

Preliminary Engineer's Report  
For Kizell Creek Municipal Drain

Prepared For:



Prepared By:

Robinson Consultants Inc.  
Consulting Engineers

Our Project No. B19049  
October 2021

October 15<sup>th</sup>, 2021

Mayor and Members of Council  
City of Ottawa  
110 Laurier Ave. West  
Ottawa, ON K19 1J1

**Attention:**                   **Mr. Rick O'Connor**  
   **City Clerk**

**Reference:**                   **Preliminary Engineer's Report for Kizell Creek**  
   **Municipal Drain**  
   **City of Ottawa**  
   **Our Project No. B19049**

Dear Sir:

This Preliminary Engineer's Report for the Kizell Creek Municipal Drain, City of Ottawa, which is respectfully submitted for Council's consideration, was initiated as a result of a petition under Section 4 of the Drainage Act, R.S.O. 1990. the landowner in parts of Lots 7, 8 and 9, Conc, 2 for the purpose of providing an outlet for lands in the proposed Stages 7 and 8 in the Kanata North Lands (KNL) development. The purpose of the preliminary report, which is completed in accordance with Section 10 of the Drainage Act, R.S.O. 1990, is to assess the possibility of diverting flow from Shirley's Brook to Kizell Creek and Kizell Municipal Drain to provide an outlet for the proposed development of Stages 7 and 8 of KNL, review the requirements, cost considerations and to provide an opportunity for outside agency comments.

All costs associated with the preliminary report will be assessed to the original petitioners should the decision be to not proceed to a final Engineer's Report following consideration of the Preliminary Engineer's Report.

If you have any questions, please feel free to contact Andy Robinson at [ajrobinson@rcii.com](mailto:ajrobinson@rcii.com) or by cell phone 613-761-0161 or Lorne Franklin at [lfranklin@rcii.com](mailto:lfranklin@rcii.com) or by cell phone 613-791-1335.

Yours very truly,

ROBINSON CONSULTANTS INC.



A.J. Robinson, P.Eng.  
Drainage Engineer

AJR: plw



Lorne Franklin, L.E.T., C.E.T., rcca, CISEC  
Licensed Engineering Technologist  
Drainage Services

CC David Ryan, P. Geo, Manager Municipal Drains, City of Ottawa

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## 1.0 INTRODUCTION

Robinson Consultants Inc. was appointed by the City of Ottawa on June 12<sup>th</sup>, 2019 to complete a Preliminary Engineer's Report related to the Kizell Creek in response to a petition under Section 4 of the Drainage Act R.S.O. 1990 to extend the limit of the existing Kizell Municipal Drain to the outlet of the Beaver Pond Storm Water Management Facility. The petition was initiated to consider the viability of diverting flow from Stages 7 and 8 of the Kanata North Development Lands (KNL), in part of Lots 7, 8 and 9, Conc 2, and part of Lots 8 and 9 Conc. 3, Geographic Township of March, from the Shirley's Brook watershed to the Kizell Creek/Kizell Municipal Drain watershed.

A Preliminary Engineer's Report for the proposed Municipal Drain was initiated by the City of Ottawa to ensure that the landowners in the watershed are informed of the costs, impacts of any required improvements (widening, deepening, additional land required, etc.) and any environmental concerns associated with the project prior to proceeding to a full Engineer's Report.

In conjunction with the Preliminary Engineer's Report, design considerations and general details of the proposed drain will be circulated to the various environmental approval agencies including the Mississippi Valley Conservation Authority (MVCA), Department of Fisheries and Oceans (DFO), National Capital Commission (NCC) and the Ministry of Environment Conservation and Parks (MECP). Where provided, requirements or concerns of the agencies will be included in the Final Engineer's Report.

The purpose of the proposed drain is to provide adequate outlet for drainage from Stages 7 and 8 KNL which is proposed to be diverted from Shirley's Brook watershed to the Kizell Creek watershed. The Preliminary Report will provide a proposed drainage solution, discuss costs and address agency concerns where available.

Requirements for Preliminary Reports are outlined under Section 10 of the Drainage Act (R.S.O. 1990), and are as noted below:

- A sketched plan of the drainage works.
- An estimated cost of the works (to the extent practicable to do so).
- An environmental appraisal (where requested).
- And a Benefit/Cost Statement (where requested).
- We note that an environmental appraisal or benefit/cost statement has not been requested in this regard and, as such, neither has been completed.

The minimum applicable items as well as additional considerations are outlined in the sections below.

## 1.1 History

The Preliminary Engineer's Report was initiated in response to a petition on behalf of KNL Developments Inc., a property owner in Lot 7 Conc. 2 to Lot 9 Conc. 3, Geographic Township of March (City of Ottawa). The petition described the work required as legal and sufficient outlet for the development of Stages 7 and 8 of the Kanata Lakes Development. The proposed Stages 7 and 8 of the Kanata Lakes Development presently is tributary to Shirley's Brook.



## 1.2 Scoping Meeting

A Scoping Meeting was held on October 15, 2019 to receive information from the petitioner and to provide an opportunity for reviewing agencies to provide input in advance of proceeding to complete the Preliminary Engineer's Report. A copy of the notes from the meeting are included in **Appendix A** of this report.

A summary of the background information presented on behalf of KNL Developments Ltd. at the Scoping Meeting is outlined below:

- The development of KNL Stage 7 and 8 requires areas that currently drain to Shirley's Brook (in natural conditions) to be redirected to the Kizell Municipal Drain with flow attenuated within the "Beaver Pond" complex.
- The drainage area of the Kizell Municipal Drain is mostly in developed areas with developments starting in the early 1990's.
- The "Beaver Pond" was developed to attenuate flow from some developed areas and has an MOE Certificate of Approval for operations. Many options for drainage of the Stage 7 and 8 lands were reviewed – ultimately the redirection of flow from 7 and 8 to Kizell Creek or the removal of trees and construction of a new pond in the Trillium Woods are the only options. The preferred solution is that Stage 7 and 8 be added to the certificate of approval and drain to the Kizell Municipal Drain.
- Minor flows (minor = contribution to storm sewers at <2y storm) would be directed to the Kizell Municipal Drain and major (major = overland/over road flows at > 2y storm) would be attenuated in a SWM facility and continue to be directed to Shirley's Brook.
- Under existing conditions, creeks are flooded. New systems will limit the extent of any flooding to existing conditions.
- The developer's understanding is that the NCC is looking for restoration of wetlands. Improved base flow within the Kizell Municipal Drain supports fish habitat – some areas are periodically dry.
- The engineers have completed a modelling exercise where the contribution from Stage 7 & 8, under fully developed conditions, is "turned-off" and the additional land makes a minimal difference in water levels through the drain.
- A recently completed study which defines the impact for post Stage 7 and 8 flows is entitled Kanata Lakes SWM Serviceability Study – Stage 7 and 8.
- There has been an OMB decision that directs the developer to protect the Trillium Woods by directing flow to the Beaver Pond.

## 1.3 On-Site Meeting

An On-site meeting was held on November 13<sup>th</sup>, 2019 to discuss the requirements of the petition, as well as to determine if there are other concerns within the drainage area. The notes from the On-site meeting are included in **Appendix A**. Primary concerns noted at the meeting were as follows:

- What are the legal rights of the people to say that they do not want this to be a municipal drain? Council would consider in its decision to adopt or not adopt the report.

- Is the Preliminary Report able to be appealed? The general options for appeal of a full Engineer's Report are not available for a Preliminary Engineer's Report, however, if Council does not approve the report, the original petitioner can appeal the decision to the Drainage Tribunal.
- Under the Drainage Act can you legally go on private properties to survey, etc. Yes, but no construction work can be undertaken until the By-law for the Engineer's Report has received third reading.
- What are the projected level and duration of flows that are expected? The developer's engineer responded that there will be negligible increase in flows.
- Is it true that there is a Planning Act process that is separate from the Drainage Act process? Why is there a need to convert this to a municipal drain? The Planning Act process is separate from the Drainage Act process. Confirmation of a legal outlet is required as part of the Planning Act process—the Drainage Act can provide for a legal outlet.
- Is it possible to show the difference in capacity from today to when the diversion of flow from Stages 7 and 8 is in place? The Drainage Engineer will look at the potential impact on all affected properties as part of the Preliminary Engineer's Report.
- One of the NCC concerns is an increase in peak flow as well as the total volume of flow, will this be considered? This will be considered as part of the overall assessment of potential impacts.

## **2.0 AREA REQUIRING DRAINAGE**

Subsequent to the on-site meeting and upon hearing all concerns noted at the meeting it was determined by the Drainage Engineer that the "area requiring drainage", as per the requirements of the Drainage Act was as described in the petition, being part of Lots 7, 8 and 9, Conc. 2, and part of Lots 8 and 9 Conc. 3, Geographic Township of March.

Improvements to allow for sufficient outlet for the area requiring drainage are assessed by this report.

## **3.0 SOLUTION ANALYSIS**

The purpose of this Preliminary Engineer's Report is to review the potential for Stages 7 and 8 of Kanata North Development lands in part of Lots 7, 8 and 9 of Conc. 2 and part of Lots 8 and 9 of Conc. 3 Geographic Township of March to be diverted from the Shirley's Brook watershed to the Kizell Creek/Kizell Municipal Drain watershed. From the perspective of the Drainage Act the impact on the hydrology and hydraulics of the receiving water course is of greatest concern. It is appreciated that other concerns related to the diversion of flows from one watershed to another may exist, but these will be dealt with through other approvals required by the Planning Act and other legislation.

### **3.1 Hydrology**

The hydrology of the Kanata North Development lands has been the subject of a series of studies and analyses over a period of time. In preparation for completing the Preliminary Engineer's Report the City of Ottawa was requested to consolidate the background reports and agree in principle on the hydrological model to be utilized for assessment of the existing Kizell Creek and Kizell Municipal Drain capacity and for design of any required

improvements. Considering that the hydrology in the City of Ottawa, Shirley's Brook & Watts Creek Phase 2 Stormwater Management Study, April 2015 by AECOM, which is the study of record and was utilized in the assessment of the existing Kizell Municipal Drain and Extension Water Management Engineer's Report it is important that any proposed changes to the hydrology be documented and supported.

Attached in **Appendix B** is a Memorandum from IBI Group dated April 21, 2021, entitled "Flow Analysis to Support the Design Storms and Flows for the Drainage Engineer's Report for the Kizell Drain". As indicated in the noted Memorandum the following is an excerpt from the SWM Serviceability Report – Stages 7 and 8. *"The City of Ottawa confirmed that the proposed conceptual servicing solution for Stages 7/8 as outlined in the SWM Serviceability Report—Stage 7 and 8 is acceptable by the City to facilitate the Drainage Engineer's preliminary report with respect to the petition filed by Kanata Lakes development. The SWM Serviceability Report—Stage 7 and 8 has not been approved and will be reviewed in detail after the final Drainage Engineer's report has been approved by Council with all appeal periods exhausted and relevant development applications completed."*

The interpretation of the above comments is that there is agreement on the technical aspects of the report and resulting flow analysis presented in the Memorandum from IBI Group, but that formal approval cannot be provided until all other requirements are in place including Council approval of the final Engineer's Report. It is on this basis that the hydrologic analysis flows presented in the noted Memorandum are utilized in the hydraulic analysis and resulting design considerations in this Preliminary Engineer's Report.

The existing conditions hydrologic model includes the updated Beaver Pond stage storage rating curve and includes Stage 9 of Kanata North Development Lands. The existing conditions Stage 9 model results are included in Table 6: Flows at Key Points in Kizell Drain of the Memorandum from IBI in Appendix B. Table 6 also includes the flows at key points with Stages 7 and 8 included. For the location of the flows in Table 6 please refer to AECOM Figure 2 included in Appendix B.

The proposed Kizell Creek Municipal Drain is tributary to the existing Kizell Municipal Drain which terminates upstream of the second crossing of Legget Drive. The Draft Engineer's Report Kizell Drain and Extension Water Management terminates approximately 136 metres upstream of the centre line of Legget Drive or 390 metres upstream of Herzberg Road. Herzberg Road is location KFP4 on Table 6 and AECOM Figure 2 in Appendix B.

