0.15 m, the max. depth over road crown of an arterial road
de	(m)	**0.000**	
Te	**(m)**	**0.000**	Flow is contained within ROW
$Q_{area(A+B)}$	(m^3/s)	0.000	
$Q_{area(B)}$	(m^3/s)	0.000	
$Q_{area(A)}$	(m^3/s)	0.000	
$Q_{area(B+C+D)}$	(m^3/s)	0.087	
$Q_{area(D)}$	(m^3/s)	0.000	
$Q_{area(B+C)}$	(m^3/s)	0.087	
$Q_{area(E)}$	(m^3/s)	0.000	
$Q_{area(A+B+C+E)}$	(m^3/s)	0.087	
$Q_{two\ sides}$	**(m^3/s)**	**0.173**	
d_{Flow} (3)	(m)	0.071	d_{flow} < 0.30 m, the maximum allowable depth of flow
$A_{flow\ two\ sides}$	(m^2)	0.249	
v	(m/s)	0.696	
v×d	**(m^2/s)**	**0.049**	v×d < 0.60 m^2/s

Notes:
(1) 100-year flow from DDSWMM model (Chicago storm).
(2) The computations assume that the total incoming flow is equally divided on both sides on the road.
(3) Computations based on methodology described in MTO Drainage Management Manual, 1997, Ch.4, pp. 59-60.
So is the longitudinal road slope



Equations:

$Q_{area(A+B)} = 0.375 \times So^{0.5} \times d^{2.667} / (n_{road} \times Sw)$

$Q_{area(B)} = 0.375 \times So^{0.5} \times (ds)^{2.667} / (n_{road} \times Sw)$

$Q_{area(B+C+D)} = 0.375 \times So^{0.5} \times (ds)^{2.667} / (n_{road} \times Sx)$

$Q_{area(D)} = 0.375 \times So^{0.5} \times (dd)^{2.667} / (n_{road} \times Sx)$

$Q_{area(E)} = 0.375 \times So^{0.5} \times (de)^{2.667} / (n_{shoulder} \times Se)$

Table A-1: Summary of East Urban Community Drainage Area Characteristics

MH ID	SWMHYMO ID	Area (ha)	C	TIMP	XIMP	Min. Capture [1]	Min. Capture [1] (m^3/s)	100-Year Capture [2] (m^3/s)	100-Year Storage [2] (m^3)	100-Year Storage [2] (m^3/ha)	100-Year + 20% Capture [3] (m^3/s)	100-Year + 20% Storage [3] (m^3)	100-Year + 20% Storage [3] (m^3/ha)	Notes
41	A041a	3.70	0.80	86	86	5-Year	0.987	1.125	N/A	N/A	1.125	N/A	N/A	Modelled in DDSWMM; Negligible On-Site Storage Assumed
301	A301a	0.42	0.40	29	29	2-Year	0.026	0.030	N/A	N/A	0.032	N/A	N/A	Negligible On-Site Storage Assumed
301	A301b	0.56	0.90	99	99	5-Year	0.159	0.181	46	82	0.194	67	120	
301	A301c	2.28	0.80	86	86	5-Year	0.529	0.603	N/A	N/A	0.603	N/A	N/A	Also Modelled in DDSWMM; Negligible On-Site Storage Assumed
301	A301d	4.28	0.90	99	99	2-Year	0.817	0.931	573	134	0.996	831	194	
301	A301e	6.15	0.70	71	66	2-Year	0.771	0.879	857	139	0.941	1242	202	
301	A301f	7.35	0.85	93	93	2-Year	1.264	1.441	973	132	1.542	1411	192	
301	A301g	8.61	0.70	71	66	2-Year	1.049	1.196	1150	134	1.280	1668	194	
2041	A2041a	1.38	0.80	86	81	2-Year	0.232	0.264	183	133	0.282	265	192	
2042	A2042a	1.20	0.80	86	81	2-Year	0.203	0.231	159	132	0.247	230	192	
2043	A2043a	1.29	0.80	86	81	2-Year	0.217	0.247	171	133	0.264	248	192	
2044	A2044a	0.22	0.90	99	99	5-Year	0.063	0.072	19	87	0.077	28	127	
2044	A2044b	2.14	0.90	99	99	10-Year	0.694	0.791	N/A	N/A	0.846	N/A	N/A	Negigible On-Site Storage Assumed; Major Flow to External System
2046	A2046a	0.23	0.90	99	99	5-Year	0.066	0.075	20	87	0.080	29	126	
2046	A2046b	2.39	0.80	86	81	2-Year	0.390	0.445	321	134	0.476	465	195	
2047	A2047a	0.26	0.90	99	99	5-Year	0.074	0.084	23	88	0.090	33	127	
2047	A2047b	0.47	0.80	86	81	2-Year	0.081	0.092	64	135	0.098	92	196	
2047	A2047c	1.15	0.80	86	81	2-Year	0.195	0.222	152	132	0.238	220	191	
2048	A2048a	0.26	0.90	99	99	5-Year	0.074	0.084	23	88	0.090	33	127	
2048	A2048b	0.80	0.80	86	81	2-Year	0.137	0.156	106	133	0.167	154	193	
2048	A2048c	1.14	0.80	86	81	2-Year	0.193	0.220	151	132	0.235	219	192	
2049	A2049a	0.25	0.90	99	99	5-Year	0.071	0.081	22	88	0.087	32	128	
2049	A2049b	0.49	0.80	86	81	2-Year	0.085	0.097	66	134	0.104	95	194	
2049	A2049c	0.76	0.80	86	81	2-Year	0.130	0.148	101	133	0.158	147	193	
2057	A2057a	0.24	0.90	99	99	5-Year	0.069	0.079	21	86	0.085	30	125	
2057	A2057b	0.44	0.80	86	81	2-Year	0.076	0.087	59	135	0.093	86	195	
2057	A2057c	6.37	0.80	86	81	2-Year	0.975	1.112	888	139	1.190	1287	202	
2060	A2060a	0.42	0.90	99	99	5-Year	0.120	0.137	35	83	0.147	51	121	
2060	A2060b	0.65	0.85	93	93	5-Year	0.174	0.198	52	80	0.212	76	117	
2060	A2060c	1.78	0.40	29	29	100-Year	0.368	0.368	N/A	N/A	0.368	N/A	N/A	Negligible On-Site Storage Assumed
2060	A2060d	9.40	0.40	29	29	100-Year	1.817	1.817	N/A	N/A	1.817	N/A	N/A	Negligible On-Site Storage Assumed
2061	A2061a	0.20	0.90	99	99	5-Year	0.057	0.065	18	89	0.070	26	130	
2062	A2062a	0.13	0.90	99	99	5-Year	0.037	0.042	12	93	0.045	17	131	
2063	A2063a	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2065	A2065a	0.42	0.80	86	81	5-Year	0.101	0.115	35	82	0.123	50	119	
2066	A2066a	0.60	0.80	85	80	5-Year	0.143	0.163	48	80	0.174	69	115	
2072	A2072a	0.20	0.90	99	99	5-Year	0.057	0.065	18	89	0.070	26	130	
2072	A2072b	3.10	0.70	71	66	2-Year	0.408	0.465	430	139	0.498	624	201	
2075	A2075a	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2075	A2075b	1.25	0.70	71	66	2-Year	0.172	0.196	169	135	0.210	245	196	
2083	A2083a	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2083	A2083b	4.30	0.70	71	66	2-Year	0.554	0.632	547	127	0.676	794	185	
2084	A2084a	0.87	0.70	71	66	2-Year	0.121	0.138	117	134	0.148	169	194	
2084	A2084b	1.27	0.40	29	29	2-Year	0.078	0.089	N/A	N/A	0.095	N/A	N/A	Negligible On-Site Storage Assumed
2084	A2084c	4.97	0.77	81	76	5-Year	1.032	1.176	506	102	1.258	734	148	
2085	A2085a	0.70	0.70	71	66	2-Year	0.098	0.112	94	134	0.120	136	194	
2116	A2116a	0.23	0.80	86	81	2-Year	0.040	0.046	32	137	0.049	46	200	
2116	A2116b	0.24	0.80	86	81	2-Year	0.042	0.048	33	137	0.051	48	200	
2116	A2116c	0.56	0.40	29	29	2-Year	0.035	0.040	N/A	N/A	0.043	N/A	N/A	Negligible On-Site Storage Assumed
2116	A2116d	0.72	0.90	99	99	2-Year	0.149	0.170	99	137	0.182	143	199	
2116	A2116e	0.89	0.90	99	99	5-Year	0.251	0.286	71	80	0.306	103	116	
2116	A2116f	1.13	0.80	86	81	100-Year	0.496	0.496	N/A	N/A	0.496	N/A	N/A	Negligible On-Site Storage Assumed
2116	A2116g	1.16	0.70	71	66	2-Year	0.160	0.182	157	135	0.195	227	196	
2116	A2116h	2.18	0.40	29	29	100-Year	0.449	0.449	N/A	N/A	0.449	N/A	N/A	Negligible On-Site Storage Assumed
2116	A2116i	2.62	0.70	71	66	2-Year	0.348	0.397	361	138	0.425	524	200	

Table A-1: Summary of East Urban Community Drainage Area Characteristics

MH	SWMHYMO	Area	C	TIMP	XIMP	Min. Capture [1]	Min. Capture [1]	100-Year Capture [2]	100-Year Storage [2]		100-Year + 20% Capture [3]	100-Year + 20% Storage [3]		Notes
ID	ID	(ha)					(m^3/s)	(m^3/s)	(m^3)	(m^3/ha)	(m^3/s)	(m^3)	(m^3/ha)	
2116	A2116j	2.77	0.90	99	99	2-Year	0.543	0.619	373	134	0.662	540	195	
2116	A2116k	2.94	0.80	86	81	100-Year	1.261	1.261	N/A	N/A	1.261	N/A	N/A	Negligible On-Site Storage Assumed
2116	A2116l	3.12	0.90	99	99	2-Year	0.607	0.692	419	134	0.740	608	195	
2116	A2116m	7.72	0.70	71	66	2-Year	0.950	1.083	1097	142	1.159	1591	206	
2116	A2116n	9.47	0.90	99	99	85 L/s/ha	0.805	0.805	2593	274	0.805	3760	397	
2117	A2117a	0.53	0.70	71	66	2-Year	0.075	0.086	70	132	0.092	102	192	
2118	A2118a	0.30	0.70	71	66	2-Year	0.043	0.049	40	133	0.052	58	193	
2118	A2118b	0.64	0.70	71	66	2-Year	0.090	0.103	85	133	0.110	123	192	
2118	A2118c	1.26	0.70	71	66	2-Year	0.173	0.197	171	135	0.211	247	196	
2119	A2119a	0.49	0.90	99	99	5-Year	0.139	0.158	41	84	0.169	59	120	
2119	A2119b	0.95	0.80	86	81	100-Year	0.418	0.418	N/A	N/A	0.418	N/A	N/A	Negligible On-Site Storage Assumed
2119	A2119c	0.95	0.80	86	81	100-Year	0.418	0.418	N/A	N/A	0.418	N/A	N/A	Negligible On-Site Storage Assumed
2119	A2119d	1.16	0.40	29	29	2-Year	0.071	0.081	N/A	N/A	0.087	N/A	N/A	Negligible On-Site Storage Assumed
2119	A2119e	2.86	0.70	71	66	2-Year	0.378	0.431	396	138	0.461	574	201	
2119	A2119f	5.63	0.90	99	99	2-Year	1.053	1.200	757	134	1.284	1097	195	
2119	A2119g	7.33	0.70	71	66	2-Year	0.906	1.033	967	132	1.105	1402	191	
2120	A2120a	0.41	0.70	71	66	2-Year	0.058	0.066	55	134	0.071	80	195	
2121	A2121a	1.13	0.70	71	66	2-Year	0.156	0.178	152	135	0.190	221	196	
2136	A2136a	0.35	0.70	71	66	2-Year	0.050	0.057	47	133	0.061	68	194	
2136	A2136b	1.21	0.70	71	66	2-Year	0.167	0.190	163	135	0.203	236	195	
2138	A2138a	0.37	0.70	71	66	2-Year	0.052	0.059	50	136	0.063	73	197	
2138	A2138b	0.67	0.70	71	66	2-Year	0.094	0.107	90	134	0.114	130	194	
2139	A2139a	0.37	0.70	71	66	2-Year	0.052	0.059	50	136	0.063	73	197	
2140	A2140a	0.12	0.70	71	66	2-Year	0.017	0.019	17	142	0.020	25	208	
2141	A2141a	0.37	0.70	71	66	2-Year	0.052	0.059	50	136	0.063	73	197	
2201	A2201a	6.77	0.80	86	81	2-Year	1.032	1.176	N/A	N/A	1.258	N/A	N/A	Negligible On-Site Storage Assumed
2203	A2203a	0.40	0.80	86	81	2-Year	0.069	0.079	N/A	N/A	0.085	N/A	N/A	Negligible On-Site Storage Assumed
2203	A2203b	4.64	0.40	29	29	2-Year	0.263	0.300	N/A	N/A	0.321	N/A	N/A	Negligible On-Site Storage Assumed
2204	A2204a	0.89	0.80	86	81	2-Year	0.152	0.173	N/A	N/A	0.185	N/A	N/A	Negligible On-Site Storage Assumed
2205	A2205a	0.83	0.80	86	81	2-Year	0.142	0.162	N/A	N/A	0.173	N/A	N/A	Negligible On-Site Storage Assumed
2206	A2206a	1.03	0.80	86	81	2-Year	0.175	0.200	N/A	N/A	0.214	N/A	N/A	Negligible On-Site Storage Assumed
2208	A2208a	1.48	0.80	86	81	2-Year	0.248	0.283	N/A	N/A	0.303	N/A	N/A	Negligible On-Site Storage Assumed
2209	A2209a	0.39	0.90	99	99	5-Year	0.111	0.127	33	84	0.136	48	123	
2211	A2211a	3.97	0.80	86	81	2-Year	0.629	0.717	N/A	N/A	0.767	N/A	N/A	Negligible On-Site Storage Assumed
2212	A2212a	0.10	0.70	71	66	2-Year	0.014	0.016	14	143	0.017	21	210	
ForeN	AForeN	4.88	0.55	50	50	100% Capture	N/A	N/A	N/A	N/A	N/A	N/A	N/A	North Forebay
MainS	AHE1	18.48	0.41	30	30	5-Year	0.688	0.688	635	34	0.688	635	34	Modelled in DDSWMM
MainS	ATW1	3.09	0.80	86	86	10-Year	3.295	3.295	1228	71	3.295	1228	397	Modelled in DDSWMM
MainS	ATW2	14.25	0.80	86	86									Modelled in DDSWMM

[1] 2-year capture on local roads, 5-year capture on collector roads, and 10-year capture on arterial roads, with no surface storage used during these events (exceptions and greater than 2-year capture highlighted).

[2] 100-year capture set to 114% of minimum capture, and 100-year surface storage set to minimum required to contain runoff within surface storage (exceptions as described under Notes).

[3] 100-year + 20% stress test capture set at 107% of 100-year capture, and 100-year + 20% stress test storage set to 145% of 100-year storage, based on Abbottsville Crossing pilot project (exceptions as described under Notes).