Table 6 in the Memorandum from IBI includes calculated flows for the area of the water course that is covered by the Draft Engineer's Report Kizell Drain and Extension Water Management. The flows from the AECOM 2015 Report for various return periods were used in completing the hydraulic modeling and design for the Draft Engineer's Report Kizell Municipal Drain and Extension Water Management. In all cases, including flow points KFP4, KFP5, KFP6, WFP2 and WFP3 the flow rates presented in the IBI Memorandum are lower than those from the AECOM 2015 Report. Therefore, once the recommended improvements are implemented for the existing Kizell Municipal Drain, there should not be any impact on the flood plain and water surface elevation as presented in the Draft Engineer's Report Kizell Municipal Drian and Extension Water Management.

Peak flow values for design events ranging from the 2-100 years event are provided in **Table 3.1** for both the existing and proposed conditions.

**Table 3.1**  
**Peak Flow Estimates**

Station	Peak Flow m <sup>3</sup> /s					
	2 yr.	5 yr.	10 yr.	25 yr.	50 yr.	100 yr.
<b>Kizell Creek – Existing (Stage 9)</b>						
Beaver Pond Outlet	0.32	0.49	0.61	0.78	0.96	1.19
March Road	0.71	1.13	1.49	1.94	2.39	3.02
Legget Drive	1.18	1.88	2.44	3.16	3.84	4.80
Marsh Sparrow Private	2.61	4.13	5.30	6.83	8.21	10.15
Herzberg Road*	3.08	4.88	6.25	8.05	9.67	11.93
<b>Kizell Creek – Proposed (Stages 7 &amp; 8)</b>						
Beaver Pond Outlet	0.60	0.96	1.42	1.99	2.16	2.39
March Road	0.92	1.49	1.90	2.40	2.80	3.42
Legget Drive	1.39	2.24	2.84	3.61	4.25	5.21
Marsh Sparrow Private	2.80	4.47	5.68	7.26	8.62	10.58
Herzberg Road*	3.27	5.22	6.62	8.47	10.08	12.37

\* Note: Peak flows are lower than flows from the 2015 AECOM report used in the Draft Engineer's Report Kizell Municipal Drian and Extension Water Management

### 3.2 Hydraulic Modelling

A preliminary survey of the existing Kizell Creek and major crossings was completed in conjunction with this Preliminary Engineer's Report. The results of the survey as well as the proposed improvement options are indicated on Dwg. 19049-A1 and in profile on Dwg. No. 19049-P1 through 19049-P5, which are provided in **Appendix C**.

The HEC-RAS model developed in the AECOM study, with updating of watercourse cross-sections based on detailed field surveys and LiDAR mapping, has been used to generate water levels for the 2, 5, 10, 25, 50 and 100 year design storms for both the existing and proposed conditions with channel improvements and storm water management facilities, notably the Beaver Pond (Kizell Cell and Beaver Cell) within the KNL development area, which will control the existing and proposed future flows.

### 3.3 Capacity of Existing Culverts

The capacity of existing culverts along the Kizell Creek were calculated using MTO nomographs. The modeled flows for Stages 7 and 8 at these culverts was then used to verify if sufficient capacity exists. A summary of capacities and flows is included in **Table 3.2**.

**Table 3.2**  
**Summary of Culvert Capacities**

Culvert Location	Existing Capacity* m <sup>3</sup> /s	Flow Return Period					
		2 yr m <sup>3</sup> /s	5 yr m <sup>3</sup> /s	10 yr m <sup>3</sup> /s	25 yr m <sup>3</sup> /s	50 yr m <sup>3</sup> /s	100 yr m <sup>3</sup> /s
Renfrew Rail Corridor	1.30	0.60	0.96	1.42	1.99	2.16	2.39
Station Road	1.80	0.60	0.96	1.42	1.99	2.16	2.39
K5 Nordion Property	1.50	0.85	1.38	1.81	2.32	2.67	3.21
March Road	8.40	0.92	1.49	1.90	2.40	2.80	3.42
Legget Drive	3.60	1.39	2.24	2.84	3.61	4.25	5.21
Marsh Sparrow Private	7.20	2.80	4.47	5.68	7.26	8.62	10.58

\*Note: Existing capacity is based on inlet control with a HW/D equal to 1 for comparison purposes only.

Culverts on the Kizell Municipal Drain downstream of Kizell Creek have been assessed and improvements recommended as part of the Draft Engineer's Report Kizell Municipal Drian and Extension Water Management.

### 3.4 Capacity of Proposed Culverts

New culverts are proposed for five locations on Kizell Creek. The size, capacity and location of the proposed culverts are listed in **Table 3.3**. These culverts have been sized to maintain the existing water levels up to the 100 year event.

**Table 3.3**  
**Capacities of Proposed Culverts**

Location	Station	Proposed	
		Capacity* (m <sup>3</sup> /s)	Size (mm)
Renfrew Rail Corridor	5+191.3	4.00	(1)-1050mm CSP ex.** (1)-1350mm Conc. Prop.
Station Road	5+186.6	6.25	2400mm x 1500mm Conc. Box
K5 Nordion Property	4+735.1	5.50	3000mm x 1200mm Conc. Box***
Legget Drive	4+131.5	5.00	2700mm x 1200mm Conc. Box
Marsh Sparrow Private	2+974.6	7.00	2700mm x 1500mm Conc. Box

Notes: \* Proposed capacity is based on inlet control with a HW/D equal to 1 for comparison purposes only.

\*\* Propose to add one additional culvert to increase capacity beyond the existing culvert.

\*\*\* Required opening depth is 600 mm, proposed size is closest available precast structure.

## **4.0 ENVIRONMENTAL CONSIDERATIONS**

### **4.1 Conservation Authorities Act**

The "Fill, Construction and Alteration of Waterways and Wetlands" is regulated by the Ontario Conservation Authorities Act. The Mississippi Valley Conservation Authority (MVCA) is the governing Agency with regard to the Conservation Authorities Act for the proposed drain. In conjunction with the completion of the Final Engineer's Report a Permit for the required work will be obtained from the MVCA.

The Preliminary Report will be circulated for review and consideration by the MVCA. Conditions or suggestions by the MVCA will be considered in the full Engineer's Report. Some of the standard Conservation Authorities Act requirements listed below may mitigate any potential adverse impacts:

- Establish all required sediment and erosion control measures prior to the commencement of work and maintain all measures in good working order throughout the duration of work and until permanent erosion control measures are established.
- Complete work to the standards and specifications of the "approved" Final Engineer's Report.
- Complete work in conformance with any noted fish and fish habitat authorization requirements.
- Riparian vegetation may be removed for either bank (but preferably not both).
- Finished channel to be as narrow and deep as possible.
- Complete work only when flows are not elevated.
- Avoid in water work between March 15<sup>th</sup> and July 15<sup>th</sup>.
- Other requirements contained in the permit issued by MVCA.

### **4.2 Fish and Fish Habitat**

The existing Kizell Municipal Drain (downstream of Legget Drive) is classified as a Type "E" drain under the Department of Fisheries and Oceans Drain Classification System – DFO ID No. 92720, last assessed in 2017. Class "E" drains have permanent flows and support sensitive fish species which may require specific mitigation measures.

The upstream portion of the existing Kizell Creek does not have a specific classification since it is not presently a municipal drain. For this initial consideration the same classification (Class "E") is assumed for Kizell Creek.

By utilizing the following Best Management Practices (BMP's) it is anticipated that some of the potential impacts to fish and fish habitat may be mitigated:

- Install appropriate temporary sediment and erosion control measures sufficient to control sediment throughout the duration of any work and maintain until permanent measures are in place and functional.
- Where possible, complete work in the dry, or under "no-flow" conditions.
- Where possible, minimize the disturbance to the existing ditch to the bottom only, or the bottom plus one side only.
- Where work is completed on one side only the preferred side for construction will be the North or East side where possible.
- Complete work outside of normal fisheries exclusion timing windows (No work between March 15<sup>th</sup> and July 15<sup>th</sup> of any calendar year).

- Stabilize (seed) all disturbed areas prior to September 15<sup>th</sup> of any calendar year and/or provide additional erosion control measures (such as erosion control blankets) for work past September 15<sup>th</sup>.
- Provide methodologies and measures to remove/relocate fish (downstream) and exclude fish from work areas where in-water work is anticipated.
- Provide scour/erosion protection at tile drainage outlets.

However, these measures may not fully mitigate the proposed modifications due to the specific conditions found within a typical Class "E" system associated with the improvements considered. As such, it is anticipated that further mitigation or compensation measures may be required. A "Letter of Authorization" for any proposed work from the DFO will be required. Final fish and fish habitat mitigation measures will be established in conjunction with the final Engineer's Report and may be adjusted depending on the nature and extent of the required work.

The nature and extent of additional mitigation and/or compensation measures is dynamic and subject to change at the time of review of the Final Engineer's Report. As such, the cost of these measures may not be fully estimated by this preliminary report.

#### **4.3 Ministry of Environment Conservation and Parks (MECP) – Species at Risk**

This Preliminary Report will be submitted for MECP consultation and screening. Should the decision be made to proceed to a full Engineer's Report, details of the chosen option will be forwarded to the MECP for further consultation.

Based on consultations for other projects in the general vicinity of the proposed Kizell Creek Municipal Drain it is anticipated that the following Species at Risk (SAR) will be identified as potentially existing in proximity to the site (subject to further consultation with the MECP).

##### ***Birds***

- Barn Swallow (Threatened)
- Bank Swallow (Threatened)
- Bobolink (Threatened)
- Eastern Meadowlark (Threatened)
- Piping Plover (Endangered)
- Bald Eagle (Special Concern)
- Canada Warbler (Special Concern)
- Eastern Wood-Pewee (Special Concern)
- Peregrine Falcon (Special Concern)
- Wood Thrush (Special Concern)

##### ***Turtles***

- Snapping Turtle

##### ***Fish***

- American Eel (Endangered)

##### ***Butterflies***

- Monarch (Special Concern)

## **Trees**

- Butternut (Endangered)

Species and general habitat protection are afforded to species identified as "Threatened".

- Where it is the determination of the MECP that the proposed work has the potential to adversely affect a SAR species or their habitat, the MECP may require an Environmental Site Assessment (ESA). However, under Section 6 of the Ontario Drainage Act, an Agency requesting an ESA is responsible for the costs of the ESA. For the purpose of costing, it is assumed that an official ESA will not be requested/required.
- Where the potential adverse effects to SAR species or their habitat may be mitigated through the implementation of standard Best Management Practices (BMP) or avoidance practices such measures will be determined and implemented in conjunction with the Final Engineer's Report. For the purpose of costing, it is assumed that standard BMP's and avoidance will be sufficient. Typical costs are accommodated in the Cost Estimate provided in this report.

## **5.0 RECOMENDATIONS**

### **5.1 Recommended Solution**

The recommended solution is to complete minor improvements to the channel of the existing Kizell Creek, increase the capacity of undersized culverts and install erosion and sediment control protection at selected locations as shown on the drawings included in **Appendix C**. By implementing the recommended improvements as discussed herein and shown on the drawings in Appendix C, for the proposed Kizell Creek Municipal Drain, as well as the improvements for the proposed Kizell Municipal Drain and Extension Water Management system a sufficient outlet in accordance with the Drainage Act will be provided for the proposed diversion of Stages 7 and 8 of the Kanata North Development lands.

Robinson Consultants Inc. recommends that upon acceptance of the Preliminary Engineer's Report by Council following the Meeting to Consider the Preliminary Engineer's Report, that the City instruct the Drainage Engineer to complete a final Engineer's Report for the solution described by this report.

## **6.0 ESTIMATED TOTAL COST**

### **6.1 Assessment of Initial Costs**

The cost of the identified improvements and modifications to the existing Kizell Creek, including the Preliminary and Final Engineer's Report, allowances for land and crops, inspection, administration, and construction is estimated at \$1,550,000. It is anticipated that, other than a contribution by the City for the Leggett Drive culvert replacement, the full cost as identified above will be assessed to the property owners of Kanata North Development lands identified as Stage 7 and Stage 8 in part of Lots 7, 8 and 9, Conc. 2 and part of Lots 8 and 9 Conc. 3, Geographic Township of March.

Where applicable, allowances to individual property owners are also provided for lands used and/or crops lost in the construction of the drain.

The estimated initial costs noted above are exclusive of any grants or allowances as outlined below. Details of the estimates are provided in **Appendix D**.



## 6.2 Assessment for Future Maintenance

As noted above the initial cost associated with the improvements and modifications to Kizell Creek will be assessed to the Stage 7 and Stage 8 lands in the Kanata North Development. For future maintenance assessment schedules will be included in the Final Engineer's Report. The distribution of cost for maintenance is to be determined under the Final Engineer's Report with a percentage of the cost assessed to the owners who directly benefit from the improvements and a percentage of the cost assessed to all affected property owners (upstream of the limit of construction, but within the drainage area) for outlet. Individual assessments are not specified by a Preliminary Engineer's Report.

Grants (current rate of 33% of the assessed cost) for agricultural properties based on the eligibility criteria of the Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA)-Agricultural Drainage Infrastructure Program (ADIP) may be available to eligible properties. General eligibility requirements include the following:

- Be assessed as farmland by the Municipal Property Assessment Corporation.
- Used as part of an ongoing farming operation generating at least \$7,000 in annual revenue.
- Hold a valid Farm Business Registration Number and be registered with AgriCorp.
- Have more than 50% Canadian ownership.

All of which is respectfully submitted,

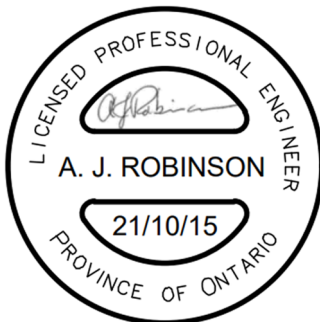
ROBINSON CONSULTANTS INC.



A.J. Robinson, P.Eng.  
Drainage Engineer



Lorne Franklin, L.E.T., C.E.T., rcca, CISEC  
Licensed Engineering Technologist  
Drainage Services



Professional Engineers  
Ontario

21/10/15

Licensed Engineering Technologist

Name: L. FRANKLIN

Number: 100501335

Limitations: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.

Association of Professional Engineers of Ontario

## Appendix A

### Meeting Notes

- Scoping Meeting
- On-Site Meeting

## **DETAILS**

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DATE: October 15, 2019  
TIME: 10:00am  
LOCATION: Kanata Rec Centre

## **IN ATTENDANCE**

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Derek Moodie	(DM)	City of Ottawa	<a href="mailto:derrick.moodie@ottawa.ca">derrick.moodie@ottawa.ca</a>
David Ryan	(DR)	City of Ottawa	<a href="mailto:david.ryan@ottawa.ca">david.ryan@ottawa.ca</a>
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John Price	(JP)	MVCA	<a href="mailto:jprice@mvc.on.ca">jprice@mvc.on.ca</a>
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## **ITEMS DISCUSSED**

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### **1.0 Project Introduction**

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DR introduced the project noting that it was to address a petition for drainage received for KNL for stages 7 and 8 lands.

DR indicated that Andy Robinson had been appointed as the Drainage Engineer for a Preliminary Report in June of 2019.

DR indicated that this meeting is a "Scoping Meeting", which is not officially part of the Drainage Act process, however, it is recommended by OMAFRA for complex projects.

DR initiated a round-table introduction of those in attendance and their role.

### **2.0 Project Description**

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AR indicated that the primary reason for this meeting was to gather input from the Conservation Authority (MVCA) and the National Capital Commission (NCC) with regard to issues or concerns with the project.

AR indicated that the next step in the Drainage Act process will be to schedule the official "on-site" meeting. The on-site meeting is the preliminary public consultation.

AR indicated that it is not typical to complete an Environmental Appraisal for projects under the Drainage Act, however, there are provisions to complete one where requested. The Drainage Act requires that the requesting agency pay the cost of the Environmental Appraisal. AR also indicated that it is anticipated that a significant portion of EA work will likely have been completed in conjunction with the development process – in this case, RCI will review provided information.

AR indicated that the “Preliminary Report” allows RCI to consider all options to provide drainage for KNL 7&8.

DR indicated that after consideration of the Preliminary Report, Council may decide to proceed to a full Engineer's Report to address the desired option

AR provided a sketch/plan indicating the current drainage area boundary of the Kizell Municipal Drain (based on the S. 78 Report for KNL Stage 9) and highlighting the extent of KNL Stage 7, 8 and 9.

### **3.0 Project Detail**

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PS indicated that development of KNL Stage 7 & 8 requires areas that currently drain to Shirley's Brook (in natural conditions) to be redirected to the Kizell Municipal Drain with flow attenuated within the “Beaver Pond” complex.

PS indicated that the drainage area of the Kizell Municipal Drain is a mostly developed area with developments starting in the early 1990's.

PS indicated that the “Beaver Pond” was developed to attenuate flow from some developed areas and has an MOE Certificate of Approval for operations. Many options for drainage of the Stage 7 & 8 lands were reviewed – ultimately the redirection of flow from 7 & 8 to Kizell or the removal of trees and construction of a new pond in the Trillium Woods are the only options. The preferred solution is that Stage 7 & 8 be added to the certificate of approval and drain to the Kizell Municipal Drain.

PS indicated that minor flows (minor = contribution to storm sewers at <2y storm) would be directed to the Kizell Municipal Drain and major (major = overland/over road flows at > 2y storm) would be attenuated in a SWM facility and continue to be directed to Shirley's Brook.

PS indicated that under existing conditions, creeks are flooded. New systems will limit the extent of any flooding to existing conditions.

PS indicated that the developer has maxed out financial contributions to the City under the development requirements.

PS indicated that it is the developer's understanding that the NCC is looking for restoration of wetlands. He indicated that improved base flow within the Kizell Municipal Drain supports fish habitat – some areas are periodically dry.

PS indicated that they have completed a modelling exercise where the contribution from Stage 7 & 8 under developed conditions is “turned-off” and the additional land makes a minimal difference in water levels.

PS directed attention to a recently completed study which defines the impact for post Stage 7 & 8 flows – Kanata Lakes SWM Serviceability Study – Stage 7 & 8.

PS indicated that there has been an OMB decision that directs the developer to protect the Trillium Woods by directing flow to the Beaver Pond.

PS indicated that diversion of this size is fairly common.

PS indicated that he is confident the developer has done all they can to benefit the system

When asked, JS indicated he had nothing further to add to the PS presentation.

AR indicated that it is anticipated that the main agencies with concerns will be the MVCA and the NCC.

MVCA – Questioned AR with regard to the current extent of the drain. AR explained that the drain currently extends to north of Leggett Drive, but options for the preliminary report will consider extension to the outlet of the Beaver Pond, noting that the Municipal Drain likely should have been updated/extended in conjunction with other development over the years.

AR explained that there is a benefit to incorporating the existing watercourse as a Municipal Drain, including sediment and erosion control, access, defined maintenance, and special features in addition to providing legal outlet.

DR explained that a watercourse can provide for legal outlet but only where lands are unmodified – once you start changing things, collecting water, paving, developing, etc. you can't just dump extra water on downstream lands – you need a legal outlet.

MVCA – identified that it is their understanding that the beaver pond outlet is currently 1cms but the proposed flow is 2.3cms. PS clarified that the outlet is currently 1.9cms because of development over the years. The proposal will result in peak flow of 2.4cms but will increase flow duration.

MVCA will review the impact on flood plain mapping resulting from the increased discharge from the Beaver Pond.

PS noted that the watercourse is occasionally dry and expects that increased duration of flow will help fisheries.

MG question if there were proposed modifications to the pond. PS answered that there were new inlets to the pond but no additional modification required.

AR questioned MVCA if it was volume (duration) of flow or rate of flow (peak) that was the primary concern for MVCA. MVCA-JP indicated that they have completed flood plain mapping based on 1cms and would have to review the impact, adding that they would also have to review Shirley's Brook to ensure the diversion of base flow from the area will not impact Shirley's Brook.

MVCA noted that they have issued a permit for the relocation of Shirley's Brook (to move the channel closer to the rail) and they have issued a permit for the removal of the culvert at Nordion and are working collaboratively.

MVCA indicated that they are not sure at this point what additional study may be required to support a permit for the proposed work.

MVCA indicated that portions of the Beaver Pond are now regulated as a PSW, the MVCA understands that McKinley prepared the study of the wetland, however, they have not received a copy of the report.

AR noted that the Municipal Drain proposals will not include disturbing the pond. The proposed Municipal Drain will start at the outlet of the Beaver Pond.

AR questioned what are the NCC's requirements? NCC-EK responded that they want to ensure:

- Past environmental studies are addressed and incorporated
- Kizell Drain is currently identified as cold water and must continue to be cold water.
- Restore wetland habitat
- No impact to water quality or quantity
- North Kanata Trunk Sewer mitigation/compensation measures are in place or proposed for NCC lands – they can not be put at risk under new proposals.

PS questioned NCC how the temperature of Watt's Creek was defined. EK responded that there is a Study (Cook)

***Action – (NCC-EK) – provide Cook Study***

***Action – (NCC-EK) – Share Ducks Unlimited Plans.***

AR questioned the time frame for Ducks Unlimited plans? NCC-EK responded preliminary plans are anticipated for November but will need to clarify when final plans might be available.

***Action – (NCC-EK) – provide schedule for Ducks Unlimited final plans.***

PS indicated that the current outlet flow from the Beaver Pond is 1.9 cms, however the City of Ottawa study Shirley's Brook & Watt's Creek Phase 2 Stormwater Management Study prepared by AECOM in 2015 includes a statement that the maximum 100 year target flow value identified in the approved MOE Certificate of Approval for the Beaver Pond is 0.96 cms.

#### **4.0 Other Concerns**

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MD questioned—will Kizell Creek become part of the drain? AR responded that yes, it will, if flow is directed that way and is required for legal and sufficient outlet.

MD expressed concern that conversion to a Municipal Drain will result in delay and appeals.

DM noted that the City decided to go to a preliminary report as there was a question as to if the diversion of flow between drainage areas was even acceptable.

MD noted the OMB decision directing that trillium woods be protected and flows be brought to beaver pond.

DR questioned if the varying names (beaver Pond, Beaver cell, Kizell cell, etc.) were all the same thing? MD responded that there are different locations u/s and d/s of Goulbourn Forced Road, but they are all hydraulically connected.

DR noted that the Engineer can design to accommodate most requirements but needs answers on what is preferred or acceptable.

JS questioned the timeline for the new Engineer's Report, noting that the current project for Kizell Municipal Drain has taken 4 years – noting that 4 years is not acceptable.

AR questioned MVCA – is the diversion concept approvable. MVCA-MC answered that they are not yet in a position to answer, noting both benefit and potential detriment due to the proposal. MVCA will review the new KNL study. MVCA noted general concern with regard to loss of base flow from Shirley's Brook. MVCA will review the study provided

PS noted that the new study shows equivalent pre/post base flow to Shirley's Brook.

***Action – (MVCA) – Review Study & update RCI/City with regard to general approvability.***

MVCA will need to confirm that there are no required changes to the Beaver Pond Outlet and the specifications of the current MOE ECA for the Beaver Pond.

PS noted that there are no ECA changes required but they can look at this item in detail.

MVCA noted that they were contacted by a landowner downstream of the Beaver Pond with concern for the a "pinch-point" on Kizell Creek that was causing localized flooding.

***Action – (MVCA) – provide contact information and a description of the issue to RCI for further review***

## **NEXT MEETING**

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The next step in the process is the official "on-site" meeting for local landowners as prescribed by the Drainage Act. Date TBD.