Calculation Sheet 1A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)(1 - Q_5 / Q_{100})(LT_c)(60/2)$, and

Q = Flow (m^3/s) A = Area (ha)
V = Volume (m^3) L = Length of Unit Hydrograph
C = Runoff Coefficient T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)
0.000	0.00
0.005	0.00
0.010	0.01
0.015	0.02
0.020	0.05
0.025	0.10
0.030	0.18
0.035	0.29
0.040	0.43
0.045	0.61
0.050	0.83
0.055	1.11
0.060	1.44
0.065	1.83
0.070	2.29
0.075	2.81
0.080	3.41
0.085	4.09
0.090	4.86
0.095	5.71
0.100	6.64
0.105	7.66
0.110	8.77
0.115	9.96
0.120	11.23
0.125	12.59
0.130	14.04
0.135	15.57
0.140	17.18

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.030	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.046	0.02	3.3	3.5	3.8	4.0	4.3	4.6	4.8	5.1	5.4	5.6	5.9	6.2	6.4	6.7	6.9
0.062	0.11	4.4	4.7	5.1	5.5	5.8	6.2	6.5	6.9	7.2	7.6	7.9	8.3	8.7	9.0	9.4
0.078	0.29	5.5	6.0	6.4	6.9	7.3	7.8	8.2	8.7	9.1	9.5	10.0	10.4	10.9	11.3	11.8
0.094	0.57	6.7	7.2	7.7	8.3	8.8	9.3	9.9	10.4	11.0	11.5	12.0	12.6	13.1	13.7	14.2
0.110	0.95	7.8	8.4	9.1	9.7	10.3	10.9	11.6	12.2	12.8	13.5	14.1	14.7	15.4	16.0	16.6
0.126	1.43	8.9	9.6	10.4	11.1	11.8	12.5	13.3	14.0	14.7	15.4	16.1	16.9	17.6	18.3	19.0
0.142	2.01	10.1	10.9	11.7	12.5	13.3	14.1	14.9	15.8	16.6	17.4	18.2	19.0	19.8	20.6	21.5
0.158	2.70	11.2	12.1	13.0	13.9	14.8	15.7	16.6	17.5	18.4	19.3	20.2	21.2	22.1	23.0	23.9
0.174	3.49	12.3	13.3	14.3	15.3	16.3	17.3	18.3	19.3	20.3	21.3	22.3	23.3	24.3	25.3	26.3
0.190	4.39	13.5	14.5	15.6	16.7	17.8	18.9	20.0	21.1	22.2	23.3	24.3	25.4	26.5	27.6	28.7
0.206	5.38	14.6	15.8	17.0	18.1	19.3	20.5	21.7	22.9	24.0	25.2	26.4	27.6	28.8	29.9	31.1
0.222	6.49	15.7	17.0	18.3	19.5	20.8	22.1	23.4	24.6	25.9	27.2	28.4	29.7	31.0	32.3	33.5
0.238	7.69	16.9	18.2	19.6	20.9	22.3	23.7	25.0	26.4	27.8	29.1	30.5	31.9	33.2	34.6	36.0
0.254	9.00	18.0	19.4	20.9	22.4	23.8	25.3	26.7	28.2	29.6	31.1	32.5	34.0	35.5	36.9	38.4
0.270	10.42	19.1	20.7	22.2	23.8	25.3	26.9	28.4	29.9	31.5	33.0	34.6	36.1	37.7	39.2	40.8
0.286	11.93	20.3	21.9	23.5	25.2	26.8	28.4	30.1	31.7	33.4	35.0	36.6	38.3	39.9	41.6	43.2
0.302	13.56	21.4	23.1	24.9	26.6	28.3	30.0	31.8	33.5	35.2	37.0	38.7	40.4	42.2	43.9	45.6
0.318	15.28	22.5	24.3	26.2	28.0	29.8	31.6	33.5	35.3	37.1	38.9	40.7	42.6	44.4	46.2	48.0
0.334	17.09	23.7	25.6	27.5	29.4	31.3	33.2	35.1	37.0	39.0	40.9	42.8	44.7	46.6	48.5	50.5
0.350	18.98	24.8	26.8	28.8	30.8	32.8	34.8	36.8	38.8	40.8	42.8	44.8	46.9	48.9	50.9	52.9
0.366	20.94	25.9	28.0	30.1	32.2	34.3	36.4	38.5	40.6	42.7	44.8	46.9	49.0	51.1	53.2	55.3
0.382	22.96	27.1	29.2	31.4	33.6	35.8	38.0	40.2	42.4	44.6	46.8	48.9	51.1	53.3	55.5	57.7
0.398	25.02	28.2	30.5	32.8	35.0	37.3	39.6	41.9	44.1	46.4	48.7	51.0	53.3	55.6	57.8	60.1
0.414	27.14	29.3	31.7	34.1	36.4	38.8	41.2	43.5	45.9	48.3	50.7	53.0	55.4	57.8	60.2	62.5
0.430	29.29	30.5	32.9	35.4	37.8	40.3	42.8	45.2	47.7	50.2	52.6	55.1	57.6	60.0	62.5	65.0
0.446	31.48	31.6	34.1	36.7	39.3	41.8	44.4	46.9	49.5	52.0	54.6	57.1	59.7	62.3	64.8	67.4
0.462	33.70	32.7	35.4	38.0	40.7	43.3	46.0	48.6	51.2	53.9	56.5	59.2	61.8	64.5	67.1	69.8
0.478	35.95	33.9	36.6	39.3	42.1	44.8	47.5	50.3	53.0	55.8	58.5	61.2	64.0	66.7	69.5	72.2

Calculation Sheet 1A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)(1 - Q_5 / Q_{100})(LT_c)(60/2)$, and

Q = Flow (m^3/s)
V = Volume (m^3)
C = Runoff Coefficient
I = Intensity (mm/hour)
A = Area (ha)
L = Length of Unit Hydrograph
T_c = Time of Concentration (minutes)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)	Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.145	18.88	0.494	38.23	35.0	37.8	40.6	43.5	46.3	49.1	52.0	54.8	57.6	60.5	63.3	66.1	69.0	71.8	74.6
0.150	20.67	0.510	40.53	36.1	39.0	42.0	44.9	47.8	50.7	53.6	56.6	59.5	62.4	65.3	68.3	71.2	74.1	77.0
0.155	22.54	0.526	42.85	37.3	40.3	43.3	46.3	49.3	52.3	55.3	58.3	61.4	64.4	67.4	70.4	73.4	76.4	79.5
0.160	24.50	0.542	45.20	38.4	41.5	44.6	47.7	50.8	53.9	57.0	60.1	63.2	66.3	69.4	72.6	75.7	78.8	81.9
0.165	26.55	0.558	47.58	39.5	42.7	45.9	49.1	52.3	55.5	58.7	61.9	65.1	68.3	71.5	74.7	77.9	81.1	84.3
0.170	28.69	0.574	49.98	40.7	43.9	47.2	50.5	53.8	57.1	60.4	63.7	67.0	70.3	73.5	76.8	80.1	83.4	86.7
0.175	30.93	0.590	52.42	41.8	45.2	48.5	51.9	55.3	58.7	62.1	65.4	68.8	72.2	75.6	79.0	82.4	85.7	89.1
0.180	33.27	0.606	54.90	42.9	46.4	49.9	53.3	56.8	60.3	63.7	67.2	70.7	74.2	77.6	81.1	84.6	88.1	91.6
0.185	35.71	0.622	57.41	44.1	47.6	51.2	54.7	58.3	61.9	65.4	69.0	72.6	76.1	79.7	83.3	86.8	90.4	94.0
0.190	38.25	0.638	59.96	45.2	48.9	52.5	56.1	59.8	63.5	67.1	70.8	74.4	78.1	81.7	85.4	89.1	92.7	96.4
0.195	40.91	0.654	62.55	46.3	50.1	53.8	57.6	61.3	65.0	68.8	72.5	76.3	80.0	83.8	87.5	91.3	95.1	98.8
0.200	43.67	0.670	65.18	47.5	51.3	55.1	59.0	62.8	66.6	70.5	74.3	78.2	82.0	85.8	89.7	93.5	97.4	101.2
0.205	46.55	0.686	67.85	48.6	52.5	56.4	60.4	64.3	68.2	72.2	76.1	80.0	84.0	87.9	91.8	95.8	99.7	103.6
0.210	49.54	0.702	70.57	49.7	53.8	57.8	61.8	65.8	69.8	73.8	77.9	81.9	85.9	89.9	94.0	98.0	102.0	106.1
0.215	52.66	0.718	73.34	50.9	55.0	59.1	63.2	67.3	71.4	75.5	79.6	83.8	87.9	92.0	96.1	100.2	104.4	108.5
0.220	55.89	0.734	76.15	52.0	56.2	60.4	64.6	68.8	73.0	77.2	81.4	85.6	89.8	94.0	98.3	102.5	106.7	110.9
0.225	59.25	0.750	79.00	53.1	57.4	61.7	66.0	70.3	74.6	78.9	83.2	87.5	91.8	96.1	100.4	104.7	109.0	113.3
0.230	62.74	0.766	81.91	54.3	58.7	63.0	67.4	71.8	76.2	80.6	85.0	89.4	93.8	98.1	102.5	106.9	111.3	115.7
0.235	66.36	0.782	84.86	55.4	59.9	64.3	68.8	73.3	77.8	82.3	86.7	91.2	95.7	100.2	104.7	109.2	113.7	118.1
0.240	70.11	0.798	87.86	56.5	61.1	65.7	70.2	74.8	79.4	83.9	88.5	93.1	97.7	102.2	106.8	111.4	116.0	120.6
0.245	74.00	0.814	90.91	57.7	62.3	67.0	71.6	76.3	81.0	85.6	90.3	95.0	99.6	104.3	109.0	113.6	118.3	123.0
0.250	78.03	0.830	94.01	58.8	63.6	68.3	73.0	77.8	82.6	87.3	92.1	96.8	101.6	106.3	111.1	115.9	120.6	125.4
0.255	82.20	0.846	97.16	59.9	64.8	69.6	74.5	79.3	84.1	89.0	93.8	98.7	103.5	108.4	113.2	118.1	123.0	127.8
0.260	86.51	0.862	100.37	61.1	66.0	70.9	75.9	80.8	85.7	90.7	95.6	100.6	105.5	110.4	115.4	120.3	125.3	130.2
0.265	90.98	0.878	103.62	62.2	67.2	72.2	77.3	82.3	87.3	92.4	97.4	102.4	107.5	112.5	117.5	122.6	127.6	132.6
0.270	95.59	0.894	106.93	63.3	68.5	73.6	78.7	83.8	88.9	94.0	99.2	104.3	109.4	114.5	119.7	124.8	129.9	135.1
0.275	100.36	0.910	110.29	64.5	69.7	74.9	80.1	85.3	90.5	95.7	100.9	106.2	111.4	116.6	121.8	127.0	132.3	137.5
0.280	105.28	0.926	113.70	65.6	70.9	76.2	81.5	86.8	92.1	97.4	102.7	108.0	113.3	118.6	124.0	129.3	134.6	139.9
0.285	110.37	0.942	117.16	66.7	72.1	77.5	82.9	88.3	93.7	99.1	104.5	109.9	115.3	120.7	126.1	131.5	136.9	142.3

Calculation Sheet 1A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = (Q_{100} - Q_5) (1 - Q_5 / Q_{100}) (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)
0.290	115.61
0.295	121.02
0.300	126.60
0.305	132.35
0.310	138.27
0.315	144.37
0.320	150.65
0.325	157.11
0.330	163.76
0.335	170.59
0.340	177.61
0.345	184.83
0.350	192.25

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.958	120.68	67.9	73.4	78.8	84.3	89.8	95.3	100.8	106.3	111.8	117.3	122.7	128.2	133.7	139.2	144.7
0.974	124.25	69.0	74.6	80.1	85.7	91.3	96.9	102.5	108.0	113.6	119.2	124.8	130.4	136.0	141.6	147.1
0.990	127.88	70.1	75.8	81.5	87.1	92.8	98.5	104.1	109.8	115.5	121.2	126.8	132.5	138.2	143.9	149.6
1.006	131.56	71.3	77.0	82.8	88.5	94.3	100.1	105.8	111.6	117.4	123.1	128.9	134.7	140.4	146.2	152.0
1.022	135.30	72.4	78.3	84.1	89.9	95.8	101.7	107.5	113.4	119.2	125.1	130.9	136.8	142.7	148.5	154.4
1.038	139.09	73.5	79.5	85.4	91.4	97.3	103.2	109.2	115.1	121.1	127.0	133.0	138.9	144.9	150.9	156.8
1.054	142.93	74.7	80.7	86.7	92.8	98.8	104.8	110.9	116.9	123.0	129.0	135.0	141.1	147.1	153.2	159.2
1.070	146.83	75.8	81.9	88.0	94.2	100.3	106.4	112.6	118.7	124.8	131.0	137.1	143.2	149.4	155.5	161.7
1.086	150.79	76.9	83.2	89.4	95.6	101.8	108.0	114.2	120.5	126.7	132.9	139.1	145.4	151.6	157.8	164.1
1.102	154.80	78.1	84.4	90.7	97.0	103.3	109.6	115.9	122.2	128.6	134.9	141.2	147.5	153.8	160.2	166.5
1.118	158.87	79.2	85.6	92.0	98.4	104.8	111.2	117.6	124.0	130.4	136.8	143.2	149.7	156.1	162.5	168.9
1.134	162.99	80.3	86.8	93.3	99.8	106.3	112.8	119.3	125.8	132.3	138.8	145.3	151.8	158.3	164.8	171.3
1.150	167.17	81.5	88.1	94.6	101.2	107.8	114.4	121.0	127.6	134.2	140.8	147.3	153.9	160.5	167.1	173.7

Calculation Sheet 1B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)$ $(1 - Q_5 / Q_{100})$ (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)
0.000	0.00
0.005	0.00
0.010	0.01
0.015	0.02
0.020	0.05
0.025	0.10
0.030	0.18
0.035	0.29
0.040	0.43
0.045	0.61
0.050	0.83
0.055	1.11
0.060	1.44
0.065	1.83
0.070	2.29
0.075	2.81
0.080	3.41
0.085	4.09
0.090	4.86
0.095	5.71
0.100	6.64
0.105	7.66
0.110	8.77
0.115	9.96
0.120	11.23
0.125	12.59
0.130	14.04
0.135	15.57
0.140	17.18

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.046	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.062	0.01	4.4	4.7	5.1	5.5	5.8	6.2	6.5	6.9	7.2	7.6	7.9	8.3	8.7	9.0	9.4
0.078	0.09	5.5	6.0	6.4	6.9	7.3	7.8	8.2	8.7	9.1	9.5	10.0	10.4	10.9	11.3	11.8
0.094	0.24	6.7	7.2	7.7	8.3	8.8	9.3	9.9	10.4	11.0	11.5	12.0	12.6	13.1	13.7	14.2
0.110	0.48	7.8	8.4	9.1	9.7	10.3	10.9	11.6	12.2	12.8	13.5	14.1	14.7	15.4	16.0	16.6
0.126	0.83	8.9	9.6	10.4	11.1	11.8	12.5	13.3	14.0	14.7	15.4	16.1	16.9	17.6	18.3	19.0
0.142	1.27	10.1	10.9	11.7	12.5	13.3	14.1	14.9	15.8	16.6	17.4	18.2	19.0	19.8	20.6	21.5
0.158	1.81	11.2	12.1	13.0	13.9	14.8	15.7	16.6	17.5	18.4	19.3	20.2	21.2	22.1	23.0	23.9
0.174	2.45	12.3	13.3	14.3	15.3	16.3	17.3	18.3	19.3	20.3	21.3	22.3	23.3	24.3	25.3	26.3
0.190	3.20	13.5	14.5	15.6	16.7	17.8	18.9	20.0	21.1	22.2	23.3	24.3	25.4	26.5	27.6	28.7
0.206	4.05	14.6	15.8	17.0	18.1	19.3	20.5	21.7	22.9	24.0	25.2	26.4	27.6	28.8	29.9	31.1
0.222	5.00	15.7	17.0	18.3	19.5	20.8	22.1	23.4	24.6	25.9	27.2	28.4	29.7	31.0	32.3	33.5
0.238	6.05	16.9	18.2	19.6	20.9	22.3	23.7	25.0	26.4	27.8	29.1	30.5	31.9	33.2	34.6	36.0
0.254	7.21	18.0	19.4	20.9	22.4	23.8	25.3	26.7	28.2	29.6	31.1	32.5	34.0	35.5	36.9	38.4
0.270	8.47	19.1	20.7	22.2	23.8	25.3	26.9	28.4	29.9	31.5	33.0	34.6	36.1	37.7	39.2	40.8
0.286	9.83	20.3	21.9	23.5	25.2	26.8	28.4	30.1	31.7	33.4	35.0	36.6	38.3	39.9	41.6	43.2
0.302	11.30	21.4	23.1	24.9	26.6	28.3	30.0	31.8	33.5	35.2	37.0	38.7	40.4	42.2	43.9	45.6
0.318	12.87	22.5	24.3	26.2	28.0	29.8	31.6	33.5	35.3	37.1	38.9	40.7	42.6	44.4	46.2	48.0
0.334	14.55	23.7	25.6	27.5	29.4	31.3	33.2	35.1	37.0	39.0	40.9	42.8	44.7	46.6	48.5	50.5
0.350	16.31	24.8	26.8	28.8	30.8	32.8	34.8	36.8	38.8	40.8	42.8	44.8	46.9	48.9	50.9	52.9
0.366	18.15	25.9	28.0	30.1	32.2	34.3	36.4	38.5	40.6	42.7	44.8	46.9	49.0	51.1	53.2	55.3
0.382	20.06	27.1	29.2	31.4	33.6	35.8	38.0	40.2	42.4	44.6	46.8	48.9	51.1	53.3	55.5	57.7
0.398	22.03	28.2	30.5	32.8	35.0	37.3	39.6	41.9	44.1	46.4	48.7	51.0	53.3	55.6	57.8	60.1
0.414	24.06	29.3	31.7	34.1	36.4	38.8	41.2	43.5	45.9	48.3	50.7	53.0	55.4	57.8	60.2	62.5
0.430	26.13	30.5	32.9	35.4	37.8	40.3	42.8	45.2	47.7	50.2	52.6	55.1	57.6	60.0	62.5	65.0
0.446	28.24	31.6	34.1	36.7	39.3	41.8	44.4	46.9	49.5	52.0	54.6	57.1	59.7	62.3	64.8	67.4
0.462	30.39	32.7	35.4	38.0	40.7	43.3	46.0	48.6	51.2	53.9	56.5	59.2	61.8	64.5	67.1	69.8
0.478	32.57	33.9	36.6	39.3	42.1	44.8	47.5	50.3	53.0	55.8	58.5	61.2	64.0	66.7	69.5	72.2
0.494	34.79	35.0	37.8	40.6	43.5	46.3	49.1	52.0	54.8	57.6	60.5	63.3	66.1	69.0	71.8	74.6

Calculation Sheet 1B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)(1 - Q_5 / Q_{100})(LT_c)(60/2)$, and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)
0.145	18.88
0.150	20.67
0.155	22.54
0.160	24.50
0.165	26.55
0.170	28.69
0.175	30.93
0.180	33.27
0.185	35.71
0.190	38.25
0.195	40.91
0.200	43.67
0.205	46.55
0.210	49.54
0.215	52.66
0.220	55.89
0.225	59.25
0.230	62.74
0.235	66.36
0.240	70.11
0.245	74.00
0.250	78.03
0.255	82.20
0.260	86.51
0.265	90.98
0.270	95.59
0.275	100.36
0.280	105.28
0.285	110.37

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.510	37.03	36.1	39.0	42.0	44.9	47.8	50.7	53.6	56.6	59.5	62.4	65.3	68.3	71.2	74.1	77.0
0.526	39.29	37.3	40.3	43.3	46.3	49.3	52.3	55.3	58.3	61.4	64.4	67.4	70.4	73.4	76.4	79.5
0.542	41.59	38.4	41.5	44.6	47.7	50.8	53.9	57.0	60.1	63.2	66.3	69.4	72.6	75.7	78.8	81.9
0.558	43.90	39.5	42.7	45.9	49.1	52.3	55.5	58.7	61.9	65.1	68.3	71.5	74.7	77.9	81.1	84.3
0.574	46.25	40.7	43.9	47.2	50.5	53.8	57.1	60.4	63.7	67.0	70.3	73.5	76.8	80.1	83.4	86.7
0.590	48.63	41.8	45.2	48.5	51.9	55.3	58.7	62.1	65.4	68.8	72.2	75.6	79.0	82.4	85.7	89.1
0.606	51.04	42.9	46.4	49.9	53.3	56.8	60.3	63.7	67.2	70.7	74.2	77.6	81.1	84.6	88.1	91.6
0.622	53.48	44.1	47.6	51.2	54.7	58.3	61.9	65.4	69.0	72.6	76.1	79.7	83.3	86.8	90.4	94.0
0.638	55.97	45.2	48.9	52.5	56.1	59.8	63.5	67.1	70.8	74.4	78.1	81.7	85.4	89.1	92.7	96.4
0.654	58.49	46.3	50.1	53.8	57.6	61.3	65.0	68.8	72.5	76.3	80.0	83.8	87.5	91.3	95.1	98.8
0.670	61.05	47.5	51.3	55.1	59.0	62.8	66.6	70.5	74.3	78.2	82.0	85.8	89.7	93.5	97.4	101.2
0.686	63.66	48.6	52.5	56.4	60.4	64.3	68.2	72.2	76.1	80.0	84.0	87.9	91.8	95.8	99.7	103.6
0.702	66.31	49.7	53.8	57.8	61.8	65.8	69.8	73.8	77.9	81.9	85.9	89.9	94.0	98.0	102.0	106.1
0.718	69.00	50.9	55.0	59.1	63.2	67.3	71.4	75.5	79.6	83.8	87.9	92.0	96.1	100.2	104.4	108.5
0.734	71.74	52.0	56.2	60.4	64.6	68.8	73.0	77.2	81.4	85.6	89.8	94.0	98.3	102.5	106.7	110.9
0.750	74.52	53.1	57.4	61.7	66.0	70.3	74.6	78.9	83.2	87.5	91.8	96.1	100.4	104.7	109.0	113.3
0.766	77.35	54.3	58.7	63.0	67.4	71.8	76.2	80.6	85.0	89.4	93.8	98.1	102.5	106.9	111.3	115.7
0.782	80.23	55.4	59.9	64.3	68.8	73.3	77.8	82.3	86.7	91.2	95.7	100.2	104.7	109.2	113.7	118.1
0.798	83.16	56.5	61.1	65.7	70.2	74.8	79.4	83.9	88.5	93.1	97.7	102.2	106.8	111.4	116.0	120.6
0.814	86.13	57.7	62.3	67.0	71.6	76.3	81.0	85.6	90.3	95.0	99.6	104.3	109.0	113.6	118.3	123.0
0.830	89.16	58.8	63.6	68.3	73.0	77.8	82.6	87.3	92.1	96.8	101.6	106.3	111.1	115.9	120.6	125.4
0.846	92.23	59.9	64.8	69.6	74.5	79.3	84.1	89.0	93.8	98.7	103.5	108.4	113.2	118.1	123.0	127.8
0.862	95.36	61.1	66.0	70.9	75.9	80.8	85.7	90.7	95.6	100.6	105.5	110.4	115.4	120.3	125.3	130.2
0.878	98.54	62.2	67.2	72.2	77.3	82.3	87.3	92.4	97.4	102.4	107.5	112.5	117.5	122.6	127.6	132.6
0.894	101.77	63.3	68.5	73.6	78.7	83.8	88.9	94.0	99.2	104.3	109.4	114.5	119.7	124.8	129.9	135.1
0.910	105.05	64.5	69.7	74.9	80.1	85.3	90.5	95.7	100.9	106.2	111.4	116.6	121.8	127.0	132.3	137.5
0.926	108.38	65.6	70.9	76.2	81.5	86.8	92.1	97.4	102.7	108.0	113.3	118.6	124.0	129.3	134.6	139.9
0.942	111.77	66.7	72.1	77.5	82.9	88.3	93.7	99.1	104.5	109.9	115.3	120.7	126.1	131.5	136.9	142.3
0.958	115.21	67.9	73.4	78.8	84.3	89.8	95.3	100.8	106.3	111.8	117.3	122.7	128.2	133.7	139.2	144.7

Calculation Sheet 1B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 2-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)$ $(1 - Q_5 / Q_{100})$ (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	16.3	16.0	15.7	15.5	15.3	15.1	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.3	14.2

Static Depth (m)	Static Volume (m^3)
0.290	115.61
0.295	121.02
0.300	126.60
0.305	132.35
0.310	138.27
0.315	144.37
0.320	150.65
0.325	157.11
0.330	163.76
0.335	170.59
0.340	177.61
0.345	184.83
0.350	192.25

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.974	118.70	69.0	74.6	80.1	85.7	91.3	96.9	102.5	108.0	113.6	119.2	124.8	130.4	136.0	141.6	147.1
0.990	122.25	70.1	75.8	81.5	87.1	92.8	98.5	104.1	109.8	115.5	121.2	126.8	132.5	138.2	143.9	149.6
1.006	125.85	71.3	77.0	82.8	88.5	94.3	100.1	105.8	111.6	117.4	123.1	128.9	134.7	140.4	146.2	152.0
1.022	129.50	72.4	78.3	84.1	89.9	95.8	101.7	107.5	113.4	119.2	125.1	130.9	136.8	142.7	148.5	154.4
1.038	133.21	73.5	79.5	85.4	91.4	97.3	103.2	109.2	115.1	121.1	127.0	133.0	138.9	144.9	150.9	156.8
1.054	136.98	74.7	80.7	86.7	92.8	98.8	104.8	110.9	116.9	123.0	129.0	135.0	141.1	147.1	153.2	159.2
1.070	140.79	75.8	81.9	88.0	94.2	100.3	106.4	112.6	118.7	124.8	131.0	137.1	143.2	149.4	155.5	161.7
1.086	144.67	76.9	83.2	89.4	95.6	101.8	108.0	114.2	120.5	126.7	132.9	139.1	145.4	151.6	157.8	164.1
1.102	148.60	78.1	84.4	90.7	97.0	103.3	109.6	115.9	122.2	128.6	134.9	141.2	147.5	153.8	160.2	166.5
1.118	152.58	79.2	85.6	92.0	98.4	104.8	111.2	117.6	124.0	130.4	136.8	143.2	149.7	156.1	162.5	168.9
1.134	156.63	80.3	86.8	93.3	99.8	106.3	112.8	119.3	125.8	132.3	138.8	145.3	151.8	158.3	164.8	171.3
1.150	160.72	81.5	88.1	94.6	101.2	107.8	114.4	121.0	127.6	134.2	140.8	147.3	153.9	160.5	167.1	173.7
1.166	164.88	82.6	89.3	95.9	102.6	109.3	116.0	122.7	129.3	136.0	142.7	149.4	156.1	162.8	169.5	176.2

Calculation Sheet 2A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = (Q_{100} - Q_5) (1 - Q_5 / Q_{100}) (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

Static Depth (m)	Static Volume (m^3)
0.000	0.00
0.005	0.00
0.010	0.01
0.015	0.02
0.020	0.05
0.025	0.10
0.030	0.18
0.035	0.29
0.040	0.43
0.045	0.61
0.050	0.83
0.055	1.11
0.060	1.44
0.065	1.83
0.070	2.29
0.075	2.81
0.080	3.41
0.085	4.09
0.090	4.86
0.095	5.71
0.100	6.64
0.105	7.66
0.110	8.77
0.115	9.96
0.120	11.23
0.125	12.59
0.130	14.04
0.135	15.57
0.140	17.18

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.030	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.046	0.02	1.8	1.9	2.1	2.2	2.3	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.3	3.5	3.6
0.062	0.11	2.4	2.6	2.8	3.0	3.1	3.3	3.5	3.6	3.8	4.0	4.2	4.3	4.5	4.7	4.9
0.078	0.29	3.1	3.3	3.5	3.7	3.9	4.1	4.4	4.6	4.8	5.0	5.2	5.5	5.7	5.9	6.1
0.094	0.57	3.7	4.0	4.2	4.5	4.7	5.0	5.3	5.5	5.8	6.0	6.3	6.6	6.8	7.1	7.4
0.110	0.95	4.3	4.6	4.9	5.2	5.5	5.8	6.2	6.5	6.8	7.1	7.4	7.7	8.0	8.3	8.6
0.126	1.43	5.0	5.3	5.7	6.0	6.3	6.7	7.1	7.4	7.8	8.1	8.5	8.8	9.2	9.5	9.9
0.142	2.01	5.6	6.0	6.4	6.8	7.2	7.6	7.9	8.3	8.7	9.1	9.5	9.9	10.3	10.7	11.1
0.158	2.70	6.2	6.7	7.1	7.5	8.0	8.4	8.8	9.3	9.7	10.2	10.6	11.0	11.5	11.9	12.4
0.174	3.49	6.8	7.3	7.8	8.3	8.8	9.3	9.7	10.2	10.7	11.2	11.7	12.2	12.6	13.1	13.6
0.190	4.39	7.5	8.0	8.5	9.0	9.6	10.1	10.6	11.2	11.7	12.2	12.7	13.3	13.8	14.3	14.9
0.206	5.38	8.1	8.7	9.2	9.8	10.4	11.0	11.5	12.1	12.7	13.2	13.8	14.4	15.0	15.5	16.1
0.222	6.49	8.7	9.3	10.0	10.6	11.2	11.8	12.4	13.0	13.7	14.3	14.9	15.5	16.1	16.8	17.4
0.238	7.69	9.4	10.0	10.7	11.3	12.0	12.7	13.3	14.0	14.6	15.3	16.0	16.6	17.3	18.0	18.6
0.254	9.00	10.0	10.7	11.4	12.1	12.8	13.5	14.2	14.9	15.6	16.3	17.0	17.8	18.5	19.2	19.9
0.270	10.42	10.6	11.4	12.1	12.9	13.6	14.4	15.1	15.9	16.6	17.4	18.1	18.9	19.6	20.4	21.1
0.286	11.93	11.3	12.0	12.8	13.6	14.4	15.2	16.0	16.8	17.6	18.4	19.2	20.0	20.8	21.6	22.4
0.302	13.56	11.9	12.7	13.5	14.4	15.2	16.1	16.9	17.7	18.6	19.4	20.3	21.1	22.0	22.8	23.6
0.318	15.28	12.5	13.4	14.3	15.1	16.0	16.9	17.8	18.7	19.6	20.5	21.3	22.2	23.1	24.0	24.9
0.334	17.09	13.1	14.1	15.0	15.9	16.8	17.8	18.7	19.6	20.5	21.5	22.4	23.3	24.3	25.2	26.1
0.350	18.98	13.8	14.7	15.7	16.7	17.6	18.6	19.6	20.6	21.5	22.5	23.5	24.5	25.4	26.4	27.4
0.366	20.94	14.4	15.4	16.4	17.4	18.4	19.5	20.5	21.5	22.5	23.5	24.6	25.6	26.6	27.6	28.7
0.382	22.96	15.0	16.1	17.1	18.2	19.3	20.3	21.4	22.4	23.5	24.6	25.6	26.7	27.8	28.8	29.9
0.398	25.02	15.7	16.8	17.9	19.0	20.1	21.2	22.3	23.4	24.5	25.6	26.7	27.8	28.9	30.0	31.2
0.414	27.14	16.3	17.4	18.6	19.7	20.9	22.0	23.2	24.3	25.5	26.6	27.8	28.9	30.1	31.3	32.4
0.430	29.29	16.9	18.1	19.3	20.5	21.7	22.9	24.1	25.3	26.5	27.7	28.9	30.1	31.3	32.5	33.7
0.446	31.48	17.5	18.8	20.0	21.2	22.5	23.7	25.0	26.2	27.4	28.7	29.9	31.2	32.4	33.7	34.9
0.462	33.70	18.2	19.4	20.7	22.0	23.3	24.6	25.9	27.1	28.4	29.7	31.0	32.3	33.6	34.9	36.2
0.478	35.95	18.8	20.1	21.4	22.8	24.1	25.4	26.7	28.1	29.4	30.7	32.1	33.4	34.7	36.1	37.4

Calculation Sheet 2A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)$ $(1 - Q_5 / Q_{100})$ (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

Static Depth (m)	Static Volume (m^3)
0.145	18.88
0.150	20.67
0.155	22.54
0.160	24.50
0.165	26.55
0.170	28.69
0.175	30.93
0.180	33.27
0.185	35.71
0.190	38.25
0.195	40.91
0.200	43.67
0.205	46.55
0.210	49.54
0.215	52.66
0.220	55.89
0.225	59.25
0.230	62.74
0.235	66.36
0.240	70.11
0.245	74.00
0.250	78.03
0.255	82.20
0.260	86.51
0.265	90.98
0.270	95.59
0.275	100.36
0.280	105.28
0.285	110.37

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.494	38.23	19.4	20.8	22.2	23.5	24.9	26.3	27.6	29.0	30.4	31.8	33.1	34.5	35.9	37.3	38.7
0.510	40.53	20.1	21.5	22.9	24.3	25.7	27.1	28.5	30.0	31.4	32.8	34.2	35.6	37.1	38.5	39.9
0.526	42.85	20.7	22.1	23.6	25.0	26.5	28.0	29.4	30.9	32.4	33.8	35.3	36.8	38.2	39.7	41.2
0.542	45.20	21.3	22.8	24.3	25.8	27.3	28.8	30.3	31.8	33.3	34.9	36.4	37.9	39.4	40.9	42.4
0.558	47.58	22.0	23.5	25.0	26.6	28.1	29.7	31.2	32.8	34.3	35.9	37.4	39.0	40.6	42.1	43.7
0.574	49.98	22.6	24.2	25.7	27.3	28.9	30.5	32.1	33.7	35.3	36.9	38.5	40.1	41.7	43.3	44.9
0.590	52.42	23.2	24.8	26.5	28.1	29.7	31.4	33.0	34.7	36.3	37.9	39.6	41.2	42.9	44.5	46.2
0.606	54.90	23.8	25.5	27.2	28.9	30.5	32.2	33.9	35.6	37.3	39.0	40.7	42.4	44.0	45.7	47.4
0.622	57.41	24.5	26.2	27.9	29.6	31.3	33.1	34.8	36.5	38.3	40.0	41.7	43.5	45.2	47.0	48.7
0.638	59.96	25.1	26.9	28.6	30.4	32.2	33.9	35.7	37.5	39.3	41.0	42.8	44.6	46.4	48.2	49.9
0.654	62.55	25.7	27.5	29.3	31.1	33.0	34.8	36.6	38.4	40.2	42.1	43.9	45.7	47.5	49.4	51.2
0.670	65.18	26.4	28.2	30.1	31.9	33.8	35.6	37.5	39.4	41.2	43.1	45.0	46.8	48.7	50.6	52.4
0.686	67.85	27.0	28.9	30.8	32.7	34.6	36.5	38.4	40.3	42.2	44.1	46.0	47.9	49.9	51.8	53.7
0.702	70.57	27.6	29.5	31.5	33.4	35.4	37.3	39.3	41.2	43.2	45.1	47.1	49.1	51.0	53.0	55.0
0.718	73.34	28.2	30.2	32.2	34.2	36.2	38.2	40.2	42.2	44.2	46.2	48.2	50.2	52.2	54.2	56.2
0.734	76.15	28.9	30.9	32.9	35.0	37.0	39.0	41.1	43.1	45.2	47.2	49.3	51.3	53.4	55.4	57.5
0.750	79.00	29.5	31.6	33.6	35.7	37.8	39.9	42.0	44.1	46.1	48.2	50.3	52.4	54.5	56.6	58.7
0.766	81.91	30.1	32.2	34.4	36.5	38.6	40.7	42.9	45.0	47.1	49.3	51.4	53.5	55.7	57.8	60.0
0.782	84.86	30.8	32.9	35.1	37.2	39.4	41.6	43.8	45.9	48.1	50.3	52.5	54.7	56.8	59.0	61.2
0.798	87.86	31.4	33.6	35.8	38.0	40.2	42.4	44.7	46.9	49.1	51.3	53.5	55.8	58.0	60.2	62.5
0.814	90.91	32.0	34.3	36.5	38.8	41.0	43.3	45.5	47.8	50.1	52.4	54.6	56.9	59.2	61.4	63.7
0.830	94.01	32.7	34.9	37.2	39.5	41.8	44.1	46.4	48.8	51.1	53.4	55.7	58.0	60.3	62.7	65.0
0.846	97.16	33.3	35.6	37.9	40.3	42.6	45.0	47.3	49.7	52.0	54.4	56.8	59.1	61.5	63.9	66.2
0.862	100.37	33.9	36.3	38.7	41.1	43.4	45.8	48.2	50.6	53.0	55.4	57.8	60.3	62.7	65.1	67.5
0.878	103.62	34.5	37.0	39.4	41.8	44.2	46.7	49.1	51.6	54.0	56.5	58.9	61.4	63.8	66.3	68.7
0.894	106.93	35.2	37.6	40.1	42.6	45.1	47.5	50.0	52.5	55.0	57.5	60.0	62.5	65.0	67.5	70.0
0.910	110.29	35.8	38.3	40.8	43.3	45.9	48.4	50.9	53.5	56.0	58.5	61.1	63.6	66.1	68.7	71.2
0.926	113.70	36.4	39.0	41.5	44.1	46.7	49.2	51.8	54.4	57.0	59.6	62.1	64.7	67.3	69.9	72.5
0.942	117.16	37.1	39.7	42.3	44.9	47.5	50.1	52.7	55.3	58.0	60.6	63.2	65.8	68.5	71.1	73.7