## **CONCLUSION**

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Please report any errors or omissions to the undersigned.

Meeting Notes Prepared By:

ROBINSON CONSULTANTS INC.

Lorne Franklin, L.E.T., C.E.T. rcca, CISEC

# **Kizell Municipal Drain, KNL Sections 7 & 8**

## **On-site meeting with the Engineer**

**November 13, 2019 at 2:30pm**

## **Kanata Recreation Complex, Hall B**

### **Meeting notes**

- Meeting began at 2:34
- A petition was received by the City to extend the current Kizell Municipal Drain.
- This process will determine if the existing Kizell Municipal Drain can be extended.
- Municipal Drains are provincial drains that the city administers on behalf of the province.
- This is the on-site meeting which is required under the Drainage Act.
- The engineer decides who is invited to this meeting. If your land touches the proposed Municipal Drain then you have been invited to this meeting
- This is an information gathering meeting. If you have any drainage concerns this is the time to let the Drainage Engineer know.
- There are comment cards at the back of the room to leave your contact information, any concerns or any information that may be helpful to the engineer.
- This is a preliminary Engineers' Report at this point.
- Charles Warnock. Is the preliminary report able to be appealed? No, it is not. There are appeal processes for a final report that can be appealed. \* A clarification e-mail regarding the answer to this question was sent by Andy Robinson the following day. "This in general is true, with the exception that the original petitioner(s) can appeal to the Drainage Tribunal if Council fails to instruct the engineer to proceed with the preparation of a full report. There are also options for the Minister to appeal where lands used for agricultural purposes are included in the area, and for the Ministry of Natural Resources (including on behalf of a conservation authority) if the environmental appraisal is unsatisfactory. However, these latter two potential appeals do not apply since there is no agricultural land and an environmental appraisal has not been required."
- Marcel, KNL – What are the legal rights of people to say they do not want this to be a Municipal Drain? Council can decide to not adopt the report.
- Marcel, KNL - Could the diversion still happen without turning this into a Municipal Drain? You might be able to get legal easements all the way through to allow your water to go that way.



- Charles Warnock, Planning, City of Ottawa – Environmental appraisal, what is it? At this time no official request has been received for an environmental appraisal under the Drainage Act. There are already a lot of studies that have been completed by City, NCC and others.
- Marcel, KNL - Under the Drainage Act can you legally go on properties to survey etc.? Yes but no work can be done until the by-law receives 3<sup>rd</sup> reading.
- Marcel, KNL - Can you go on the land belonging to higher levels of government? In the past we have never had any difficulty when entering property belonging to a higher level government for surveying.
- Phil, Marshes Golf Club – what are the projected level and duration of flows that we are expecting? Peter Spal answer – The flows that already end up at the golf course ultimately. There will be negligible increase in flows. All the studies have been provided to City, CA and Drainage Engineer. Charles Warnock - The city can't review and comment on the reports that have been submitted because the Drainage Act process is ongoing.
- Andy Robinson - The idea of the preliminary report is to look at what can be done with the proposed diversion using the Drainage Act.
- Andy Robinson - For development projects, generally we get the reports approved in principle by the CA before the report is finalized, recognizing that the City or CA could have some different requirements.
- Novatech, Kanata Research Park – Do you have access to the updated flood plain mapping? Can Novatech get access to this information as well? There is a patch work of modelling already completed in this area and if RCI has more information to add Novatech would like to have access. Novatech has a deadline of March 2020 to resolve the drainage issue at Kanta Business Park. Until RCI has worked through things with NCC no preliminary report will be shared. This is standard practice for any ongoing project. Colin, NCC – the NCC has not asked that this information not be shared, this is a decision from RCI.
- Colin, NCC –Is it correct that there is a Planning Act process that is separate from the Drainage Act process? Why is there a need to convert this to a Drain? Andy is assuming that the planners looked at this to see if this feasible? Confirmation of a legal outlet is a requirement in planning. The Drainage Act can provide confirmation of legal outlet. Once the use of the land changes then you don't have legal outlet for that land any longer.
- Nordion – is it possible to show the difference in capacity from today to if the diversion takes place? Hypothetically is it 5% or 10%? If you are OK now then you shouldn't have any problems after the diversion. RCI will look at the impact on all of the properties.
- Colin, NCC – one of the NCC concerns is an increase in peak flows. The total volume is also a concern. He thinks it is about a 13% increase in land to the existing watershed.

Appendix B

IBI Flow Analysis Memo



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# Memorandum

<b>To/Attention</b>	Charles Warnock Andy Robinson	<b>Date</b>	April 21, 2021
<b>From</b>	Peter Spal	<b>Project No</b>	28661
<b>cc</b>	Marcel Denomme Alanna Minogue		
<b>Subject</b>	Flow Analysis to Support the Design Storms and Flows for the Drainage Engineer's Report for the Kizell Drain		

Further to our Team meetings on December 14 and December 16, we are summarising relevant information to facilitate the Drainage Engineer's Review with respect to Kanata Lakes development. As noted during these meeting, it is of critical importance to reach a consensus regarding the status of the existing model, selection of design storms and modelling recommendations. The memorandum is therefore focused on the following issues.

1. To decide which existing conditions model to use
2. The choice of design storms to be used in the review
3. Modeling recommendations

## 1. MODEL COMPARISON

### 1.1. Updates to AECOM's Original Model

As part of IBI's ongoing work in Kanata Lakes, IBI has reviewed the MVCA's Watts Creek/Kizell Drain Flood Plain Mapping Study report (November 2017). The report notes that the AECOM 2015 SWMHYMO model from the Phase 2 Final report for Watts Creek and Kizell Drain has been used with a 12 hour SCS design storm. The most up to date hydrologic model for Watts Creek remains the AECOM 2015 Phase 2 SWMHYMO model.

Subsequent to AECOM's modelling in 2015, two significant updates have been incorporated by IBI. These are:

1. Introduction of Kimmins Court in the Watts Creek model (IBI Group)
2. Update of Beaver Pond rating curve based on survey data in the Upper Kizell XPSWMM model (JFSA and IBI Group)

In more specific terms, the changes IBI has made to the existing conditions Watts Creek model from the Phase 2 Final report (AECOM 2015) due to Kimmins Court include:

- The addition of Kimmins Court
- Reduction of areas KD2A-2 and KD2A-3 to reflect the development of Kimmins Court

Please see Figure A1 in **Appendix A** for the location of these areas. The updated Beaver Pond survey information is also provided in **Appendix A**.

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The difference in these drainage areas are provided in the below table. Please note that you may see Area 2P with an area of 3.52 ha in the models you have received up to this point. This was a typo and Area 2P should be 3.54 ha. This discrepancy resulted in negligible increases in flow but we note this for full transparency. We have rerun the model using 3.54 ha.

**Table 1: Updates to AECOM’s Watts Creek Original Model**

	AECOM	IBI Existing	
Drainage Area	Area (ha)	Area (ha)	Flow point drainage Area adds to
2P	0	3.54 (previously 3.52)	KFP2
KD2A-2	44.99	43.01	KFP3
KD2A-3	48.56	47	KFP4

**Table 2** provides modeling results for the AECOM model run with AECOM’s original storm events (100 year SCS and 100 year Chicago 15 min timestep) for the following scenarios:

- Original AECOM model
- Development of Kimmins Court (in Watts Creek model)
- Update to BP storage (in Upper Kizell XPSWMM model)
- Development of Kimmins Court and update to BP storage

**Table 2: Comparison Using AECOM Design Storms**

	Flows (cms)											
	Original AECOM Model			AECOM + Kimmins Court			AECOM + Updated BP Storage			AECOM + Kimmins Court + Updated BP Storage		
Flow Point	CHI	SCS	Combined	CHI	SCS	Combined	CHI	SCS	Combined	CHI	SCS	Combined
KFP1	0.91	0.91	0.91	0.91	0.91	0.91	0.80	0.82	0.82	0.80	0.82	0.82
KFP2	1.01	1.02	1.02	1.02	1.03	1.03	0.89	0.93	0.93	0.90	0.94	0.94
KFP3	2.76	2.19	2.76	2.97	2.35	2.97	2.77	2.15	2.77	2.95	2.29	2.95
KFP4	12.7	10.3	12.70	12.73	10.32	12.73	12.65	10.21	12.65	12.70	10.25	12.70
KFP5	11.5	10	11.50	11.54	10.04	11.54	11.45	9.91	11.45	11.47	9.94	11.47
KFP6	19	16.8	19.00	19.00	16.83	19.00	18.94	16.67	18.94	18.96	16.71	18.96
WFP1	18.5	16.3	18.50	18.46	16.33	18.46	18.46	16.33	18.46	18.46	16.33	18.46
WFP2	37.5	33.1	37.50	37.45	33.15	37.45	37.39	33.00	37.39	37.42	33.03	37.42
WFP3	38.4	34	38.40	38.33	34.07	38.33	38.27	33.92	38.27	38.29	33.95	38.29
WFP4	37.7	33.8	37.70	37.72	33.87	37.72	37.67	33.77	37.67	37.62	33.76	37.62
WFP5	28.2	27	28.20	28.18	27.03	28.18	28.11	26.96	28.11	28.09	26.95	28.09

\*Shaded values represent the selected flow value used in the floodplain analysis by AECOM

***Introduction of Kimmins Court Development***

Looking at the key flow points along Watts Creek, we note that the addition of 2P is at KFP2. Please see **Appendix A** for the flow point locations along Watts Creek (AECOM Figure 2). There is not a significant increase in peak flow here as the timing of 2P occurs much earlier than

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that of KD-1 and KD-2A-1. At KFP3 there is a reduction in KD2A-2 to reflect the development of 2P. Rather than seeing a reduction in peak flow, we see that the peak increases here. This is because the peak timing is much earlier and coincides with the peak from 2P increasing peak flows here.

**Updated Beaver Pond Storage Rating Curve**

Updating the Beaver Pond rating curve reduces the outflow from Beaver Pond. The flows at every flow point are reduced in comparison to the original AECOM model outputs.

**Introduction of Kimmins Court and Updating Beaver Pond Storage Rating Curve**

The combination results in increased flows at flow point KFP2 but the rest of the flow points have flows lower than the original AECOM model results.

**1.2. Comparison of Models: AECOM and JFSA (continuous)**

In 2015, JFSA completed the Continuous Modeling of Beaver and Kizell Ponds Under Existing Conditions report. JFSA updated AECOM’s model to a continuous model for the Upper Kizell model (upstream of Beaver Pond). The Watts Creek model remains unchanged from AECOM’s. Model runs have been completed to compare AECOM’s model (AECOM + Kimmins Court + Updated BP Storage) and JFSA’s continuous model. Both models have been run with the original AECOM storm events (100 year Chicago and 100 year SCS). Each model includes Kimmins Court and the updated Beaver Pond Storage. IBI notes that results from Chicago storm event downstream of the Beaver Pond have not been reported in past reports when running the continuous model.

**Table 3: Model Comparison**

Flow Point	Flows (cms)					
	AECOM + Kimmins Court + Updated BP Storage*			JFSA#		
	CHI	SCS	Combined	CHI	SCS	Combined
KFP1	0.80	0.82	0.82	0.83	0.85	0.85
KFP2	0.90	0.94	0.94	0.93	0.97	0.97
KFP3	2.95	2.29	2.95	2.95	2.27	2.95
KFP4	12.70	10.25	12.70	12.69	10.22	12.69
KFP5	11.47	9.94	11.47	11.43	9.90	11.43
KFP6	18.96	16.71	18.96	18.90	16.65	18.90
WFP1	18.46	16.33	18.46	18.46	16.33	18.46
WFP2	37.42	33.03	37.42	37.36	32.98	37.36
WFP3	38.29	33.95	38.29	38.23	33.89	38.23
WFP4	37.62	33.76	37.62	37.56	33.70	37.56
WFP5	28.09	26.95	28.09	28.03	26.91	28.03

\* AECOM’s 2015 Watts Creek SWMHYMO model has been updated to include the Kimmins Court development. Inflows from AECOM’s Upper Kizell XPSWMM model has been modified to include the updated Beaver Pond storages. See Section 1.1 for further details

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# AECOM's 2015 Watts Creek SWMHYMO model has been updated to include the Kimmins Court development. No changes were made to JFSA's 2015 Upper Kizell SWMHYMO continuous model which provides inflows to the Watts Creek model.