Calculation Sheet 2A: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.10% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.075	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)(1 - Q_5 / Q_{100})(LT_c)(60/2)$, and

Q = Flow (m^3/s)
V = Volume (m^3)
C = Runoff Coefficient
I = Intensity (mm/hour)
A = Area (ha)
L = Length of Unit Hydrograph
T_c = Time of Concentration (minutes)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

Static Depth (m)	Static Volume (m^3)
0.290	115.61
0.295	121.02
0.300	126.60
0.305	132.35
0.310	138.27
0.315	144.37
0.320	150.65
0.325	157.11
0.330	163.76
0.335	170.59
0.340	177.61
0.345	184.83
0.350	192.25

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.958	120.68	37.7	40.3	43.0	45.6	48.3	50.9	53.6	56.3	58.9	61.6	64.3	67.0	69.6	72.3	75.0
0.974	124.25	38.3	41.0	43.7	46.4	49.1	51.8	54.5	57.2	59.9	62.6	65.4	68.1	70.8	73.5	76.2
0.990	127.88	38.9	41.7	44.4	47.1	49.9	52.6	55.4	58.2	60.9	63.7	66.4	69.2	72.0	74.7	77.5
1.006	131.56	39.6	42.3	45.1	47.9	50.7	53.5	56.3	59.1	61.9	64.7	67.5	70.3	73.1	75.9	78.7
1.022	135.30	40.2	43.0	45.8	48.7	51.5	54.3	57.2	60.0	62.9	65.7	68.6	71.4	74.3	77.1	80.0
1.038	139.09	40.8	43.7	46.6	49.4	52.3	55.2	58.1	61.0	63.9	66.8	69.7	72.6	75.5	78.4	81.3
1.054	142.93	41.5	44.4	47.3	50.2	53.1	56.0	59.0	61.9	64.8	67.8	70.7	73.7	76.6	79.6	82.5
1.070	146.83	42.1	45.0	48.0	51.0	53.9	56.9	59.9	62.8	65.8	68.8	71.8	74.8	77.8	80.8	83.8
1.086	150.79	42.7	45.7	48.7	51.7	54.7	57.7	60.8	63.8	66.8	69.8	72.9	75.9	78.9	82.0	85.0
1.102	154.80	43.4	46.4	49.4	52.5	55.5	58.6	61.7	64.7	67.8	70.9	73.9	77.0	80.1	83.2	86.3
1.118	158.87	44.0	47.1	50.1	53.2	56.3	59.4	62.6	65.7	68.8	71.9	75.0	78.1	81.3	84.4	87.5
1.134	162.99	44.6	47.7	50.9	54.0	57.1	60.3	63.5	66.6	69.8	72.9	76.1	79.3	82.4	85.6	88.8
1.150	167.17	45.2	48.4	51.6	54.8	58.0	61.1	64.3	67.5	70.8	74.0	77.2	80.4	83.6	86.8	90.0

Calculation Sheet 2B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)\ (1 - Q_5 / Q_{100})\ (LT_c)\ (60/2)$, and

Q = Flow (m^3/s)
V = Volume (m^3)
C = Runoff Coefficient
I = Intensity (mm/hour)
A = Area (ha)
L = Length of Unit Hydrograph
T_c = Time of Concentration (minutes)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925

Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

Static Depth (m)	Static Volume (m^3)
0.000	0.00
0.005	0.00
0.010	0.01
0.015	0.02
0.020	0.05
0.025	0.10
0.030	0.18
0.035	0.29
0.040	0.43
0.045	0.61
0.050	0.83
0.055	1.11
0.060	1.44
0.065	1.83
0.070	2.29
0.075	2.81
0.080	3.41
0.085	4.09
0.090	4.86
0.095	5.71
0.100	6.64
0.105	7.66
0.110	8.77
0.115	9.96
0.120	11.23
0.125	12.59
0.130	14.04
0.135	15.57
0.140	17.18

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.046	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.062	0.01	2.4	2.6	2.8	3.0	3.1	3.3	3.5	3.6	3.8	4.0	4.2	4.3	4.5	4.7	4.9
0.078	0.09	3.1	3.3	3.5	3.7	3.9	4.1	4.4	4.6	4.8	5.0	5.2	5.5	5.7	5.9	6.1
0.094	0.24	3.7	4.0	4.2	4.5	4.7	5.0	5.3	5.5	5.8	6.0	6.3	6.6	6.8	7.1	7.4
0.110	0.48	4.3	4.6	4.9	5.2	5.5	5.8	6.2	6.5	6.8	7.1	7.4	7.7	8.0	8.3	8.6
0.126	0.83	5.0	5.3	5.7	6.0	6.3	6.7	7.1	7.4	7.8	8.1	8.5	8.8	9.2	9.5	9.9
0.142	1.27	5.6	6.0	6.4	6.8	7.2	7.6	7.9	8.3	8.7	9.1	9.5	9.9	10.3	10.7	11.1
0.158	1.81	6.2	6.7	7.1	7.5	8.0	8.4	8.8	9.3	9.7	10.2	10.6	11.0	11.5	11.9	12.4
0.174	2.45	6.8	7.3	7.8	8.3	8.8	9.3	9.7	10.2	10.7	11.2	11.7	12.2	12.6	13.1	13.6
0.190	3.20	7.5	8.0	8.5	9.0	9.6	10.1	10.6	11.2	11.7	12.2	12.7	13.3	13.8	14.3	14.9
0.206	4.05	8.1	8.7	9.2	9.8	10.4	11.0	11.5	12.1	12.7	13.2	13.8	14.4	15.0	15.5	16.1
0.222	5.00	8.7	9.3	10.0	10.6	11.2	11.8	12.4	13.0	13.7	14.3	14.9	15.5	16.1	16.8	17.4
0.238	6.05	9.4	10.0	10.7	11.3	12.0	12.7	13.3	14.0	14.6	15.3	16.0	16.6	17.3	18.0	18.6
0.254	7.21	10.0	10.7	11.4	12.1	12.8	13.5	14.2	14.9	15.6	16.3	17.0	17.8	18.5	19.2	19.9
0.270	8.47	10.6	11.4	12.1	12.9	13.6	14.4	15.1	15.9	16.6	17.4	18.1	18.9	19.6	20.4	21.1
0.286	9.83	11.3	12.0	12.8	13.6	14.4	15.2	16.0	16.8	17.6	18.4	19.2	20.0	20.8	21.6	22.4
0.302	11.30	11.9	12.7	13.5	14.4	15.2	16.1	16.9	17.7	18.6	19.4	20.3	21.1	22.0	22.8	23.6
0.318	12.87	12.5	13.4	14.3	15.1	16.0	16.9	17.8	18.7	19.6	20.5	21.3	22.2	23.1	24.0	24.9
0.334	14.55	13.1	14.1	15.0	15.9	16.8	17.8	18.7	19.6	20.5	21.5	22.4	23.3	24.3	25.2	26.1
0.350	16.31	13.8	14.7	15.7	16.7	17.6	18.6	19.6	20.6	21.5	22.5	23.5	24.5	25.4	26.4	27.4
0.366	18.15	14.4	15.4	16.4	17.4	18.4	19.5	20.5	21.5	22.5	23.5	24.6	25.6	26.6	27.6	28.7
0.382	20.06	15.0	16.1	17.1	18.2	19.3	20.3	21.4	22.4	23.5	24.6	25.6	26.7	27.8	28.8	29.9
0.398	22.03	15.7	16.8	17.9	19.0	20.1	21.2	22.3	23.4	24.5	25.6	26.7	27.8	28.9	30.0	31.2
0.414	24.06	16.3	17.4	18.6	19.7	20.9	22.0	23.2	24.3	25.5	26.6	27.8	28.9	30.1	31.3	32.4
0.430	26.13	16.9	18.1	19.3	20.5	21.7	22.9	24.1	25.3	26.5	27.7	28.9	30.1	31.3	32.5	33.7
0.446	28.24	17.5	18.8	20.0	21.2	22.5	23.7	25.0	26.2	27.4	28.7	29.9	31.2	32.4	33.7	34.9
0.462	30.39	18.2	19.4	20.7	22.0	23.3	24.6	25.9	27.1	28.4	29.7	31.0	32.3	33.6	34.9	36.2
0.478	32.57	18.8	20.1	21.4	22.8	24.1	25.4	26.7	28.1	29.4	30.7	32.1	33.4	34.7	36.1	37.4
0.494	34.79	19.4	20.8	22.2	23.5	24.9	26.3	27.6	29.0	30.4	31.8	33.1	34.5	35.9	37.3	38.7

Calculation Sheet 2B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and V = $(Q_{100} - Q_5)$ $(1 - Q_5 / Q_{100})$ (LT_c) (60/2), and

Q = Flow (m^3/s)
A = Area (ha)
V = Volume (m^3)
L = Length of Unit Hydrograph
C = Runoff Coefficient
T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

Static Depth (m)	Static Volume (m^3)
0.145	18.88
0.150	20.67
0.155	22.54
0.160	24.50
0.165	26.55
0.170	28.69
0.175	30.93
0.180	33.27
0.185	35.71
0.190	38.25
0.195	40.91
0.200	43.67
0.205	46.55
0.210	49.54
0.215	52.66
0.220	55.89
0.225	59.25
0.230	62.74
0.235	66.36
0.240	70.11
0.245	74.00
0.250	78.03
0.255	82.20
0.260	86.51
0.265	90.98
0.270	95.59
0.275	100.36
0.280	105.28
0.285	110.37

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.510	37.03	20.1	21.5	22.9	24.3	25.7	27.1	28.5	30.0	31.4	32.8	34.2	35.6	37.1	38.5	39.9
0.526	39.29	20.7	22.1	23.6	25.0	26.5	28.0	29.4	30.9	32.4	33.8	35.3	36.8	38.2	39.7	41.2
0.542	41.59	21.3	22.8	24.3	25.8	27.3	28.8	30.3	31.8	33.3	34.9	36.4	37.9	39.4	40.9	42.4
0.558	43.90	22.0	23.5	25.0	26.6	28.1	29.7	31.2	32.8	34.3	35.9	37.4	39.0	40.6	42.1	43.7
0.574	46.25	22.6	24.2	25.7	27.3	28.9	30.5	32.1	33.7	35.3	36.9	38.5	40.1	41.7	43.3	44.9
0.590	48.63	23.2	24.8	26.5	28.1	29.7	31.4	33.0	34.7	36.3	37.9	39.6	41.2	42.9	44.5	46.2
0.606	51.04	23.8	25.5	27.2	28.9	30.5	32.2	33.9	35.6	37.3	39.0	40.7	42.4	44.0	45.7	47.4
0.622	53.48	24.5	26.2	27.9	29.6	31.3	33.1	34.8	36.5	38.3	40.0	41.7	43.5	45.2	47.0	48.7
0.638	55.97	25.1	26.9	28.6	30.4	32.2	33.9	35.7	37.5	39.3	41.0	42.8	44.6	46.4	48.2	49.9
0.654	58.49	25.7	27.5	29.3	31.1	33.0	34.8	36.6	38.4	40.2	42.1	43.9	45.7	47.5	49.4	51.2
0.670	61.05	26.4	28.2	30.1	31.9	33.8	35.6	37.5	39.4	41.2	43.1	45.0	46.8	48.7	50.6	52.4
0.686	63.66	27.0	28.9	30.8	32.7	34.6	36.5	38.4	40.3	42.2	44.1	46.0	47.9	49.9	51.8	53.7
0.702	66.31	27.6	29.5	31.5	33.4	35.4	37.3	39.3	41.2	43.2	45.1	47.1	49.1	51.0	53.0	55.0
0.718	69.00	28.2	30.2	32.2	34.2	36.2	38.2	40.2	42.2	44.2	46.2	48.2	50.2	52.2	54.2	56.2
0.734	71.74	28.9	30.9	32.9	35.0	37.0	39.0	41.1	43.1	45.2	47.2	49.3	51.3	53.4	55.4	57.5
0.750	74.52	29.5	31.6	33.6	35.7	37.8	39.9	42.0	44.1	46.1	48.2	50.3	52.4	54.5	56.6	58.7
0.766	77.35	30.1	32.2	34.4	36.5	38.6	40.7	42.9	45.0	47.1	49.3	51.4	53.5	55.7	57.8	60.0
0.782	80.23	30.8	32.9	35.1	37.2	39.4	41.6	43.8	45.9	48.1	50.3	52.5	54.7	56.8	59.0	61.2
0.798	83.16	31.4	33.6	35.8	38.0	40.2	42.4	44.7	46.9	49.1	51.3	53.5	55.8	58.0	60.2	62.5
0.814	86.13	32.0	34.3	36.5	38.8	41.0	43.3	45.5	47.8	50.1	52.4	54.6	56.9	59.2	61.4	63.7
0.830	89.16	32.7	34.9	37.2	39.5	41.8	44.1	46.4	48.8	51.1	53.4	55.7	58.0	60.3	62.7	65.0
0.846	92.23	33.3	35.6	37.9	40.3	42.6	45.0	47.3	49.7	52.0	54.4	56.8	59.1	61.5	63.9	66.2
0.862	95.36	33.9	36.3	38.7	41.1	43.4	45.8	48.2	50.6	53.0	55.4	57.8	60.3	62.7	65.1	67.5
0.878	98.54	34.5	37.0	39.4	41.8	44.2	46.7	49.1	51.6	54.0	56.5	58.9	61.4	63.8	66.3	68.7
0.894	101.77	35.2	37.6	40.1	42.6	45.1	47.5	50.0	52.5	55.0	57.5	60.0	62.5	65.0	67.5	70.0
0.910	105.05	35.8	38.3	40.8	43.3	45.9	48.4	50.9	53.5	56.0	58.5	61.1	63.6	66.1	68.7	71.2
0.926	108.38	36.4	39.0	41.5	44.1	46.7	49.2	51.8	54.4	57.0	59.6	62.1	64.7	67.3	69.9	72.5
0.942	111.77	37.1	39.7	42.3	44.9	47.5	50.1	52.7	55.3	58.0	60.6	63.2	65.8	68.5	71.1	73.7
0.958	115.21	37.7	40.3	43.0	45.6	48.3	50.9	53.6	56.3	58.9	61.6	64.3	67.0	69.6	72.3	75.0

Calculation Sheet 2B: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less 5-Year + 14% Minor System Capture (0.15% High Point to High Point Slope)

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Ext	2	%
Longitudinal Slope (U/S Ponding Extent to LP	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	5	Year + 14%

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)(1 - Q_5 / Q_{100})(LT_c)(60/2)$, and

Q = Flow (m^3/s) A = Area (ha)
V = Volume (m^3) L = Length of Unit Hydrograph
C = Runoff Coefficient T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

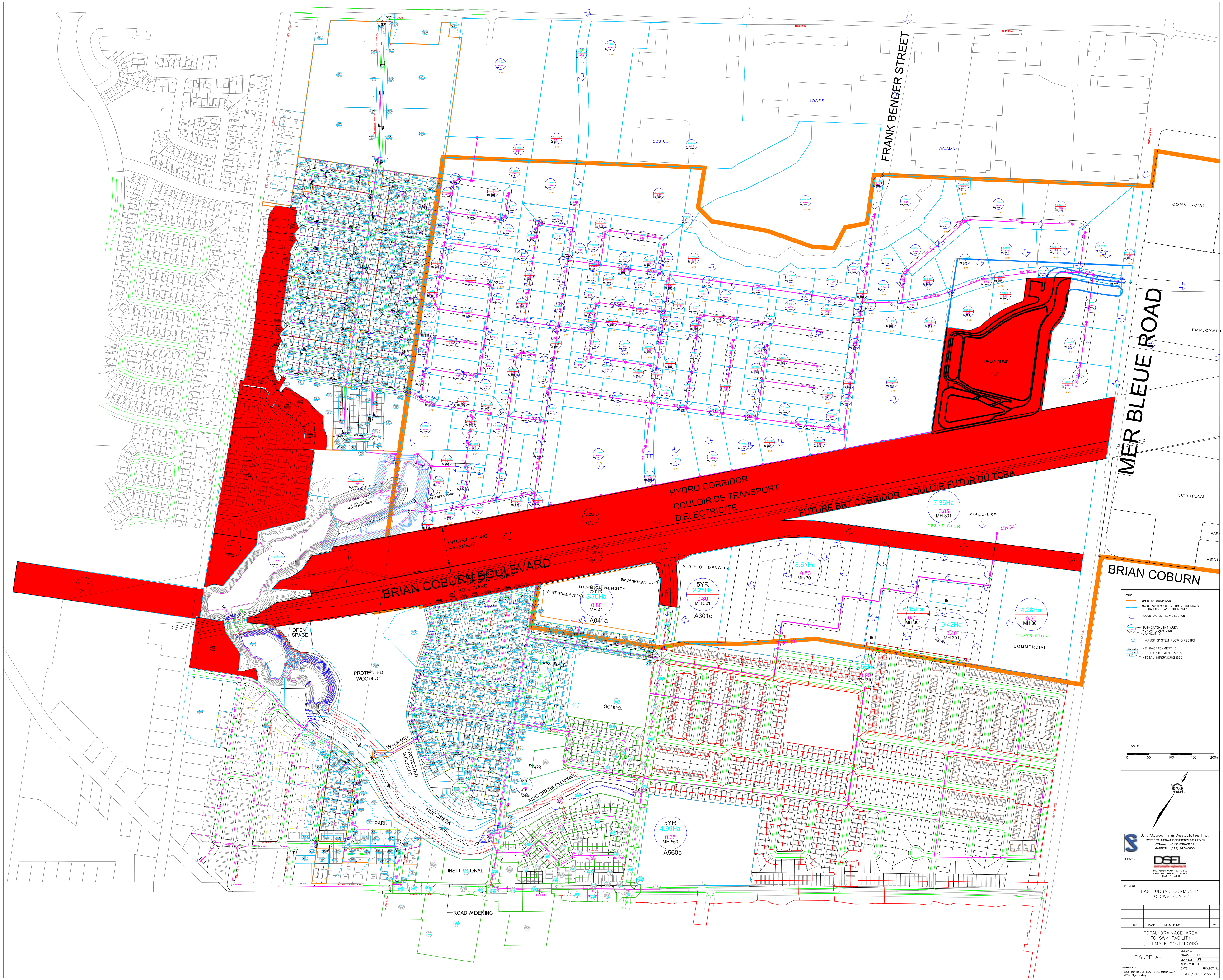
Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	6.7	6.5	6.3	6.2	6.0	5.9	5.9	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4