As shown in **Table 3**, at KFP1 and KFP2 JFSA's model produces higher flows but downstream the AECOM model produces higher flows. The results are corresponding very closely, and flow differences are not greater than 64 l/s.

The above comparisons indicate in detail the evolution from the AECOM base model to JFSA continuous model update to the **Default IBI Existing Model (D-IBI-EM)**. The D-IBI-EM model specifically refers to:

- JFSA's 2015 Upper Kizell SWMHYMO model (this model already included the updated Beaver Pond storage)
- AECOM's 2015 Watts Creek model updated to include the Kimmins Court development

## 2. DESIGN STORMS

It is evident from the comparison above that all models are producing similar results and are consistent. The outstanding question is to make a decision on what design storms should be used for further analysis, in particular the municipal drain evaluation.

- As noted above, AECOM utilised the 24 hour Chicago/SCS 15 minute timestep. Furthermore, AECOM used 2 storm events with the most critical flow from these storm events at each flow point
- For conceptual servicing, IBI has used the 24 hour 100 year SCS with a 12 minute timestep
- and JFSA used the 24 hour 100 year SCS with a 10 minute timestep design storm

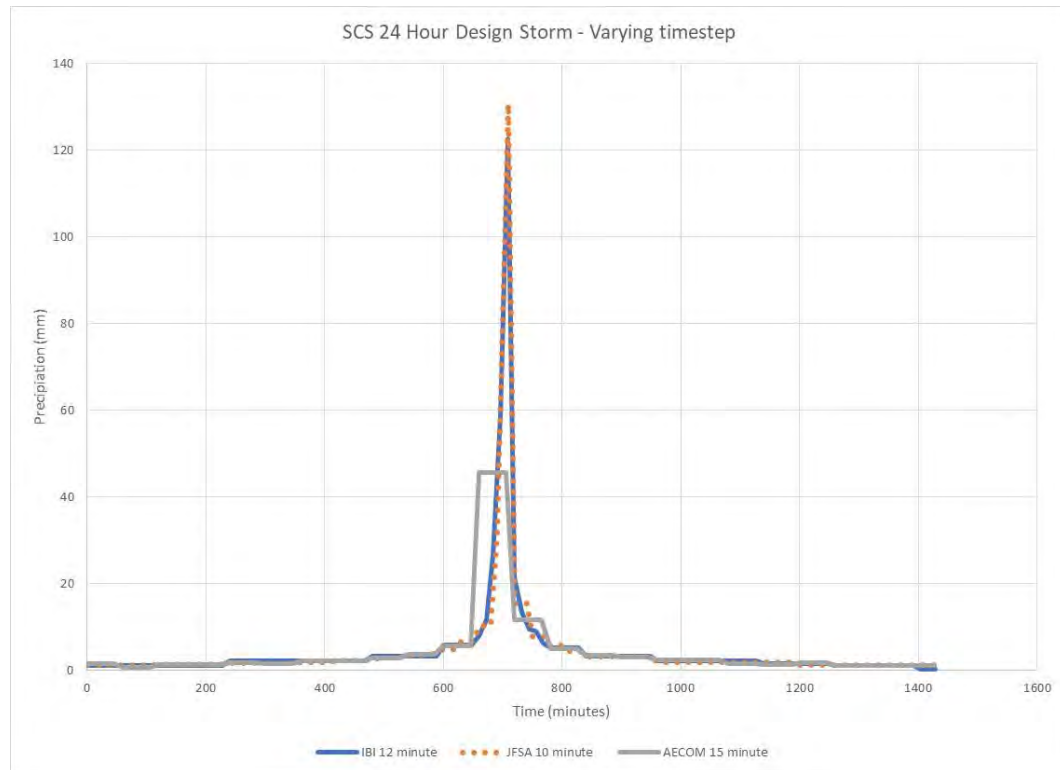
The 24 hour Chicago distribution chosen by AECOM is not a typical design storm used in Ottawa/Kanata. Typically, a 24 hour SCS design storm event is used for similar studies. Design storm distributions provided by AECOM, JFSA, and IBI are provided in **Table 4**.

**Table 4: Design Storm Distributions**

	<b>AECOM Design Storms (combination of Chicago and SCS)</b>	<b>JFSA (unmodified) Design Storms</b>	<b>IBI Design Storms</b>	<b>Proposed Design Storms</b>
Watershed Analysis	6, 12, 24 hour <b>Chicago</b> 6, 12, 24 hour <b>SCS</b> (15 minute timestep)	6, 12, 24 hour <b>Chicago</b> 6, 12, 24 hour <b>SCS</b> (10 minute timestep)	24 hour <b>SCS</b> (for Kizell Drain assessment) (12 minute timestep)	24 hour <b>SCS</b> (for Kizell Drain assessment) 12 minute timestep

**Figure 1** compares the 24 hour SCS design storm using the varying timesteps of 10 minutes, 12 minutes, and 15 minutes.

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**Figure 1: SCS 24 Hour Design Storm Comparison**

The storms using 12 and 10 minute timestep are quite similar and produce the highest peak rainfall. The 15 minute timestep misses the peak and underestimates peak precipitation by more than half.

IBI proposes the use of the 24 hour SCS design storm 12 event minutes timestep to be used by the Drainage Engineer for watershed analysis to assess the Kizell Drain. It is a typical storm event for these types of studies as well as being part of the approved Stage 9 report. Specifically, IBI proposes the 100 year SCS storm event, 12 minute timestep with 106 mm of rain.

To further qualify IBI's recommendation with respect to the selection of the design storm, a comparison was done between the single storm version versus the continuous version of the modeling technique. The original existing model was modified to include the updated Beaver Pond Storage and Kimmins Court and compared to **(DIBI-EM)**. The modeling results are presented in **Table 5**. The 24 hour SCS 12 minute design storm was used for the comparison. We note that the Upper Kizell model which feeds into the Watts Creek model was also run using this design storm event. The results presented for D-IBI-EM represent the "existing conditions" scenario reported in the approved March 2018 KNL Design Brief.

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**Table 5: Comparison of Models Using 24 Hour SCS 12 minutes Design Storm**

Flow Point	Flow (cms)		
	AECOM + BP Storage	AECOM + BP Storage + Kimmins Crt	(D-IBI-EM) IBI Continuous + BP Storage + Kimmins Crt
KFP1	0.82	0.82	0.85
KFP2	0.93	0.94	0.97
KFP3	2.64	2.83	2.81
KFP4	11.68	11.75	11.71
KFP5	10.79	10.82	10.76
KFP6	17.83	17.84	17.80
WFP1	17.44	17.44	17.44
WFP2	35.24	35.27	35.24
WFP3	36.16	36.20	36.16
WFP4	35.74	35.73	35.66
WFP5	27.60	27.59	27.53

\*Shaded areas represent the maximum flow of the three models

It is evident from the comparison that all models are producing similar results and are consistent. The **(DIBI-EM)** produces slightly higher flows for the first two flow points and slightly lower flows downstream. This is the same pattern observed in **Table 3** when comparing the AECOM and JFSA models.

### 3. EXISTING CONDITION MODEL

Assuming that the above recommendations related to the design storm and model evolution are agreeable, then the design methodology to move forward will be consistent with the existing ECA Certificates. It will be also consistent with our discussion on Teams, the City indicated that the actual existing conditions model includes the updated Beaver Pond Stage Storage rating curve and the addition of Stage 9. The approved model would be the KNL Stage 9 existing conditions model. Please see **Figure A3** in **Appendix A** for the location of the Stage 9 and Stage 7&8 developments.

Specifically, this would include:

- Upper Kizell hydrology – SWMHYMO
- Upper Kizell hydraulics – XPSWMM
- Watts Creek hydrology – SWMHMO
- Watts Creek hydraulics – HEC-RAS (note this does not form part of this evaluation)

We propose that the flows in the drainage engineer's review be revised to include Stage 9 as approved conditions. Flows for the proposed existing conditions model and flows for the 7 and 8 development are provided in **Table 6**. IBI notes that the Stage 7/8 flows are referenced from the SWM Serviceability Study – Stage 7 and 8, August 2019. The City of Ottawa confirmed that the proposed conceptual servicing solution for Stage 7/8 as outlined in the SWM Serviceability Report – Stage 7 and 8 is acceptable by the City to facilitate the Drainage Engineer's preliminary



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report with respect to the petition filed by Kanata Lakes development. The SWM Serviceability Report – Stage 7 and 8 has not been approved and will be reviewed in detail after the final Drainage engineers report has been approved by Council with all appeal periods exhausted and relevant development applications completed.

Initial review indicates that Table 6-3 and Table 5-1 of that report need to be revised to the detail design stage 9 results. This does not influence the results or analysis of this memo.

Table 6: Flows at Key Points in Kizell Drain

Flow Point	SCS 24 106 mm IBI Design Storm		
	D-IBI-EM	Stage 9*	Stage 7/8#
KFP1	0.85	0.89	2.33
KFP2	0.97	1.19	2.39
KFP3	2.81	3.02	3.42
KFP4	11.71	11.93	12.38
KFP5	10.76	10.93	11.45
KFP6	17.80	17.96	18.50
WFP1	17.44	17.44	17.44
WFP2	35.24	35.39	35.92
WFP3	36.16	36.32	36.85
WFP4	35.66	35.80	36.40
WFP5	27.53	27.61	28.24

\* Stage 9 flows are obtained from the KNL Stage 9 Design Brief, March 2018 (Table 5.16, detail column)

# Stage 7/8 flows are obtained from the SWM Serviceability Study – Stage 7 and 8, August 2019

As discussed in Section 5.7.1.2 of the Stage 9 Design Brief (2018), a portion of Stage 9 (drainage area 6P denotes the cul-de-sac located in the north-east portion of the development – see **Dwg 751** in **Appendix A**) outlets directly to Kizell Creek downstream of the Beaver Pond outlet. This results in an increase in flows from 0.97 cms to 1.19 cms (23% increase). Total discharge volumes for Stage 9 and Stage 7 and 8 are presented in **Table 7**. There is an increase in volume discharged with the Stage 7/8 development. It is anticipated that the site will provide opportunity for implementing LIDs due to the high permeability of the blasted rock placed in rear yards. This construction feature can potentially reduce the effective runoff volume from the development site.