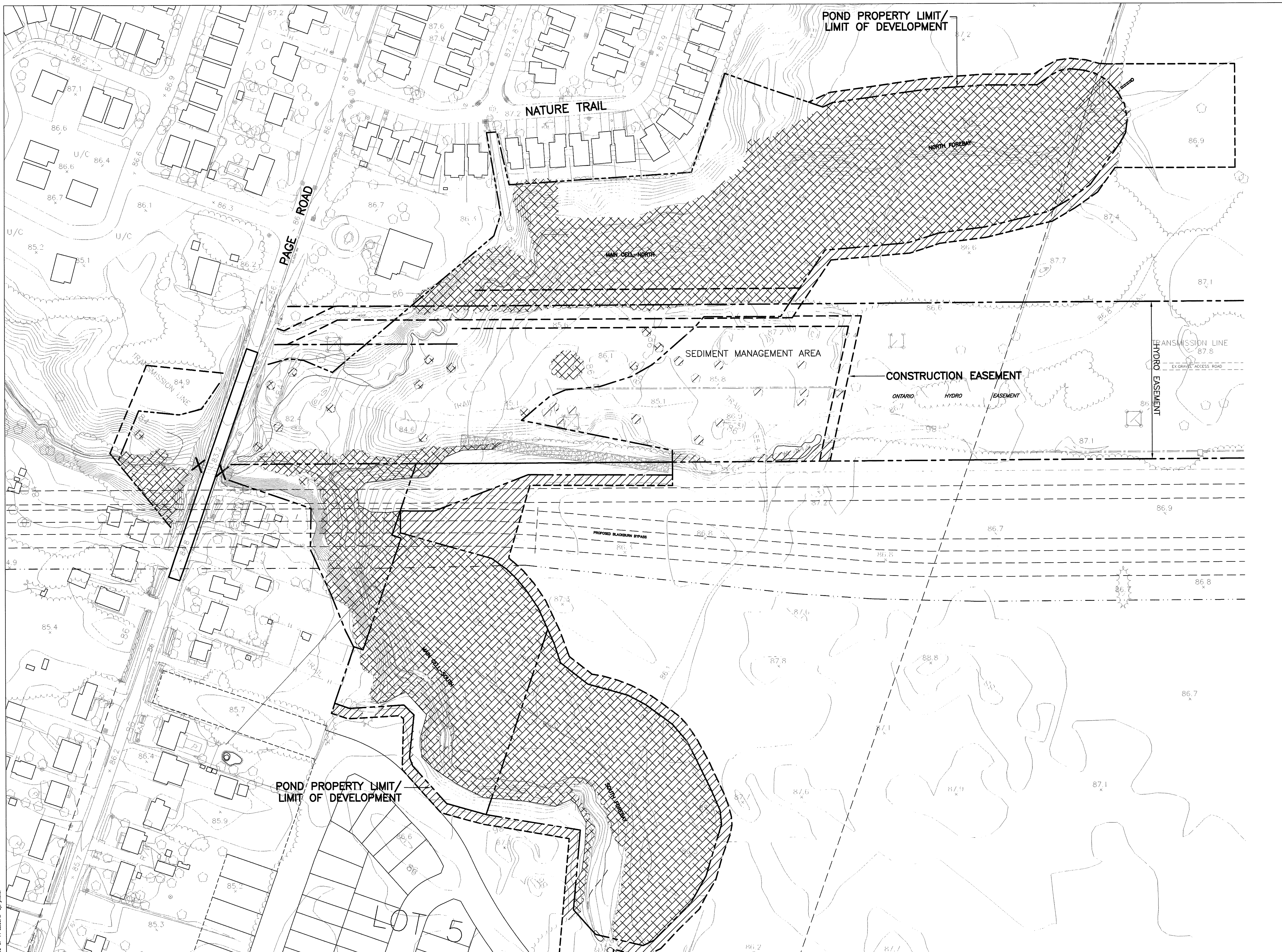
Static Depth (m)	Static Volume (m^3)
0.290	115.61
0.295	121.02
0.300	126.60
0.305	132.35
0.310	138.27
0.315	144.37
0.320	150.65
0.325	157.11
0.330	163.76
0.335	170.59
0.340	177.61
0.345	184.83
0.350	192.25

Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.974	118.70	38.3	41.0	43.7	46.4	49.1	51.8	54.5	57.2	59.9	62.6	65.4	68.1	70.8	73.5	76.2
0.990	122.25	38.9	41.7	44.4	47.1	49.9	52.6	55.4	58.2	60.9	63.7	66.4	69.2	72.0	74.7	77.5
1.006	125.85	39.6	42.3	45.1	47.9	50.7	53.5	56.3	59.1	61.9	64.7	67.5	70.3	73.1	75.9	78.7
1.022	129.50	40.2	43.0	45.8	48.7	51.5	54.3	57.2	60.0	62.9	65.7	68.6	71.4	74.3	77.1	80.0
1.038	133.21	40.8	43.7	46.6	49.4	52.3	55.2	58.1	61.0	63.9	66.8	69.7	72.6	75.5	78.4	81.3
1.054	136.98	41.5	44.4	47.3	50.2	53.1	56.0	59.0	61.9	64.8	67.8	70.7	73.7	76.6	79.6	82.5
1.070	140.79	42.1	45.0	48.0	51.0	53.9	56.9	59.9	62.8	65.8	68.8	71.8	74.8	77.8	80.8	83.8
1.086	144.67	42.7	45.7	48.7	51.7	54.7	57.7	60.8	63.8	66.8	69.8	72.9	75.9	78.9	82.0	85.0
1.102	148.60	43.4	46.4	49.4	52.5	55.5	58.6	61.7	64.7	67.8	70.9	73.9	77.0	80.1	83.2	86.3
1.118	152.58	44.0	47.1	50.1	53.2	56.3	59.4	62.6	65.7	68.8	71.9	75.0	78.1	81.3	84.4	87.5
1.134	156.63	44.6	47.7	50.9	54.0	57.1	60.3	63.5	66.6	69.8	72.9	76.1	79.3	82.4	85.6	88.8
1.150	160.72	45.2	48.4	51.6	54.8	58.0	61.1	64.3	67.5	70.8	74.0	77.2	80.4	83.6	86.8	90.0
1.166	164.88	45.9	49.1	52.3	55.5	58.8	62.0	65.2	68.5	71.7	75.0	78.2	81.5	84.8	88.0	91.3

DSEL Markup
Oct 4, 2019

Areas draining directly to the main cells





Ottawa

INFRASTRUCTURE SERVICES AND COMMUNITY SUSTAINABILITY

WATER & WASTEWATER BRANCH

W. Newell, P.Eng.
Director, Infrastructure Services Branch

Approved by:
Name: S. D'Aoust
Signed:
Date:
Stamp (if applicable)

Designed by:
Name: G. Chochlinski
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 08.03.25

NOTES:

- CLEARING
- CLEARING AND GRUBBING

As Built Drawing

These drawings have been prepared based on information provided by others. Stantec Consulting Ltd. has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result.

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Stantec

No.	Revision	Date
2	AS-BUILT	12.01.23
1	ISSUED FOR CONSTRUCTION	10.07.16
A	TENDER ISSUE	10.03.24
0	ISSUED FOR 95% REVIEW	08.04.16

Scales
0 10 30 50m

DRAWING TITLE:

EUC POND No.1
PAGE ROAD STORMWATER MANAGEMENT FACILITY
CONTRACT No.ISB08-2015

REMOVALS

Drawing No.: 14870-C04

Rev. No.: 2

171

14-733 EUC Phase 3 Area CDP
Prepared by DSEL
1-Jun-20

Comment Source	Comment Type	Commen	Comment	Response
Ted Cooper, City of Ottawa - Nov 27, 2019 Email Correspondence	MSS	1	Revise report as appropriate to be consistent with text (below) from Section 12.1 of IBI's Mer Bleue Urban Expansion Area McKinnons Creek Enhancement. Sept 30, 2019 concerning the drainage approach in the sistent with Revise text in Section 11.3.2, Section 11.8 and Section 13.1 and Point 18) in Section 15 12.1 South Orleans Employment Area (Bilberry Creek) The lands south of Innes Rd., east of Mer Bleue Rd., west of 10th Line Rd. and north of the Hydro Corridor are identified as the South Orleans Employment Area (SOEA). Also located in this area is Vanguard Drive, an existing east-west roadway in the South Orléans Community that extends approximately 450 metres west from Tenth Line Road, ending at Lanthier Drive. This area is the subject of an ongoing EA for the Vanguard Drive extension between Lanthier Dr to the east and Mer Bleue Rd. to the west. The alignment of Vanguard Drive Extension (Collector Road) is currently being finalized through the EA process. The stormwater management tributary boundary limits in this area were established in the Supplementary Report to the Master Drainage Plan and Environmental Study Report (CCL, May 2001), the Mer Bleue Community Design Plan Infrastructure Servicing Study (CCL/IBI, April 2006), and the Avalon West (Neighbourhood 5) Stormwater Management Facility Design (IBI Group, October 2013). Following those reports, the downstream stormwater management infrastructure within the Neighbourhood 5 area was designed, approved by the City of Ottawa, and constructed.	Quote added to *Section 11.3.2 North East Minor System Design* in MSS, and other sections updated accordingly.
Ted Cooper, City of Ottawa - Nov 27, 2019 Email Correspondence	MSS	1 cont.	Currently, the City of Ottawa is dealing with erosion issues along Bilberry Creek. To minimize additional flows to Billberry Creek, the City is investigating the lands south of the Vanguard Drive extension to be re-directed to McKinnons Creek via the existing stormwater infrastructure in the Avalon West development. This would establish the proposed Vanguard Dr extension as the new tributary limits for McKinnons Creek, where lands south of this road (approximately 16 ha) would be considered for stormwater servicing (re-direction of flow from Bilberry Creek) to the south via the existing Avalon West stormwater system and SWM facility. The existing Avalon West SWMF and stormwater infrastructure have been designed and constructed with limited allocation for flows from the Hydro Corridor and Transitway area (south of Hydro Corridor). The re-direction of drainage area from the SOEA must respect the flow allocation and capacity of the receiving Avalon West stormwater management system. It should be noted that this re-directed area will be required to adhere to strict stormwater management requirements in order to respect the capacity of the downstream storm infrastructure of Avalon West area to insure no negative impacts on the existing residential dwellings. The release rate allocated for the Hydro Corridor and future Transitway is approximately 1.43cms for the approximate 20 ha area as outlined within the report Avalon West (Neighbourhood 5) Stormwater Management Facility Design. Additional servicing constraints will need to be addressed as well including potential crossing conflicts with the future Transitway and associated storm infrastructure.	Quote added to *Section 11.3.2 North East Minor System Design* in MSS, and other sections updated accordingly.
Ted Cooper, City of Ottawa - Nov 27, 2019 Email Correspondence	MSS	2	Modify text where reference is made to the Mud Creek CIS. Since the plan is to have the report be approved at the same Committee meeting as the EUC MUC CDP, references to the Report should not be in the future tense. I believe a subsection should be added to 4. Existing Conditions and Site Constraints, entitled Mud Creek. This is where one paragraph should be written about the Mud Creek CIS and a few bullet points with the main findings / recommendations (per Page 14 of the online consultation: combination of reinforcement and targeted channel reconfiguration, and scoped LID implementation in the EUC MUC).	*Section 11.2.6* has been added based on input from City of Ottawa staff, related to the Mud Creek CIS.
Ted Cooper, City of Ottawa - Nov 27, 2019 Email Correspondence	MSS	3	Reference to use of spring-line connections must be removed. These will be dealt with on a case-by-case basis during detailed design, per usual procedures.	The following has been added in all relevant sections: *Additional springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in Section 14 related to minor changes are met. These are currently considered deviations from City Standards, and will require review on a case-by-case basis.*

James Holland, South Nation Conservation, January 28, 2020	MSS	4	The Conservation Partners Planning and Development Review Team completed a review of OPA D01-01-19-0002 and the Community Design Plan, and Environmental Assessment for Phase 3 of the East Urban Community on January 17, 2020. The letter noted that additional comments may be provided by South Nation Conservation on the Master Servicing Study. i. Master Servicing Study for East Urban Community Phase 3 Area Community Design Plan. Prepared by DSEL. Dated October 2019 (2nd Submission). The above study notes that the outcome of the Vanguard Drive Environmental Assessment and potential diversion of the North East quadrant to McKinnon's Creek may affect grading strategies. It further states that the "City is planning to address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area," and "a detailed stormwater analysis may be required for the North East quadrant as the design process continues to prove storage requirements are met." (page 77).	N/A
James Holland, South Nation Conservation, January 28, 2020	MSS	5	If a diversion of lands in the EUC Phase 3 North East quadrant is to be pursued, it must be demonstrated how any increased volumes to the Neighbourhood 5 pond or McKinnon's Creek downstream of the pond will be addressed. These studies must address the following: 1. Impacts to McKinnon's Creek floodplain, including updating the recently completed McKinnon's Creek Floodplain model to reflect the proposed increase in catchment area. 2. Impacts to erosion hazard allowances which examine toe erosion, slope stability, erosion access, and fluvial geomorphological considerations (meander belt width).	Section 11.3.2 North East Minor System Design has been modified to explain: *If a diversion of lands south of Vanguard is to be pursued in accordance with the Vanguard Drive Environmental Assessment (IBI, Jan 2020) and the Mer Bleue Urban Expansion Area McKinnons Creek Enhancement (IBI, Sept 30, 2019), the City and SNC expect the following issues to be addressed:* *-It must be demonstrated how any increased volumes to the Neighbourhood 5 pond or McKinnon's Creek downstream of the pond will be addressed. These studies must address the following:* *1. Impacts to McKinnon's Creek floodplain, including updating the recently completed McKinnon's Creek Floodplain model to reflect the proposed increase in catchment area, if required.* *2. Impacts to erosion hazard allowances which examine toe erosion, slope stability, erosion access, and fluvial geomorphological considerations (meander belt width), if required.* *- The current SWM design servicing Neighborhood 5 (NH5), future expansion of NH5, future development downstream of NH5 and runoff contributions from the Orleans Family Health Hub at 225 Mer Bleue Road and Blue Sea Village Mer Bleue at 2159 Mer Bleue Road would have to be assessed. Allowance for future construction of the Bus Rapid Transit Corridor (BRTC) would have to be included in the assessment.* *- Adequate stormwater quantity controls would need to be implemented at-source and/or in combination with stormwater management facilities (as necessary) to control the rate of discharge from the quadrant (south of Vanguard Drive) to the available residual capacity of trunk sewers in the catchment area of the Avalon West Stormwater Management Pond, and it would need to be demonstrated that the Avalon West SWM Pond has sufficient residual capacity to provide the necessary quality and erosion controls for the incremental increase in drainage.* *Should these requirements not be able to be met, other options would have to be evaluated to the satisfaction of the Conservation Authorities and City of Ottawa, such as substantial onsite controls & emergency overflow to Bilberry Creek, per the original outlet identified in background studies.*
James Holland, South Nation Conservation, January 28, 2020	MSS	6	Studies addressing these impacts must consider the current SWM design servicing Neighborhood 5 (NH5), future expansion of NH5, future development downstream of NH5 and runoff contributions from the Orleans Family Health Hub at 225 Mer Bleue Road and Blue Sea Village Mer Bleue at 2159 Mer Bleue Road.	See above.
James Holland, South Nation Conservation, January 28, 2020	MSS	7	It is also recommended that consultation be undertaken with stakeholders of future development relying on the NH5 SWM pond and/or the current floodplain study of McKinnon's creek.	Notification for MSS will be sent to Andy Robinson, as requested.
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	CDP - General	8	The Conservation Partners Planning and Development Review Team has completed a review of the most recent community design plan for EUC Phase 3. We offer the following comments for your consideration.	N/A
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	CDP - Section 4.1 Study Area Constraints Pg. 11	9	The slope stability constraints of the study area have been referenced in this section. The paragraph which references the slope stability constraints relies on the findings of the report "Slope Stability Assessment – reaches 7 and 12 Storm Water Management Pond Block, 3490 Inness Road Development" dated June 2019, prepared by Golder Associates Ltd. The RVCA has completed a review of the report referenced. The review was completed by Terry K. Davidson, P.Eng, RVCA Director of Regulations and Engineering. As part of the review, discrepancies were noted between the Limit of Hazard Lands calculated in the report and that in the summary text and in Figure 1 for reach 12 (see memo attached). In addition, Figure 1 illustrates a portion of the stormwater management facility within the Limit of Hazard Lands for reach 12. Based on the drawings in the MSS, it is our understanding that the pond location illustrated in the geotechnical report is no longer valid and the location of the stormwater management pond is a significant distance from the identified Limit of Hazard Lands. Therefore, the geotechnical report should clarify the discrepancies and update Figure 1 to reflect the current stormwater management pond design.	Golder geotechnical report updated and provided in Appendix H. Figure in report has been updated to reflect latest pond design. Discrepency within hazard land calculation has been resolved.
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - General	10	The RVCA has completed a review of the latest draft for the master servicing study (MSS). Please note that South Nation Conservation may provide comments separately as it pertains to the MSS.	N/A

Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - Headwater Drainage Features	11	As part of the Community Design Process headwater drainage features were identified and management recommendations were given for each tributary. Some of the tributaries were given a management recommendation of Mitigation. Within Appendix (H) of the MSS, an explanation is provided on the Mitigation measures proposed for the MSS. While this explanation is acceptable, the RVCA recommends that this information also be represented in Section 11 of the MSS for ease of reference.	The following has been added to Section 11.2.4: *It is noted that Headwater W1 and W2 are assigned a mitigation classification in the Niblett memo dated March 28, 2019, based on earlier work by Kilgour for the 3490 Innes Road site (Kilgour & Associates, July 2017). W1 in Niblett memo is the same feature as R1-R5 in the Kilgour report. The Kilgour report explains that the feature drops into a catchbasin, before contributing flows to the stormwater management pond. The stormwater management pond has an existing outlet structure that controls outflows to the downstream watercourses. The Kilgour report explains that the feature is not required to be maintained, but its functionality must be replaced by replicating outlet flows to the downstream feature: the stormwater management pond. In this case, the development of the study area includes sending all stormwater flows in the northwest quadrant to the stormwater management pond, so the function of the headwater can be considered to be replicated, e.g. there is no concern that the stormwater management pond will receive insufficient flows due to the closure of the headwater feature. Swales and perforated pipes in residential rear yards and parks will provide an additional opportunity to introduce vegetated swales within the northwest quadrant.*
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - EUC Pond 1	12	The report has indicated that the proposed pond expansion will provide enhanced treatment (80% TSS removal) for all areas that are to be treated by the new North Forebays. The report has also indicated that the combined performance of the EUC Pond 1 will be an average blended rate of 76% average long-term annual TSS removal. The RVCA accepts the proposed water quality targets based on the existing infrastructure in place, previous approvals and the enhanced water quality targets for the North Forebays.	Noted.
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - North East Quadrant Preferred Stormwater Management Plan	13	The report makes reference to the existing erosion issues on Bilberry Creek and cites the need for mitigation measures at a watershed scale. The report recognizes that the water quantity control targets already established may be reviewed by the City or RVCA relative to the established erosion thresholds and erosion characteristics of Bilberry Creek outlined in the Bilberry Creek Geomorphic Systems Master Implementation Plan (GHD, May 2014) and the findings of the Eastern Subwatersheds Stormwater Management Retrofit Study (Morrison Hershfield, December 21, 2018). While the information provided in these reports may provide some information on the Bilberry Creek system, any findings in the reports which were dated prior to 2017 may no longer be valid. In 2017, there were several slope failures within the Bilberry Creek valley lands which resulted in significant remedial measures required to render portions of the valley lands stable. The slope failures are an indication that any assumptions made by the Geomorphic Systems Master Implementation Plan and the Eastern Subwatersheds Stormwater Management Retrofit Study may no longer be valid. Therefore, there needs to be recognition that existing conditions may warrant further study of erosion thresholds. It is recommended that the following wording be added to the MSS (underlined): "As noted in Section 4.4, there are identified erosion…. <u>and any additional studies submitted by the proponent</u> may be reviewed by the City and the RVCA relative to the estimated erosion thresholds and erosion characteristics of Bilberry Creek outlined in the Bilberry Creek Geomorphic Systems Master Implementation Plan (GHD, May 2014) and the findings of the Eastern Subwatersheds Stormwater Management Retrofit Study, (Morrison Hershfield, December 21, 2018) and <u>existing conditions that have changed since previous studies were conducted. Such conditions may require additional studies to determine any new erosion thresholds</u>."	Section 11.3.2 North East Minor System Design has been modified to explain: *As noted in Section 4.4, there are identified erosion issues in Bilberry Creek, with mitigation measures being considered at a watershed scale. During detailed site-specific review of future detailed development applications and any additional studies submitted by the proponent, the currently established quantity control targets (51.25 L/s/ha for development lands and 100 L/s/ha for Vanguard Drive so as to be equivalent to the MSU (Stantec, July 2006)) may be reviewed by the City and RVCA relative to: the estimated erosion thresholds and erosion characteristics of Bilberry Creek outlined in the Bilberry Creek Geomorphic Systems Master Implementation Plan (GHD, May 2014), the findings of the Eastern Subwatersheds Stormwater Management Retrofit Study (Morrison Hershfield, December 21, 2018), and existing conditions that have changed since previous studies were conducted. Such conditions may require additional studies to determine any new erosion thresholds. The review may assess whether the proposed control level is sufficient for the particular development application or whether there would be any added benefit to further control, while considering that the North East quadrant is only a small portion of tributary area to Bilberry Creek relative to the watershed as a whole.*
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - North East Quadrant Preferred Stormwater Management Plan	14	The report acknowledges that Vanguard Drive is expected to act as a drainage split, so that the area to the south may be directed to McKinnon's Creek instead of Bilberry Creek. This will require further input from South Nation Conservation. It is also understood that a detailed stormwater analysis may be required for the North East Quadrant for storage requirements for the major system. These items could be clarified by the inclusion of the following wording (underlined): " The City has indicated that Vanguard Drive is expected to act as a drainage split, so that the area to the south may be directed to McKinnon's Creek, instead of Bilberry Creek as previously proposed in background studies. This may involve incorporating infiltration measures, surface or underground storage measures, etc., within the lands in the North East quadrant. Regardless of the measures, it is understood that the City is planning to address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area<u>, in conjunction with RVCA, SNC, and affected landowners. Detailed stormwater analysis is expected to be required in the North East quadrant as part of development applications under the Planning Act."</u>	Section 11.3.2 North East Minor System Design has been modified to explain: *The direction from City staff to consider discharging the area south of Vanguard Drive to McKinnon's Creek has not been evaluated in detail, and therefore may involve incorporating infiltration measures, surface or underground storage measures, etc., within the lands in the North East quadrant. Regardless of the measures, it is understood that the City is planning to clarify and address outlet eligibility and stormwater management requirements through Planning Act approvals for development applications within this area, in conjunction with RVCA, SNC, and affected landowners. Detailed stormwater analysis is expected to be required in the North East quadrant as part of development applications under the Planning Act.*
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	CDP - Conclusion	15	In conclusion, the Conservation Partners have no objection to the CDP in principle. We have identified some minor issues/amendments related to the supporting documents of the CDP which should be addressed prior to finalization of the CDP document.	Noted.
Jamie Batchelor, Rideau Valley Conservation Authority, January 17, 2020	MSS - Conclusion	16	The RVCA has no objection to the MSS in principle subject to the minor wording changes recommended in this letter. If you have any questions do not hesitate to contact me. Please keep us informed on the status of these applications.	Noted.
Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	18	As requested, I have reviewed the report "Slope Stability Assessment" by Golder Associates dated June 2019 (Report No. 1660030-03 Rev 6).	Noted.

Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	19	The report appears to have been completed primarily for the purpose of re-evaluate the stability of the existing slope along ravine to establishing a Limit of Hazard Lands for the SWMP. The analysis and supporting field work have been carried out an appropriate level of detail for that purpose. The report has documented the present geometry of the slope in sufficient detail, and suitable methods have been used to characterize the soil characteristics The report from the consultant makes reference to reviewing, the lands along the slope as "Hazard Lands, as defined by the "MNR Technical Guide for River and Stream Systems: Erosion Hazard Limit" as the primary technical reference for delineating hazard lands and addressing the natural hazards provisions of the Provincial Policy Statement under the Planning Act. The report from the consultant indicates that they analyzed reach 7 and 12, and both reaches indicated a Factor of Safety greater than 1.5.	Noted.
Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	20	For Reach 7, the consultant has indicated the Limit of Hazard Lands as a 11 metre setback, and was based on the following: 1. A stable slope allowance based on stability analysis using the Morgenstern Price method. 2. A toe erosion allowance of 5 metres was determined based on "Table: Minimum Toe Erosion Allowance" of the "Natural Hazards Technical Guide". 3. A 6 metre access erosion allowance was required	Noted.
Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	21	For Reach 12, the consultant has indicated the Limit of Hazard Lands as a 9 metre setback, and was based on the following: 1. A stable slope allowance based on stability analysis using the Morgenstern Price method. 2. A toe erosion allowance of 1.0 metres was determined based on "Table: Minimum Toe Erosion Allowance" of the "Natural Hazards Technical Guide". The consultant indicated there was no evidence of active erosion in May of 2019. 3. A 6 metre access erosion allowance was required. However, this setback adds up to 7 metres versus the 9 metres in the summary text and indicated on Figure 1.	Golder geotechnical report updated and provided in Appendix H. Figure in report has been updated to reflect latest pond design. Discrepency within hazard land calculation has been resolved.
Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	22	In summary, the Report No. 1660030-03 Rev 6 needs to address the inconsistency of the Limit of Hazard Lands setback for Reach 12.	Golder geotechnical report updated and provided in Appendix H. Figure in report has been updated to reflect latest pond design. Discrepency within hazard land calculation has been resolved.
Terry K. Davidson, Rideau Valley Conservation Authority, January 16, 2020 *	Slope Stability Assessment	23	The policy of the Rideau Valley Conservation Authority regarding the encroachment of the SWMP into the Limit of Hazard Land as indicated on Figure 1 "Site Plan" dated May 2, 2019 will be to deny this encroachment at time of permitting under Section 28 of the Conservation Authority's Act.	Golder geotechnical report updated and provided in Appendix H. Figure in report has been updated to reflect latest pond design. Discrepency within hazard land calculation has been resolved.

* Letter from Terry K. Davidson is dated Feb 16, 2020 but received Jan 16, 2020

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EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
CONCEPTUAL SANITARY SERVICING

PROJECT No. :	14-733
SCALE	1:5000
DATE:	OCTOBER 2018
DRAWING No.	5

176

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
North West Sanitary Trunk																										
Trunk 1	1007A	1008A			0.00				2.58	2.58					1.57	2.58	2.58	0.85	2.42	58.00	200.00	0.65	26.44	0.09	0.84	0.52
	1008A	1009A			0.00	0				2.58					1.57	0.00	2.58	0.85	2.42	86.50	250.00	0.25	29.73	0.08	0.61	0.37
	1009A	1010A			0.00	0			1.29	3.87					2.35	1.29	3.87	1.28	3.63	86.50	250.00	0.25	29.73	0.12	0.61	0.41
	1010A	1011A			0.00	0			0.22	4.09					2.49	0.22	4.09	1.35	3.84	39.50	300.00	0.20	43.25	0.09	0.61	0.38
Commercial					0.00	0			1.63	5.72						1.63	5.72									
	1011A	1012A			0.00	0			0.99	6.71					4.08	0.99	6.71	2.21	6.29	99.50	375.00	0.15	67.91	0.09	0.61	0.38
	1012A	1013A			0.00	0			1.41	8.12					4.93	1.41	8.12	2.68	7.61	117.00	375.00	0.15	67.91	0.11	0.61	0.40
	1013A	1014A			0.00	0			1.41	9.53					5.79	1.41	9.53	3.14	8.93	112.00	375.00	0.15	67.91	0.13	0.61	0.41
	1014A	1022A			0.00	0			1.51	11.04					6.71	1.51	11.04	3.64	10.35	83.50	375.00	0.15	67.91	0.15	0.61	0.44
	1022A	1023A			0.00	0			7.05	18.09					10.99	7.05	18.09	5.97	16.96	96.50	375.00	0.15	67.91	0.25	0.61	0.51
	1023A	1024A	0.65	66	0.65	66	3.63	0.78		18.09					10.99	0.65	18.74	6.18	17.95	81.00	450.00	0.12	98.76	0.18	0.62	0.47
	1024A	1025A	0.20	21	0.85	87	3.61	1.02		18.09					10.99	0.20	18.94	6.25	18.26	79.00	450.00	0.12	98.76	0.18	0.62	0.47
	1025A	1026A	0.13	14	0.98	101	3.59	1.18		18.09					10.99	0.13	19.07	6.29	18.46	51.00	450.00	0.12	98.76	0.19	0.62	0.48
	1026A	1027A	0.20	21	1.18	122	3.58	1.42		18.09					10.99	0.20	19.27	6.36	18.77	74.00	450.00	0.12	98.76	0.19	0.62	0.48
	1027A	1028A			1.18	122	3.58	1.42		18.09					10.99	0.00	19.27	6.36	18.77	11.00	450.00	0.12	98.76	0.19	0.62	0.48
	1028A	1029A	0.42	43	1.60	165	3.54	1.89		18.09					10.99	0.42	19.69	6.50	19.38	100.00	450.00	0.12	98.76	0.20	0.62	0.48
	1029A	1037A	0.60	61	2.20	226	3.50	2.56		18.09					10.99	0.60	20.29	6.70	20.25	94.00	450.00	0.12	98.76	0.21	0.62	0.49
	1037A	1040A	3.30	334	5.50	560	3.36	6.10		18.09					10.99	3.30	23.59	7.78	24.87	79.00	450.00	0.12	98.76	0.25	0.62	0.51
	1040A	1049A	1.45	147	6.95	707	3.31	7.58		18.09					10.99	1.45	25.04	8.26	26.83	79.00	450.00	0.12	98.76	0.27	0.62	0.52
	1049A	1058A	4.50	455	11.45	1162	3.21	12.09		18.09					10.99	4.50	29.54	9.75	32.83	81.50	450.00	0.12	98.76	0.33	0.62	0.56
PARK	1058A	1059A	5.80	586	17.25	1748	3.10	17.56		18.09			1.27	1.27	11.20	7.07	36.61	12.08	40.84	120.50	450.00	0.12	98.76	0.41	0.62	0.59
	1059A	1090A	0.70	71	17.95	1819	3.09	18.22		18.09				1.27	11.20	0.70	37.31	12.31	41.73	123.00	450.00	0.12	98.76	0.42	0.62	0.59
PARK, EXT FUT			4.29	618	22.24	2437			5.42	23.51			0.56	1.83		10.27	47.58									
	1090A	1095A	12.63	1276	34.87	3713	2.89	34.77		23.51				1.83	14.58	12.63	60.21	19.87	69.22	75.00	450.00	0.15	110.42	0.63	0.69	0.73
	1095A	1096A	0.50	51	35.37	3764	2.89	35.25		23.51				1.83	14.58	0.50	60.71	20.03	69.86	79.00	525.00	0.10	136.00	0.51	0.63	0.63
Contribution from Trunk 2, MH 1094A-1095A					10.71	1475				8.04				4.64			23.39									
	1096A	1107A	2.17	220	48.25	5459	2.77	49.00		31.55				6.47	20.22	2.17	86.27	28.47	97.69	86.50	525.00	0.10	136.00	0.72	0.63	0.69
	1107A	1108A	4.26	431	52.51	5890	2.74	52.30		31.55				6.47	20.22	4.26	90.53	29.87	102.39	87.00	525.00	0.10	136.00	0.75	0.63	0.69
PARK	1108A	1132A	0.07	8	52.58	5898	2.74	52.37		31.55			1.16	7.63	20.40	1.23	91.76	30.28	103.05	31.50	525.00	0.10	136.00	0.76	0.63	0.69
Contribution from External			0.96	139	53.54	6037	2.00	39.13	4.28	35.83				7.63		5.24	97.00									
			0.95	137	54.49	6174				35.83				7.63		0.95	97.95									
	1132A	1133A	9.84	994	64.33	7168	2.68	62.26		35.83				7.63	23.00	9.84	107.79	35.57	120.83	15.50	600.00	0.10	194.17	0.62	0.69	0.72
	1133A	1A (B.O.)			64.33	7168	2.68	62.26		35.83				7.63	23.00	0.00	107.79	35.57	120.83	15.50	600.00	0.10	194.17	0.62	0.69	0.72
To MH 1A By Others					64.33	7168	2.68			35.83				7.63			107.79		120.83							
Trunk 2																										
Snow removal facility	1201A	1202A			0.00	0			8.04	8.04					4.89	8.04	8.04	2.65	7.54	100.00	375.00	0.14	65.60	0.11	0.59	0.38
Park	1202A	1203A			0.00	0				8.04					4.89	0.00	8.04	2.65	7.54	100.00	375.00	0.14	65.60	0.11	0.59	0.38
	1203A	1204A	0.40	58	0.40	58				8.04			4.64	4.64	5.63	5.04	13.08	4.32	9.95	81.00	375.00	0.14	65.60	0.15	0.59	0.42
	1204A	1205A	0.89	129	1.29	187	3.53	2.14		8.04				4.64	5.63	0.89	13.97	4.61	12.38	111.00	375.00	0.14	65.60	0.19	0.59	0.45
	1205A	1206A	0.83	120	2.12	307	3.46	3.44		8.04				4.64	5.63	0.83	14.80	4.88	13.95	74.00	375.00	0.14	65.60	0.21	0.59	0.47
	1206A	1207A	1.03	149	3.15	456	3.40	5.02		8.04				4.64	5.63	1.03	15.83	5.22	15.87	75.00	375.00	0.14	65.60	0.24	0.59	0.48
	1207A	1208A			3.15	456	3.40	5.02		8.04				4.64	5.63	0.00	15.83	5.22	15.87	100.50	375.00	0.14	65.60	0.24	0.59	0.48

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.108	Harmon Correction Factor =	0.800		
Average Daily Flow =	280	l/p/day		Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	35000	L/ha/da	0.405	Extraneous Flow =	0.330	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.405	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00			Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.50	if ICI >20%	1.00 if ICI <20%				
Mixed Use	28000.00	L/ha/da					
Institutional =	0.405	l/s/Ha					

Designed: A.S.	PROJECT: **Orleans EUC MUC**	
Checked: V.C.	LOCATION: **City of Ottawa**	
Dwg. Reference:	File Ref: 14-733	Date: October, 2018 — Sheet No. 1 of 2

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	1208A	1209A	1.90	274	5.05	730	3.31	7.83		8.04				4.64	5.63	1.90	17.73	5.85	19.31	14.50	375.00	0.14	65.60	0.29	0.59	0.51
	1209A	1210A			5.05	730	3.31	7.83		8.04				4.64	5.63	0.00	17.73	5.85	19.31	112.50	375.00	0.14	65.60	0.29	0.59	0.51
	1210A	1211A			5.05	730				8.04				4.64	5.63	0.00	17.73	5.85	11.48	120.00	375.00	0.14	65.60	0.18	0.59	0.44
	1211A	1212A	3.98	574	9.03	1304				8.04				4.64	5.63	3.98	21.71	7.16	12.79	43.50	375.00	0.14	65.60	0.19	0.59	0.45
	1212A	1091A	0.00	0	9.03	1304				8.04				4.64	5.63	0.00	21.71	7.16	12.79	10.00	375.00	0.15	67.91	0.19	0.61	0.47
	1091A	1093A	0.50	51	9.53	1355	3.17	13.92		8.04				4.64	5.63	0.50	22.21	7.33	26.88	33.00	375.00	0.15	67.91	0.40	0.61	0.57
	1093A	1094A	0.64	65	10.17	1420	3.16	14.54		8.04				4.64	5.63	0.64	22.85	7.54	27.71	84.00	375.00	0.12	60.74	0.46	0.55	0.54
	1094A	1095A	0.54	55	10.71	1475	3.15	15.06		8.04				4.64	5.63	0.54	23.39	7.72	28.41	84.50	450.00	0.12	98.76	0.29	0.62	0.53
To Trunk 1, Pipe 1095A-1096A					10.71	1475				8.04				4.64			23.39									
North East Sanitary Trunk																										
External Commercial					0.00	0			10.40	10.40						10.40	10.40									
Mixed Use Block*			2.43	2531	2.43	2531			2.43	12.83						4.86	15.26									
					2.43	2531			3.45	16.28						3.45	18.71									
	204A	205A			2.43	2531	3.00	24.61	6.33	22.61			0.19	0.19	13.77	6.52	25.23	8.33	46.71	525.00	375.00	0.14	65.60	0.71	0.59	0.64
To Pipe 205A - 206A					2.43	2531				22.61				0.19			25.23		46.71							
	201A	202A			0.00	0			5.67	5.67					3.45	5.67	5.67	1.87	5.32	266.00	200.00	0.32	18.55	0.29	0.59	0.51
	202A	203A			0.00	0			0.00	5.67					3.45	0.00	5.67	1.87	5.32	176.00	250.00	0.24	29.13	0.18	0.59	0.44
	203A	205A			0.00	0			10.44	16.11					9.79	10.44	16.11	5.32	15.11	292.50	250.00	0.24	29.13	0.52	0.59	0.60
Contribution from Pipe 204A - 205A					2.43	2531				22.61				0.19			25.23									
	205A	206A			2.43	2531	3.00	24.61		38.72				0.19	23.56	0.00	41.34	13.64	61.81	150.50	375.00	0.20	78.41	0.79	0.71	0.79
To Existing Vanguard Drive Sanitary					2.43	2531				38.72				0.19			41.34		61.81							
South West Sanitary Trunk																										
Mixed Use Block			3.66	528	3.66	528			3.66	3.66					2.22	7.32	7.32									
Mid-High Density Residential			15.19	1535	18.85	2063	3.06	20.46	4.32	7.98					4.85	19.51	26.83									
	301A	302A	2.28	329	21.13	2392	3.02	23.41		7.98			0.43	0.43	4.92	2.71	29.54	9.75	38.08	791.00	375.00	0.14	65.60	0.58	0.59	0.61
To Sanitary By Others					21.13	2392				7.98				0.43			29.54		38.08							
Road			0.89	0	0.89	0									0.00	0.89	0.89	0.29	0.29	49.00	200.00	0.32	18.55	0.02	0.59	0.23
To Existing Sanitary, Fern Casey Street					0.89	0				0.00				0.00			0.89		0.29							
Mid-High Density Residential			3.69	532	3.69	532	3.37	5.81		0.00				0.00	0.00	3.69	3.69	1.22	7.03	49.00	200.00	0.32	18.55	0.38	0.59	0.55
To Existing Sanitary, Axis Way					3.69	532				0.00				0.00			3.69		7.03							
South East Sanitary Trunk																										
											9.11	9.11	0.36	0.36		9.47	9.47									
Existing Medium Density**	401A	402A	0.99	227	0.99	227	3.50	2.57		0.00	0.23	9.34		0.36	5.73	1.22	10.69	3.53	11.83	114.00	250.00	0.24	29.13	0.41	0.59	0.56
To Existing Sanitary to Gerry Lalonde Drive					0.99	227				0.00		9.34		0.36			10.69		11.83							
*Note: Proposed population 2531 per background servicing study																										
**Note: Existing population 227 per background servicing study																										

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.108	Harmon Correction Factor =	0.800		
Average Daily Flow =	280	l/p/day		Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	35000	L/ha/da	0.405	Extraneous Flow =	0.330	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.405	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00			Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.50	if ICI >20%	1.00	if ICI <20%			
Mixed Use	28000.00	L/ha/da					
Institutional =	0.405	l/s/Ha					

Designed: A.S.	PROJECT: **Orleans EUC MUC**		
Checked: V.C.	LOCATION: **City of Ottawa**		
Dwg. Reference:	File Ref: 14-733	Date: October, 2018	Sheet No. 2 of 2

DSEL
david schaeffer engineering ltd
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EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
CONCEPTUAL STORM SERVICING

PROJECT No. :	14-733
SCALE	1:5000
DATE:	OCTOBER 2018
DRAWING No.	4

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of Conc.	Intensity 2 Year	Intensity 5 Year	Intensity 10 Year	Intensity 100 Year	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	(min)	Q/Q full
North West																																	
TRUNK 1																																	
	2041	2042	1.38	0.80	3.07	3.07			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	236	600	600	CONC	0.65	29.5	495	1.75	0.28	0.48
	2042	2043	1.20	0.80	2.67	5.74			0.00	0.00			0.00	0.00			0.00	0.00	10.28	75.74	102.73	0.00	176.03	435	1050	1050	CONC	0.25	95.5	1365	1.58	1.01	0.32
	2043	2044	1.29	0.80	2.87	8.61			0.00	0.00			0.00	0.00			0.00	0.00	11.29	72.18	97.84	0.00	167.57	621	1050	1050	CONC	0.32	110.0	1545	1.78	1.03	0.40
	2044	2046			0.00	8.61	0.22	0.90	0.55	0.55	2.14	0.90	5.35	5.35			0.00	0.00	12.32	68.92	93.36	0.00	159.82	645	1200	1200	CONC	0.10	33.5	1233	1.09	0.51	0.52
	2046	2047	2.39	0.80	5.32	13.92	0.23	0.90	0.58	1.13			0.00	5.35			0.00	0.00	12.83	67.41	91.29	0.00	156.25	1041	1350	1350	CONC	0.10	103.5	1688	1.18	1.46	0.62
			0.47	0.80	1.05	14.97	0.26	0.90	0.65	1.78			0.00	5.35			0.00	0.00															
	2047	2048	1.15	0.80	2.56	17.53			0.00	1.78			0.00	5.35			0.00	0.00	14.29	63.49	85.91	0.00	146.96	1265	1350	1350	CONC	0.11	117.0	1770	1.24	1.58	0.71
			0.80	0.80	1.78	19.30	0.26	0.90	0.65	2.43			0.00	5.35			0.00	0.00															
	2048	2049	1.14	0.80	2.54	21.84			0.00	2.43			0.00	5.35			0.00	0.00	15.87	59.79	80.85	0.00	138.22	1502	1500	1500	CONC	0.10	112.5	2235	1.26	1.48	0.67
			0.49	0.80	1.09	22.93			0.00	2.43			0.00	5.35			0.00	0.00															
	2049	2057	0.76	0.80	1.69	24.62	0.25	0.90	0.63	3.05			0.00	5.35			0.00	0.00	17.35	56.72	76.66	0.00	130.99	1630	1500	1500	CONC	0.10	85.5	2235	1.26	1.13	0.73
			0.44	0.80	0.98	25.60			0.00	3.05			0.00	5.35			0.00	0.00															
	2057	2060	6.37	0.80	14.17	39.77	0.24	0.90	0.60	3.65			0.00	5.35			0.00	0.00	18.48	54.61	73.78	0.00	126.03	2441	1950	1950	CONC	0.11	90.5	4719	1.58	0.95	0.52
					0.00	39.77	0.42	0.90	1.05	4.70			0.00	5.35	1.78	0.40	1.98	1.98															
	2060	2061	0.17	0.70	0.33	40.10	0.48	0.90	1.20	5.90			0.00	5.35	9.40	0.40	10.45	12.43	19.43	52.96	71.52	0.00	122.14	4064	1950	1950	CONC	0.29	81.5	7663	2.57	0.53	0.53
	2061	2062			0.00	40.10	0.20	0.90	0.50	6.41			0.00	5.35			0.00	12.43	19.96	52.09	70.33	0.00	120.09	4032	1950	1950	CONC	0.20	79.0	6364	2.13	0.62	0.63
	2062	2063			0.00	40.10	0.13	0.90	0.33	6.73			0.00	5.35			0.00	12.43	20.58	51.12	69.00	0.00	117.80	3978	1950	1950	CONC	0.19	51.0	6203	2.08	0.41	0.64
	2063	2064			0.00	40.10	0.19	0.90	0.48	7.21			0.00	5.35			0.00	12.43	20.99	50.49	68.15	0.00	116.33	3962	2100	2100	CONC	0.19	78.5	7558	2.18	0.60	0.52
	2064	2065	0.00	0.00	0.00	40.10			0.00	7.21			0.00	5.35			0.00	12.43	21.59	49.61	66.95	0.00	114.26	3892	2100	2100	CONC	0.18	13.5	7356	2.12	0.11	0.53
	2065	2066	0.21	0.70	0.41	40.50	0.21	0.90	0.53	7.73			0.00	5.35			0.00	12.43	21.70	49.46	66.74	0.00	113.90	3935	2400	2400	CONC	0.12	96.5	8576	1.90	0.85	0.46
	2066	2072	0.31	0.70	0.60	41.11	0.29	0.90	0.73	8.46			0.00	5.35			0.00	12.43	22.54	48.27	65.12	0.00	111.12	3916	2400	2400	CONC	0.12	96.0	8576	1.90	0.84	0.46
	2072	2075	3.10	0.70	6.03	47.14	0.20	0.90	0.50	8.96			0.00	5.35			0.00	12.43	23.39	47.15	63.60	0.00	108.49	4141	2400	2400	CONC	0.10	79.0	7828	1.73	0.76	0.53
	2075	2083	1.25	0.70	2.43	49.57	0.19	0.90	0.48	9.43			0.00	5.35			0.00	12.43	24.15	46.19	62.29	0.00	106.25	4198	2400	2400	CONC	0.10	85.0	7828	1.73	0.82	0.54
	2083	2084	4.30	0.70	8.37	57.94	0.19	0.90	0.48	9.91			0.00	5.35			0.00	12.43	24.97	45.21	60.95	0.00	103.94	4515	2700	2700	CONC	0.10	81.5	10717	1.87	0.73	0.42
			0.18	0.70	0.35	58.29			0.00	9.91			0.00	5.35			0.00	12.43															
			0.20	0.70	0.39	58.68			0.00	9.91			0.00	5.35			0.00	12.43															
			0.87	0.70	1.69	60.37			0.00	9.91			0.00	5.35			0.00	12.43															
			0.95	0.70	1.85	62.22			0.00	9.91			0.00	5.35			0.00	12.43															
			1.27	0.40	1.41	63.63			0.00	9.91			0.00	5.35			0.00	12.43															
	2084	2085	1.90	0.70	3.70	67.33	1.74	0.90	4.35	14.26			0.00	5.35			0.00	12.43	25.69	44.37	59.81	0.00	101.98	5108	3000	3000	CONC	0.11	118.0	14887	2.11	0.93	0.34

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: R.B.	PROJECT: Orleans EUC MUC		
Checked: V.C.	LOCATION: City of Ottawa		
Dwg. Reference:	File Ref: 14-733	Date: October 2018	Sheet No. 1