Table 7: Total discharge volume

Outletting from:	Discharge Volume (m <sup>3</sup> )*	
	Stage 9	Stage 7/8
Beaver Pond (BP)	258,263	344,296
Headwall 2 (6P)	2,884	2,866
Total	261,147	344,046

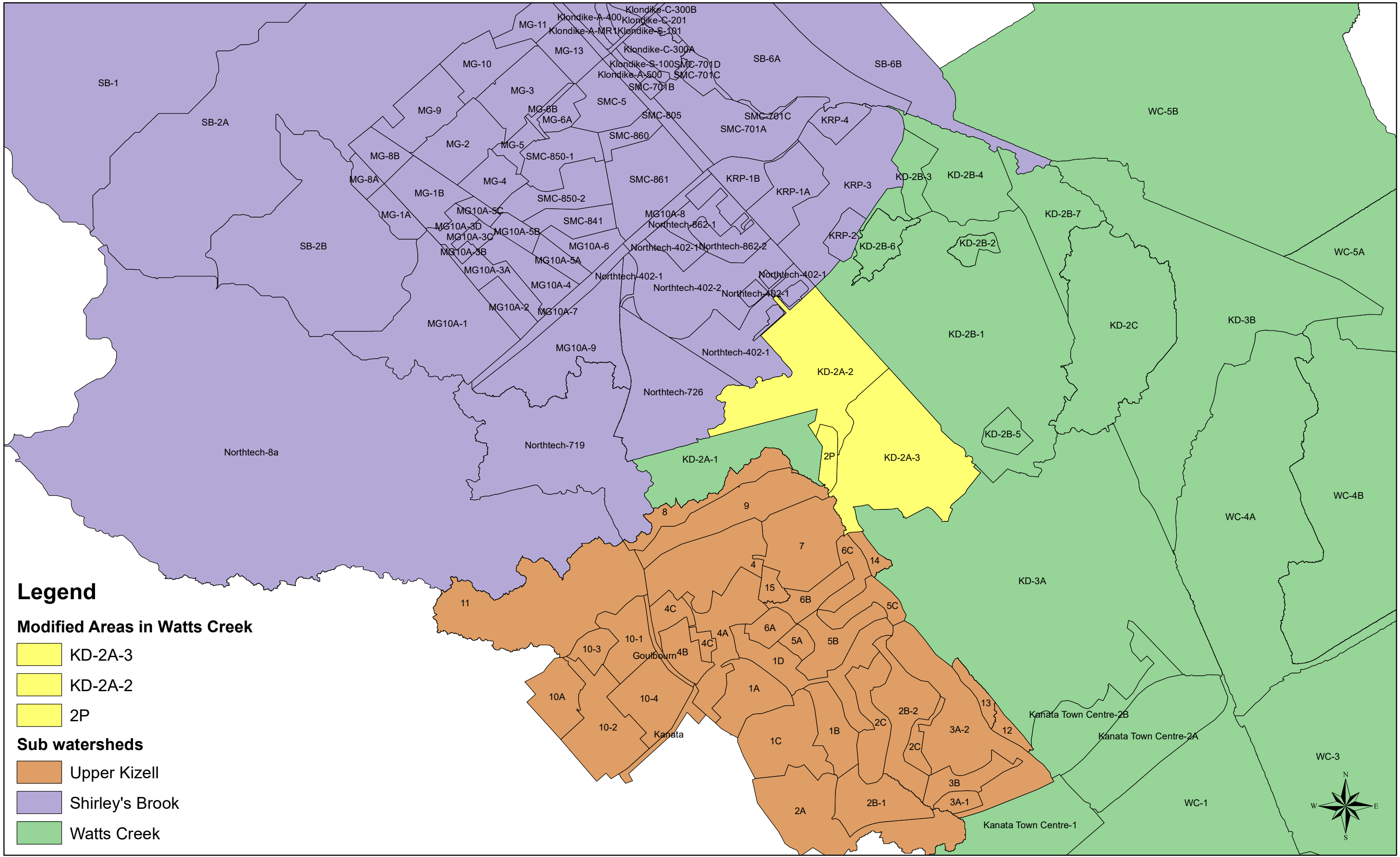
\* Discharge volumes obtained from the XPSWMM output files for the 100 year 24 hour SCS (106 mm) design storm, 12 minute time-step

Further details related to the evaluation of the functioning of the Beaver Pond for default conditions (D-IBI-EM), Stage 9 and for Stage 7/8 is provided in the **Appendix B**.

April 21, 2021

**APPENDIX A: Supporting Documentation and Figures**

Figure A1: Updated Areas: Kimmins Court, KD2A-2, and KD2A-3



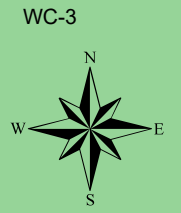
**Legend**

**Modified Areas in Watts Creek**

- KD-2A-3
- KD-2A-2
- 2P

**Sub watersheds**

- Upper Kizell
- Shirley's Brook
- Watts Creek



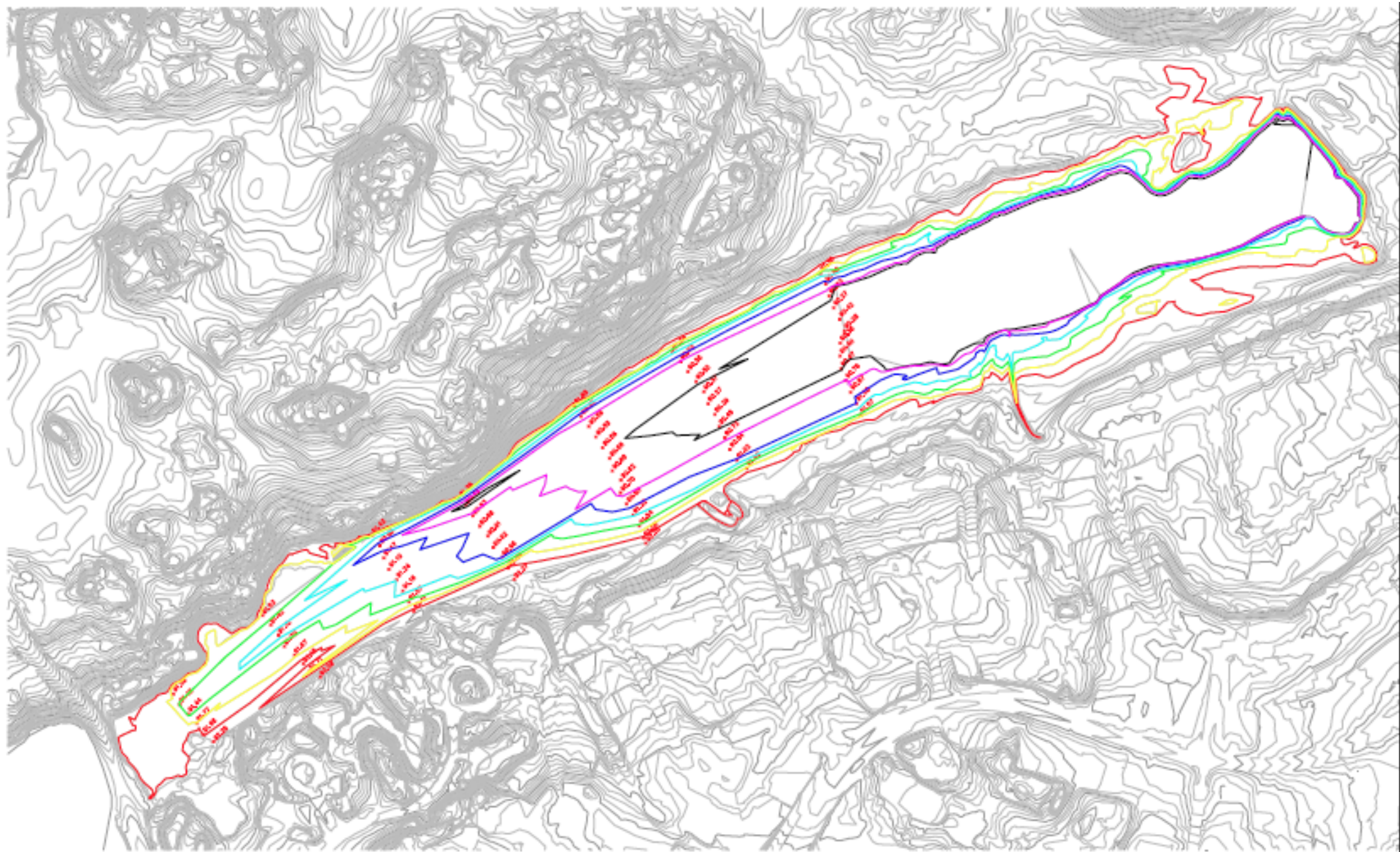
A large, bold, blue letter 'B' is positioned on the right side of the page, overlaid on a vertical strip of water ripples. The letter is centered vertically within the upper half of the page.

Beaver Pond Survey and Updated Stage–Area Curve  
(as per AOV and IBI Group)

**JFSA** Water Resources and  
Environmental Consultants







# From IBI Group

Bottom of BP 87.63 m  
Initial Depth 2.79 m

Beaver Pond Stage Area  
From AECOM Phase 1

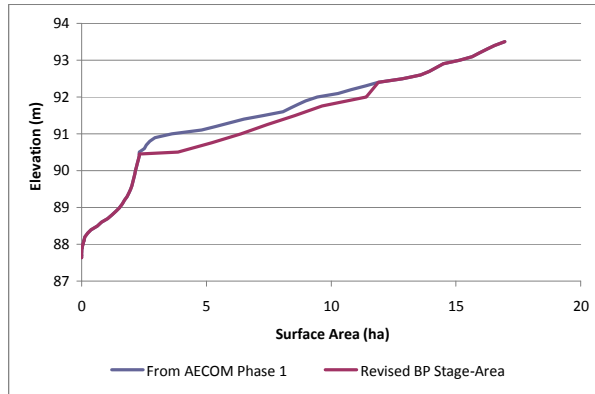
Elevation	Depth	Area (ha)
87.63	0	0.0001
87.70	0.068	0.0002
87.80	0.168	0.0003
87.90	0.268	0.0146
88.00	0.368	0.0444
88.10	0.468	0.0872
88.20	0.568	0.1288
88.30	0.668	0.2309
88.40	0.768	0.3783
88.50	0.868	0.6258
88.60	0.968	0.8016
88.70	1.068	1.0357
88.80	1.168	1.2162
88.90	1.268	1.3863
89.00	1.368	1.5083
89.10	1.468	1.6212
89.20	1.568	1.7271
89.30	1.668	1.8247
89.40	1.768	1.896
89.50	1.868	1.9549
89.60	1.968	2.0027
89.70	2.068	2.0432
89.80	2.168	2.0818
89.90	2.268	2.1193
90.00	2.368	2.1563
90.10	2.468	2.1932
90.20	2.568	2.2299
90.30	2.668	2.2664
90.40	2.768	2.3034
90.45	2.818	2.3035
90.50	2.868	2.3036
90.60	2.968	2.5089
90.70	3.068	2.5883
90.80	3.168	2.7353
90.90	3.268	2.935
91.00	3.368	3.6185
91.10	3.468	4.8076
91.20	3.568	5.3721
91.30	3.668	5.9197
91.40	3.768	6.5021
91.50	3.868	7.2709
91.60	3.968	8.0626
91.70	4.068	8.3753
91.80	4.168	8.6723
91.90	4.268	8.9692
92.00	4.368	9.4301
92.10	4.468	10.2698
92.20	4.568	10.7888
92.30	4.668	11.3862
92.40	4.768	11.8852
92.50	4.868	12.857
92.55	4.918	13.2219
92.60	4.968	13.5868
92.70	5.068	13.9225
92.80	5.168	14.2095
92.90	5.268	14.4942
93.00	5.368	15.1506
93.10	5.468	15.65
93.20	5.568	15.9507
93.30	5.668	16.2476
93.40	5.768	16.5421
93.50	5.868	16.9556

## Beaver Pond Survey Data

Survey from AOS  
from "Surface Pond2015-01-27.xlsx" 2015-01-27  
J:\28661-KanataSWM\5.9 Drawings\baseinfo\surfaces

Elevation Contour (m)	Area (m2)	Area (ha)
90.50	38559.794	3.8559794
90.75	52011.028	5.2011028
91.00	63833.475	6.3833475
91.25	74401.041	7.4401041
91.50	85388.908	8.5388908
91.75	96365.566	9.6365566
92.00	114097.925	11.4097925

Note for blue highlight: Area at 91.00 m from accompanying excel file did not correspond with CAD area. Changed area to match CAD. CAD area was 9.76 m2 less than corresponding spreadsheet.

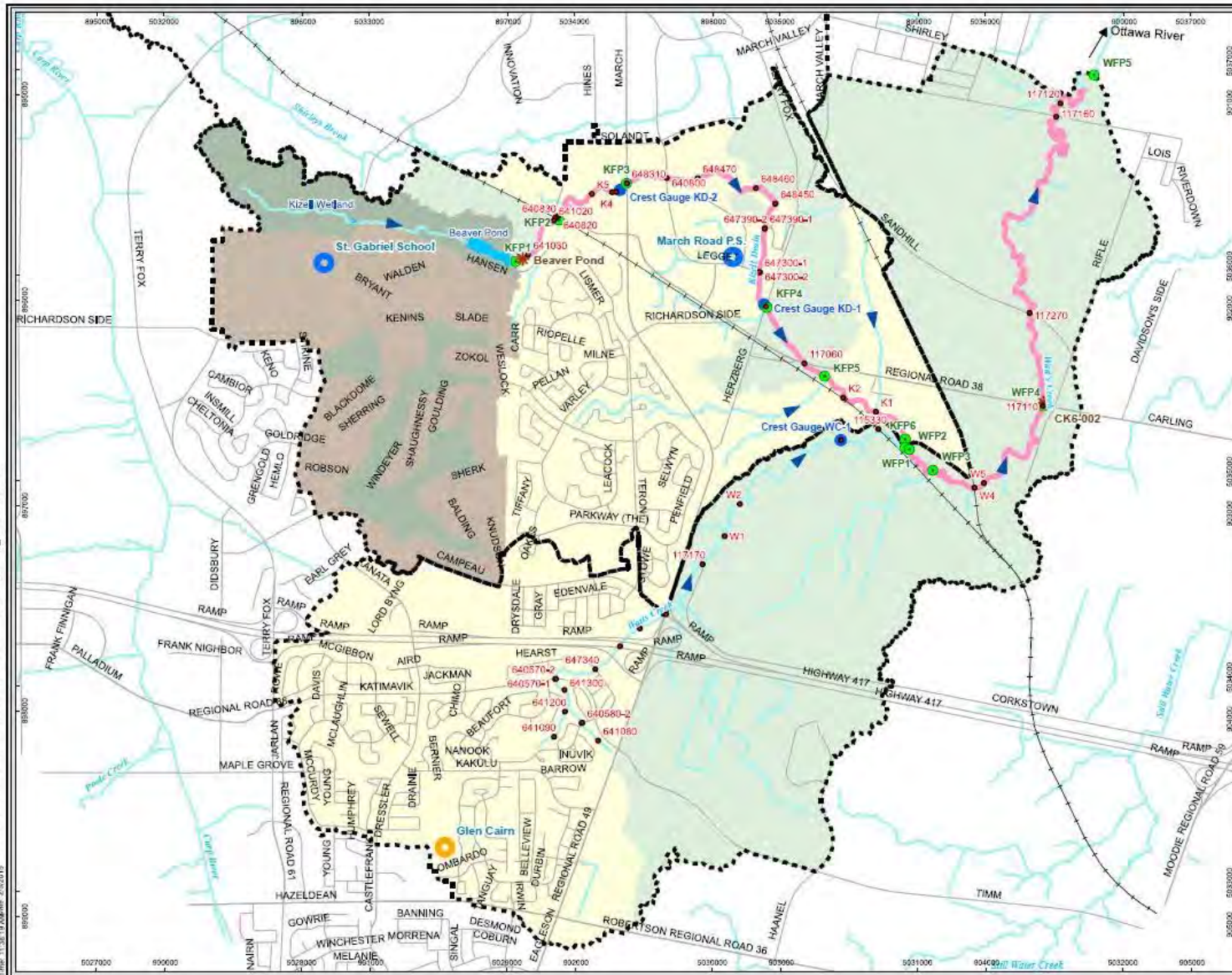


Revised BP Stage-Area

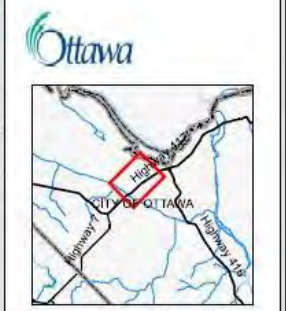
Elevation	Depth	Area (ha)
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87.80	0.168	0.0003
87.90	0.268	0.0146
88.00	0.368	0.0444
88.10	0.468	0.0872
88.20	0.568	0.1288
88.30	0.668	0.2309
88.40	0.768	0.3783
88.50	0.868	0.6258
88.60	0.968	0.8016
88.70	1.068	1.0357
88.80	1.168	1.2162
88.90	1.268	1.3863
89.00	1.368	1.5083
89.10	1.468	1.6212
89.20	1.568	1.7271
89.30	1.668	1.8247
89.40	1.768	1.896
89.50	1.868	1.9549
89.60	1.968	2.0027
89.70	2.068	2.0432
89.80	2.168	2.0818
89.90	2.268	2.1193
90.00	2.368	2.1563
90.10	2.468	2.1932
90.20	2.568	2.2299
90.30	2.668	2.2664
90.40	2.768	2.3034
90.45	2.818	2.3035
90.50	2.87	3.8559794
90.75	3.12	5.2011028
91.00	3.37	6.3833475
91.25	3.62	7.4401041
91.50	3.87	8.5388908
91.75	4.12	9.6365566
92.00	4.37	11.4097925
92.40	4.768	11.8852
92.50	4.868	12.857
92.55	4.918	13.2219
92.60	4.968	13.5868
92.70	5.068	13.9225
92.80	5.168	14.2095
92.90	5.268	14.4942
93.00	5.368	15.1506
93.10	5.468	15.65
93.20	5.568	15.9507
93.30	5.668	16.2476
93.40	5.768	16.5421
93.50	5.868	16.9556



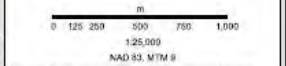
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- Legend**
- Subwatershed Boundary
  - Rural
  - Urban
  - Phase 1 Study Area
  - Crest Gauge Location
  - City of Ottawa Streamflow Gauge
  - City of Ottawa Rain Gauges
  - AECOM Rain Gauge (2015)
  - Flow Point Location
  - Hydraulic Structure Location
  - Stream and River
  - Extent of HEC-RAS Model
  - Flood Line Mapping
  - Railroads



Base mapping and cartography provided by the City of Ottawa.



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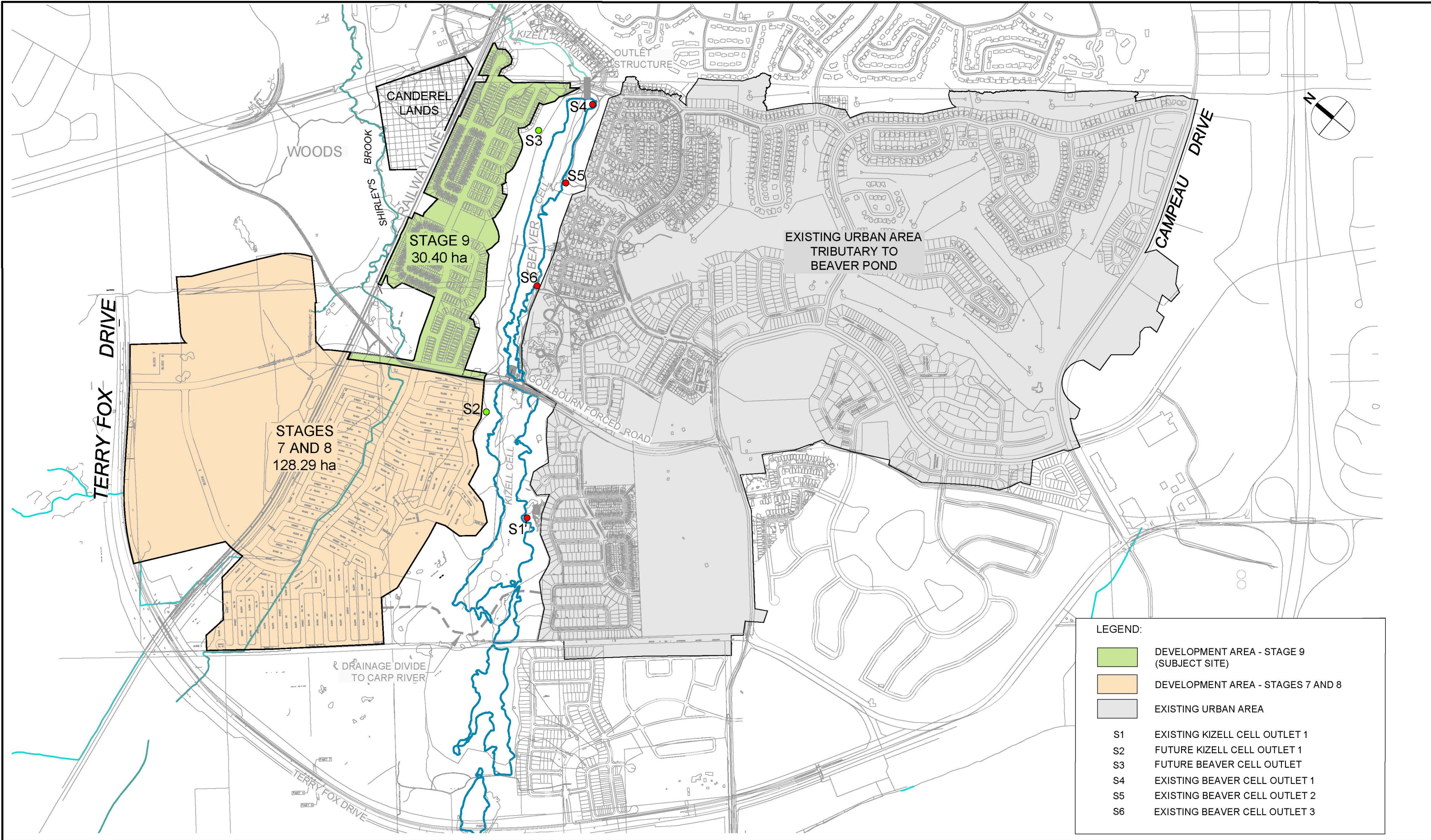
Shirley's Brook & Watt's Creek Phase 2 SWM Study

**Existing Drainage Conditions - Watt's Creek/Kizell Drain**




April 2015  
 60264539



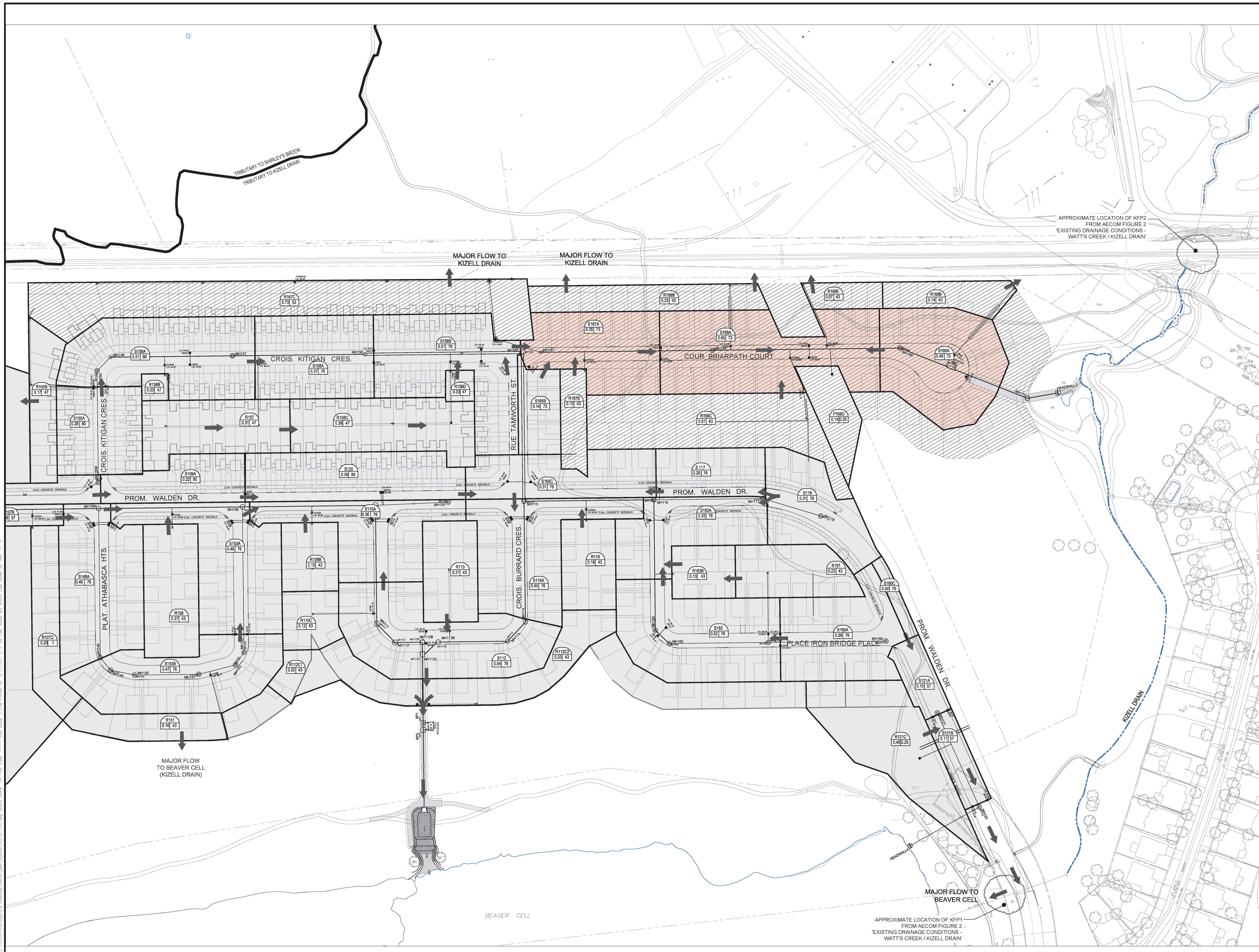
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**LEGEND:**