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning 0.013

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Ottawa

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of Conc.	Intensity 2 Year	Intensity 5 Year	Intensity 10 Year	Intensity 100 Year	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	(min)	Q/Q full
	2085	2116	0.70	0.70	1.36	68.69			0.00	14.26			0.00	5.35			0.00	12.43	26.63	43.35	58.42	0.00	99.58	5049	3000	3000	CONC	0.10	119.5	14194	2.01	0.99	0.36
PARK			0.56	0.40	0.62	69.32			0.00	14.26			0.00	5.35			0.00	12.43															
			1.16	0.70	2.26	71.57			0.00	14.26			0.00	5.35	1.13	0.80	2.51	14.95															
			2.62	0.70	5.10	76.67			0.00	14.26			0.00	5.35			0.00	14.95															
FUTURE EXT. COMM.			2.77	0.90	6.93	83.60			0.00	14.26			0.00	5.35			0.00	14.95															
			0.00	0.00	0.00	83.60			0.00	14.26			0.00	5.35	2.94	0.80	6.54	21.48															
FUTURE EXT. COMM.			3.12	0.90	7.81	91.41			0.00	14.26			0.00	5.35			0.00	21.48															
			7.72	0.70	15.02	106.43			0.00	14.26			0.00	5.35			0.00	21.48															
			0.23	0.80	0.51	106.94			0.00	14.26			0.00	5.35			0.00	21.48															
			0.72	0.90	1.80	108.75			0.00	14.26			0.00	5.35			0.00	21.48															
			9.47	0.90	0.00	108.75			0.00	14.26			0.00	5.35	2.18	0.40	2.42	23.91					85L/s/Ha	805									
FUTURE E	2116	2117	0.24	0.80	0.53	109.28	0.89	0.90	2.23	16.49			0.00	5.35			0.00	23.91	27.62	42.31	57.01	0.00	97.17	8692	3000	3000	CONC	0.13	75.0	16183	2.29	0.55	0.54
	2117	2118	0.53	0.70	1.03	110.31			0.00	16.49			0.00	5.35			0.00	23.91	28.16	41.77	56.27	0.00	95.89	8633	3000	3000	CONC	0.13	85.0	16183	2.29	0.62	0.53
			0.30	0.70	0.58	110.89			0.00	16.49			0.00	5.35			0.00	23.91															
			0.64	0.70	1.25	112.14			0.00	16.49			0.00	5.35			0.00	23.91															
	2118	2119	1.26	0.70	2.45	114.59			0.00	16.49			0.00	5.35			0.00	23.91	28.78	41.17	55.46	0.00	94.49	8696	3000	3000	CONC	0.10	80.5	14194	2.01	0.67	0.61
FUTURE EXT. COMM.			5.63	0.90	14.09	128.68			0.00	16.49			0.00	5.35			0.00	23.91															
FUTURE EXT. MED.			0.00	0.00	0.00	128.68			0.00	16.49			0.00	5.35	0.95	0.80	2.11	26.02															
PARK			1.16	0.40	1.29	129.97			0.00	16.49			0.00	5.35			0.00	26.02															
			2.86	0.70	5.57	135.53			0.00	16.49			0.00	5.35			0.00	26.02															
			0.00	0.00	0.00	135.53			0.00	16.49			0.00	5.35	0.95	0.80	2.11	28.13															
	2119	2120	7.33	0.70	14.26	149.80	0.49	0.90	1.23	17.71			0.00	5.35			0.00	28.13	29.45	40.54	54.60	0.00	93.03	10463	3000	3000	CONC	0.10	47.0	14194	2.01	0.39	0.74
	2120	2121	0.41	0.70	0.80	150.60			0.00	17.71			0.00	5.35			0.00	28.13	29.84	40.19	54.12	0.00	92.20	10409	3000	3000	CONC	0.10	84.5	14194	2.01	0.70	0.73
	2121	2142	1.13	0.70	2.20	152.79			0.00	17.71			0.00	5.35			0.00	28.13	29.84	40.19	54.12	0.00	92.20	10498	3000	3000	CONC	0.10	76.0	14194	2.01	0.63	0.74
To TRUNK 2						152.79				17.71				5.35				28.13	30.54														
TRUNK 2																																	
	2201	2202	6.77	0.80	15.06	15.06			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	1156	1350	1350	CONC	0.10	110.0	1688	1.18	1.55	0.69
	2202	2203	0.00	0.00	0.00	15.06			0.00	0.00			0.00	0.00			0.00	0.00	11.55	71.31	96.64	0.00	165.49	1074	1350	1350	CONC	0.10	110.0	1688	1.18	1.55	0.64
			0.40	0.80	0.89	15.95			0.00	0.00			0.00	0.00			0.00	0.00															
	2203	2204	4.64	0.40	5.16	21.11			0.00	0.00			0.00	0.00			0.00	0.00	13.11	66.62	90.21	0.00	154.38	1406	1350	1350	CONC	0.10	110.0	1688	1.18	1.55	0.83
	2204	2205	0.89	0.80	1.98	23.09			0.00	0.00			0.00	0.00			0.00	0.00	14.66	62.57	84.66	0.00	144.79	1444	1350	1350	CONC	0.12	110.0	1849	1.29	1.42	0.78
	2205	2206	0.83	0.80	1.85	24.93			0.00	0.00			0.00	0.00			0.00	0.00	16.08	59.32	80.21	0.00	137.12	1479	1350	1350	CONC	0.12	110.0	1849	1.29	1.42	0.80
	2206	2207	1.03	0.80	2.29	27.22			0.00	0.00			0.00	0.00			0.00	0.00	17.50	56.43	76.26	0.00	130.30	1536	1500	1500	CONC	0.10	109.5	2235	1.26	1.44	0.69
	2207	2208	0.00	0.00	0.00	27.22			0.00	0.00			0.00	0.00			0.00	0.00	18.95	53.79	72.65	0.00	124.09	1464	1500	1500	CONC	0.10	92.0	2235	1.26	1.21	0.66
	2208	2209	1.48	0.80	3.29	30.51			0.00	0.00			0.00	0.00			0.00	0.00	20.16	51.78	69.91	0.00	119.36	1580	1500	1500	CONC	0.10	91.5	2235	1.26	1.21	0.71
	2209	2210			0.00	30.51	0.39	0.90	0.98	0.98			0.00	0.00			0.00	0.00	21.36	49.94	67.39	0.00	115.03	1589	1500	1500	CONC	0.10	91.5	2235	1.26	1.21	0.71
	2210	2211	0.00	0.00	0.00	30.51			0.00	0.98			0.00	0.00			0.00	0.00	22.57	48.23	65.07	0.00	111.04	1535	1500	1500	CONC	0.10	35.0	2235	1.26	0.46	0.69
	2211	2212	3.97	0.80	8.83	39.34			0.00	0.98			0.00	0.00			0.00	0.00	23.03	47.62	64.23	0.00	109.59	1936	1650	1650	CONC	0.10	35.0	2882	1.35	0.43	0.67
	2212	2136	0.10	0.70	0.19	39.54			0.00	0.98			0.00	0.00			0.00	0.00	23.46	47.05	63.47	0.00	108.27	1922	1650	1650	CONC	0.10	35.0	2882	1.35	0.43	0.67
			0.35	0.70	0.68	40.22			0.00	0.98			0.00	0.00			0.00	0.00															
	2136	2138	1.21	0.70	2.35	42.57			0.00	0.98			0.00	0.00			0.00	0.00	23.03	47.62	64.23	0.00	109.59	2090	1800	1800	CONC	0.10	90.5	3635	1.43	1.06	0.57
			0.37	0.70	0.72	43.29			0.00	0.98			0.00	0.00			0.00	0.00															
	2138	2139	0.67	0.70	1.30	44.60			0.00	0.98			0.00	0.00			0.00	0.00	24.09	46.27	62.40	0.00	106.43	2124	1800	1800	CONC	0.10	77.0	3635	1.43	0.90	0.58
	2139	2140	0.37	0.70	0.72	45.32			0.00	0.98			0.00	0.00			0.00	0.00	24.98	45.19	60.92	0.00	103.89	2107	1800	1800	CONC	0.10	73.5	3635	1.43	0.86	0.58
	2140	2141	0.12	0.70	0.23	45.55			0.00	0.98			0.00	0.00			0.00	0.00	25.84	44.20	59.58	0.00	101.59	2072	1800	1800	CONC	0.10	17.0	3635	1.43	0.20	0.57
	2141	2142	0.37	0.70	0.72	46.27			0.00	0.98			0.00	0.00			0.00	0.00	26.04	43.98	59.28	0.00	101.08	2093	1800	1800	CONC	0.10	95.0	3635	1.43	1.11	0.58
Contribution From TRUNK 1, Pipe 2121-2143						152.79				17.71				5.35				28.13	30.54														
	2142	2143			0.00	199.06			0.00	18.69			0.00	5.35			0.00	28.13	30.54	39.56	53.28	0.00	90.75	12229	3000	3000	CONC	0.10	32.5	14194	2.01	0.27	0.86
	2143	HW			0.00	199.06			0.00	18.69			0.00	5.35			0.00	28.13	30.81	39.33	52.96	0.00	90.20	12162	3000	3000	CONC	0.10	39.0	14194	2.01	0.32	0.86
TO POND 1						199.06				18.69				5.35				28.13	30.81														

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: R.B.	PROJECT: **Orleans EUC MUC**	
Checked: V.C.	LOCATION: **City of Ottawa**	
Dwg. Reference:	File Ref: 14-733	Date: October 2018 / Sheet No. 2

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

Ottawa

LOCATION			AREA (Ha)																FLOW						SEWER DATA									
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of Conc.	Intensity 2 Year	Intensity 5 Year	Intensity 10 Year	Intensity 100 Year	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	(min)	Q/Q full
NORTH EAST TRUNK*																																	
	201	202	5.68	0.80	12.63	12.63			0.00	0.00			0.00	0.00			0.00	0.00						291	675	675	CONC	0.20	262.0	376	1.05	4.16	0.77
	202	203	0.00	0.90	0.00	12.63			0.00	0.00			0.00	0.00			0.00	0.00						291	675	675	CONC	0.20	193.0	376	1.05	3.06	0.77
			2.20	0.80	4.89	17.53			0.00	0.00			0.00	0.00			0.00	0.00															
	203	204	6.94	0.80	15.43	32.96	1.73	0.90	4.33	4.33			0.00	0.00			0.00	0.00						933	1050	1050	CONC	0.20	294.0	1221	1.41	3.47	0.76
			0.52	0.90	1.30	34.26			0.00	4.33			0.00	0.00			0.00	0.00															
			5.29	0.80	11.76	46.03			0.00	4.33			0.00	0.00			0.00	0.00															
			4.86	0.85	11.48	57.51			0.00	4.33			0.00	0.00			0.00	0.00															
			0.19	0.40	0.21	57.72			0.00	4.33			0.00	0.00			0.00	0.00															
	204	205	3.45	0.90	8.63	66.35			0.00	4.33			0.00	0.00			0.00	0.00						1666	1350	1350	CONC	0.15	513.5	2067	1.44	5.93	0.81
To Existing Storm to Wildflower Drive						66.35				4.33				0.00				0.00	0.00														
SOUTH WEST TRUNK																																	
			7.35	0.85	17.37	17.37			0.00	0.00			0.00	0.00			0.00	0.00															
Commercial			4.28	0.90	10.71	28.08			0.00	0.00			0.00	0.00			0.00	0.00															
Mid-High Density					0.00	28.08	2.28	0.80	5.07	5.07			0.00	0.00			0.00	0.00															
			6.15	0.70	11.97	40.04			0.00	5.07			0.00	0.00			0.00	0.00															
			7.88	0.70	15.33	55.38			0.00	5.07			0.00	0.00			0.00	0.00															
Park	301	302	0.42	0.40	0.47	55.85	0.56	0.90	1.40	6.47			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	4964	2100	2100	CONC	0.12	790.5	6006	1.73	7.60	0.83
To Storm By Others						55.85				6.47				0.00				0.00	10.00														
Mid-High Density Residential			0.00	0.80	0.00	0.00	0.49	0.90	1.23	1.23			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	128	525	525	CONC	0.20	57.0	192	0.89	1.07	0.66
To Existing Fern Casey Street						0.00				1.23				0.00				0.00	10.00														
Mid-High Density Residential					0.00	0.00	3.68	0.80	8.18	8.18			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	853	1050	1050	CONC	0.15	61.5	1058	1.22	0.84	0.81
To Existing Storm, to Axis Way						0.00				8.18				0.00				0.00	10.00														
SOUTH EAST TRUNK																																	
Hydro Easement			1.89	0.40	2.10	2.10			0.00	0.00			0.00	0.00			0.00	0.00															
Hydro Easement			3.33	0.40	3.70	5.80			0.00	0.00			0.00	0.00			0.00	0.00															
			8.94	0.90	22.37	28.17			0.00	0.00			0.00	0.00			0.00	0.00															
Parkette			0.63	0.40	0.70	28.87			0.00	0.00			0.00	0.00			0.00	0.00															
	401	402	0.99	0.80	2.20	31.07			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	2387	1350	1350	CONC	0.30	211.0	2923	2.04	1.72	0.82
To Existing Storm to Gerry Lalonde Drive						31.07				0.00				0.00				0.00	10.00														
Hydro Easement			1.86	0.40	2.07	2.07			0.00	0.00			0.00	0.00			0.00	0.00															
Hydro Easement			2.94	0.40	3.27	5.34			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	0.00	178.56	410	450	450	CONC	3.00	269.5	494	3.10	1.45	0.83
To Existing Storm, Trigoria Crescent						5.34				0.00				0.00				0.00	10.00														

***NOTE: NORTH EAST TRUNK DEVIATION FROM CITY STANDARDS BASED ON BACKGROUND SERVICING STUDIES. VANGUARD DRIVE CONTROLLED TO 100L/s/Ha. DEVELOPMENT AREA CONTROLLED TO 51.25 L/s/Ha.**

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Notes:
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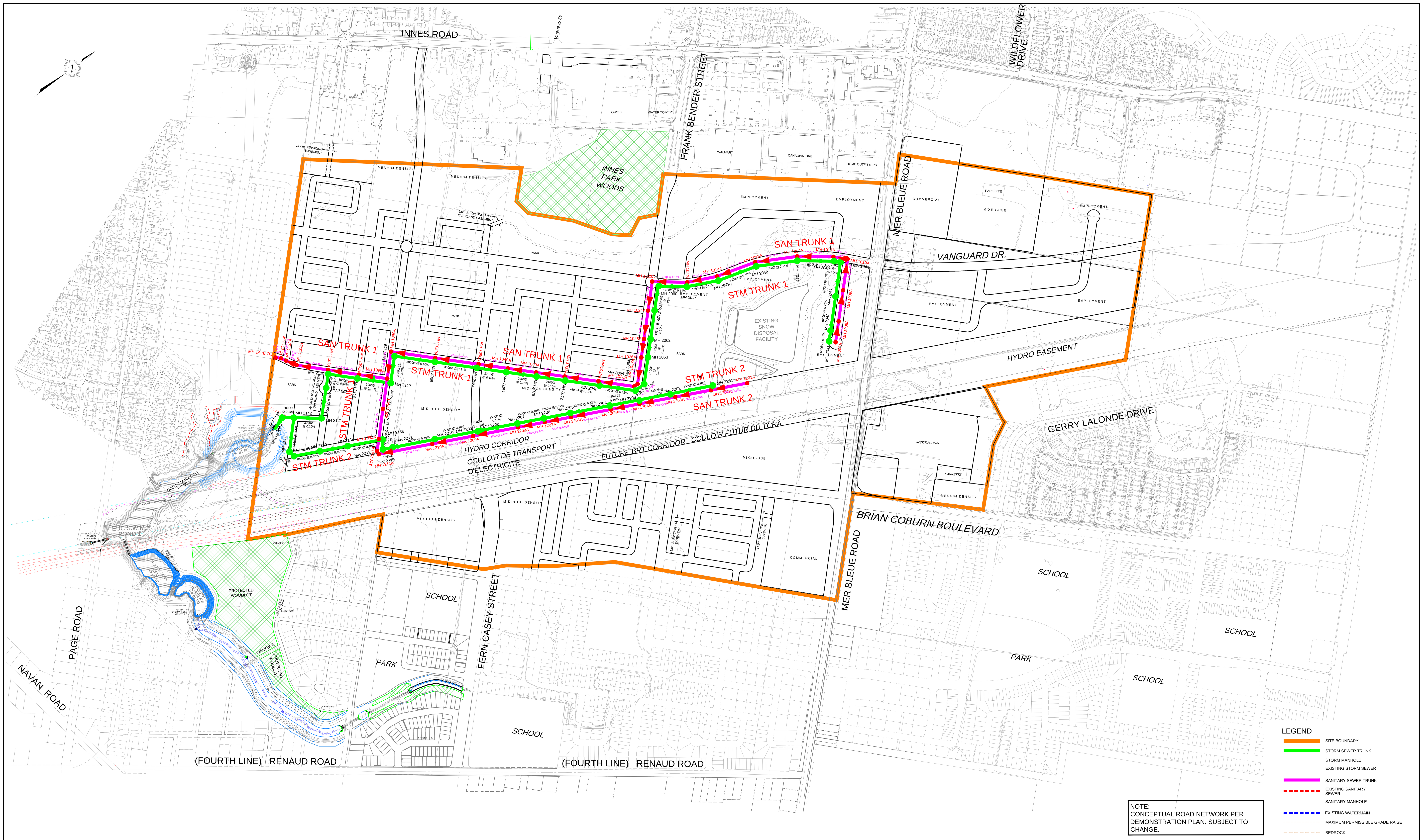
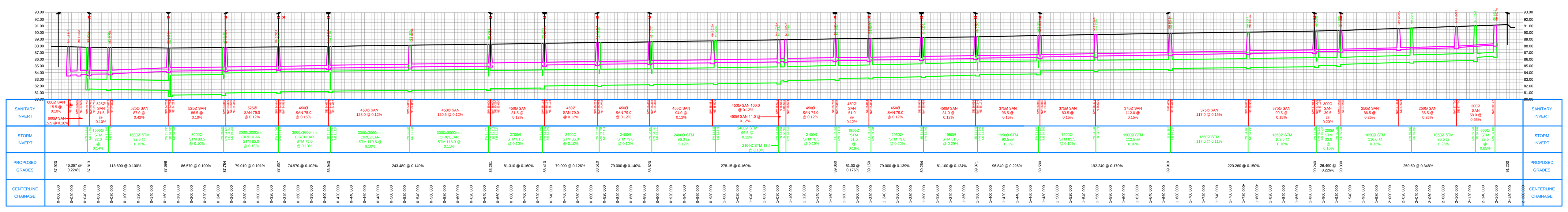
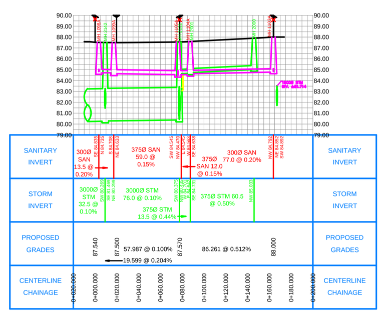
Designed: R.B.	PROJECT: Orleans EUC MUC		
Checked: V.C.	LOCATION: City of Ottawa		
Dwg. Reference:	File Ref: 14-733	Date: October 2018	Sheet No. 3



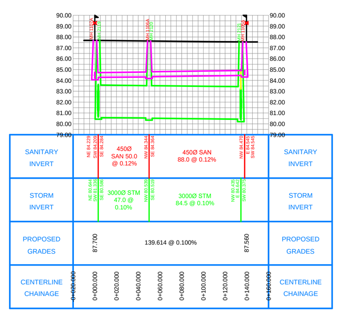
SAN TRUNK 1 AND STM TRUNK 1



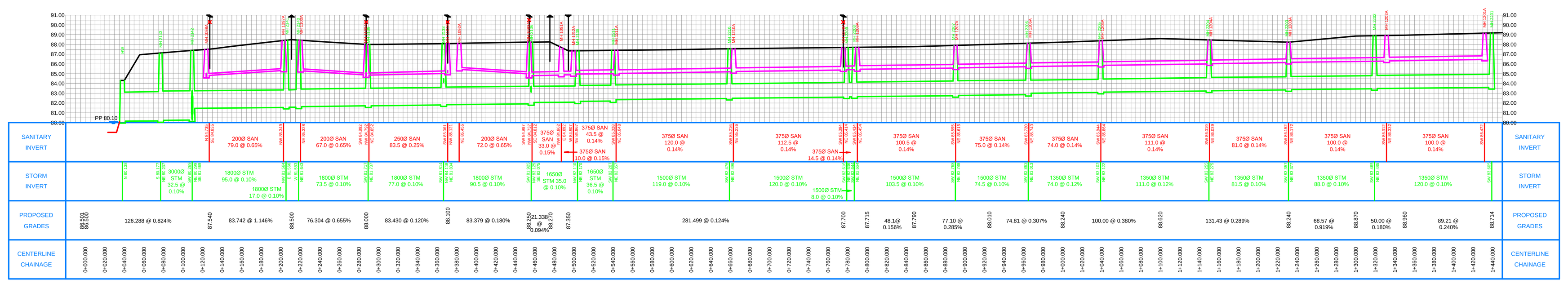
STM TRUNK 1



STM TRUNK 1



STM TRUNK 2



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EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
STORM AND SANITARY TRUNK PROFILES
OPTION 1 - ONE POND

PROJECT No. :	14-733
SCALE:	1:1500
DATE:	OCTOBER 2018
DRAWING No.	3

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EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
GRADING PLAN

PROJECT No. :	14-733
SCALE	1:4000
DATE:	OCTOBER 2018
DRAWING No.	2