	DEVELOPMENT AREA - STAGE 9 (SUBJECT SITE)
	DEVELOPMENT AREA - STAGES 7 AND 8
	EXISTING URBAN AREA
S1	EXISTING KIZELL CELL OUTLET 1
S2	FUTURE KIZELL CELL OUTLET 1
S3	FUTURE BEAVER CELL OUTLET
S4	EXISTING BEAVER CELL OUTLET 1
S5	EXISTING BEAVER CELL OUTLET 2
S6	EXISTING BEAVER CELL OUTLET 3





REVIEWED BY  
DEVELOPMENT REVIEW SERVICES BRANCH

Signed \_\_\_\_\_  
Date \_\_\_\_\_ 2017  
Plan Number \_\_\_\_\_

KEY PLAN  
NTS

LEGEND:

- DRAINAGE BOUNDARY
- AREA ID
- Imp. (%)/Tp. (hr)
- AREA (ha)
- ➔ MAJOR FLOW
- ➡ MINOR FLOW
- ▨ URBAN FLOW TO SHIRLEY'S BROOK
- ▨ URBAN FLOW TO BEAVER CELL (KIZELL DRAIN)
- ▨ AREA 6P

14		
13		
12		
11		
10		
9		
8		
7	REVISION FOR DRAINAGE ENGINEER'S REPORT	P.S. 2021:03:17
6	REVISED AS PER MOE COMMENTS	P.S. 2018:06:19
5	REVISED AS PER CITY COMMENTS	P.S. 2018:02:23
4	ISSUED FOR 4TH SUBMISSION	P.S. 2018:01:24
3	REVISED AS PER CITY COMMENTS	P.S. 2017:10:25
2	REVISED AS PER CITY COMMENTS	P.S. 2017:08:30
1	ISSUED FOR CITY REVIEW	P.S. 2017:02:15
No.	REVISIONS	By Date

IBI GROUP  
400 - 333 Preston Street  
Ottawa ON K1S 5N4 Canada  
tel 613 225 1311 fax 613 225 9868  
ibigroup.com

Project Title  
**KANATA LAKES  
STAGE 9**

Drawing Title  
**DRAINAGE AREA  
SCHEMATIC**

Scale  
1:1000

Design	P.S.	Date	FEBRUARY 2017
Drawn	J.F.	Checked	P.S.
Project No.	102101	Drawing No.	751

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 Plot Date: 2021-03-17 10:15:00  
 Plot User: pspal  
 Plot Device: HP DesignJet T1100e



April 21, 2021

**APPENDIX B: Evaluation of the Functioning of Beaver Pond**

An evaluation of the functioning of the Beaver Pond for default conditions (D-IBI-EM), Stage 9 and for Stage 7/8 is provided in **Figure B1**, **Figure B2**, and **Figure B3**.

**Table 5.9: Hydraulic Model Results for Beaver Pond – Existing Conditions**

STORM EVENT		BEAVER CELL			KIZELL CELL		
		STORAGE* (M <sup>3</sup> )	OUTFLOW (M <sup>3</sup> /S)	WATER LEVEL (M)	STORAGE* (M <sup>3</sup> )	OUTFLOW (M <sup>3</sup> /S)	WATER LEVEL (M)
3 Hour Chicago	5 Year	17,725	0.18	90.83	136	0.19	92.31
	100 Year	42,928	0.46	91.22	3,810	1.25	92.99
24 Hour SCS Type II	2 Year	20,829	0.23	90.83	130	0.18	92.31
	5 Year	29,591	0.33	91.03	284	0.31	92.40
	100 Year	132,662	0.85	92.16	10,521	1.51	93.27
25 mm 4 hour Chicago		9,239	0.06	90.66	40	0.08	92.21
<b>SENSITIVITY ANALYSIS</b>							
July 1, 1979 Historical		88,133	0.70	91.75	12,330	2.48	93.33
100 year 3 hour Chicago + 20%		79,775	0.66	91.66	9,913	1.49	93.25
100 year 24 hour SCS Type II + 20%		196,494	1.15	92.67	16,954	1.66	93.45

\*Extended storage only (Total Storage - Permanent Storage). In the Kizell Cell, the Permanent Water Level is 92.1 m with a permanent storage of 6 m<sup>3</sup>. In the Beaver Cell, the Permanent Water Level is 90.42 m with a permanent storage of 35,209 m<sup>3</sup>.

**Figure B1: Default Conditions Beaver Pond Model Results (Continuous model with updated Beaver Pond survey and Kimmins Court)**

April 21, 2021

**Table 5.10: Hydraulic Model Results for Beaver Pond – Stage 9 Interim Development Conditions**

STORM EVENT		BEAVER CELL			KIZELL CELL		
		STORAGE* (M <sup>3</sup> )	OUTFLOW (M <sup>3</sup> /S)	WATER LEVEL (M)	STORAGE* (M <sup>3</sup> )	OUTFLOW (M <sup>3</sup> /S)	WATER LEVEL (M)
3 Hour Chicago	5 Year	19,211	0.20	90.85	53	1.05	92.21
	100 Year	50,728	0.52	91.32	898	1.94	92.63
24 Hour SCS Type II	2 Year	22,306	0.25	90.91	52	1.05	92.21
	5 Year	32,449	0.36	91.07	105	1.05	92.26
	100 Year	145,577	0.89	92.27	4,293	2.47	93.00
25 mm 4 hour Chicago		10,141	0.07	90.68	24	1.05	92.16
SENSITIVITY ANALYSIS							
July 1, 1979 Historical		99,232	0.74	91.86	6,769	2.58	93.11
100 year 3 hour Chicago + 20%		90,061	0.71	91.77	3,895	2.45	92.98
100 year 24 hour SCS Type II + 20%		205,685	1.30	92.74	11,677	2.68	93.28

\*Extended storage only (Total Storage - Permanent Storage). In the Kizell Cell, the Permanent Water Level is 92.1 m with a permanent storage of 6 m<sup>3</sup>. In the Beaver Cell, the Permanent Water Level is 90.42 m with a permanent storage of 35,209 m<sup>3</sup>.

**Figure B2: Stage 9 Beaver Pond Model Results (Continuous model with updated Beaver Pond survey, Kimmins Court, and Stage 9)**

**Table 5-2: Hydraulic Model Results for Beaver Pond – Stages 7 and 8 Ultimate Development Conditions**

Storm Event		Beaver Cell			Kizell Cell		
		Storage * (m <sup>3</sup> )	Outflow (m <sup>3</sup> /s)	Water Level (m)	Storage* (m <sup>3</sup> )	Outflow (m <sup>3</sup> /s)	Water Level (m)
3 Hour Chicago	5 Year	31,751	0.58	91.06	1,626	2.26	92.77
	100 Year	83,284	1.75	91.70	10,875	2.70	93.26
24 Hour SCS Type II	2 Year	31,743	0.58	91.06	249	1.05	92.36
	5 Year	44,725	0.94	91.24	1,591	2.29	92.79
	100 Year	173,596	2.33	92.50	19,701	2.84	93.49
25 mm 4 hour Chicago		16,766	0.20	90.81	23	1.05	92.16
Sensitivity Analysis							
July 1, 1979 Historical		136,754	2.15	92.20	29,535	2.96	93.66
100 year 3 hour Chicago + 20%		125,249	2.10	92.10	20,829	2.86	93.52
100 year 24 hour SCS Type II + 20%		216,990	3.54	92.82	33,074	2.93	93.71

\*Extended storage only

**Figure B3: Stage 7/8 Beaver Pond Model Results (Continuous model with updated Beaver Pond survey, Kimmins Court, Stage 9, and Stage 7&8)**

With the proposed beaver control structure as part of Stage 9, flow from the Kizell Cell to Beaver Cell has a higher peak flow but shorter duration compared to existing conditions. The timing of the peak flow through the structure occurs prior to the peak of the areas tributary to Beaver Cell. Consequently, the peak water levels in Beaver Pond are not impacted by the higher peak flow through the structure.

April 21, 2021

Water levels, storage and outflows with the development of Stage 9 and the development of Stage 7 and 8 increase but remain within the water quantity design criteria:

- Water level in Beaver Cell < 92.60 m
- Water level in Kizell Cell < 93.69 m
- Outflow from the Beaver Pond
  - < 0.96 cms (Stage 9)
  - < 2.40 cms (Stage 7 and 8)

As discussed in Section 5.7.1.2 of the Stage 9 Design Brief (2018), a portion of Stage 9 (6P cul-de-sac) outlets directly to Kizell Creek downstream of the Beaver Pond outlet. This results in an increase in flows from 0.97 cms to 1.19 cms (23% increase) downstream of Beaver Pond (at flow point KFP2).

## Comparison of Peak Flows Downstream of Beaver Pond

A comparison of peak flows downstream of Beaver Pond is provided in **Table 6**. Excerpts from the approved Stage 9 Design Brief and the SWM Serviceability Report for Stage 7 and 8 are provided below. We note that the SWM Serviceability Report for Stage 7 and 8 and associated modeling are still awaiting detail review.

### ***Excerpt from SWM Serviceability Report - Stage 9***

*Under existing conditions, peak flow timing is mainly governed by the outflow from the Beaver Pond. In interim conditions, the coinciding of the peak flows from areas 2P and 6P tends to govern the peak flow and timing. The 100 year and 100 year + 20% SCS storm events remain governed by the outflow from Beaver Pond. Resulting peak flows at flow point KFP2 increase under interim conditions but not significantly.*

*Flows within the Kizell Drain are increased with the Stage 9 development however, further downstream of Beaver Pond outlet in Watt's Creek [at KFP5 – near Carling Avenue and Herzberg Road] these differences become less significant.*

*Upstream of Herzberg Road there are increases in water level between 0.0 and 0.09 m. The resulting increases in water level do not appear to result in further encroachment of flood areas. The model results show that the difference in water levels downstream of Herzberg Road are negligible with differences in water levels less than 0.01 m.*

*Replacement of the March Road [culvert] and K4 culverts significantly reduce water levels within the vicinity of the Nordion property between 0.55 m and 1.44 m. Water levels remain within the channel under ... [Stage 9] development flows. This provides an improvement over existing conditions.*

### ***Excerpt from SWM Serviceability Report - Stage 7 and 8\****

\* The City of Ottawa confirmed that the proposed conceptual servicing solution for Stage 7/8 as outlined in the SWM Serviceability Report – Stage 7 and 8 is acceptable by the City to facilitate the Drainage Engineer's preliminary report with respect to the petition filed by Kanata Lakes development. The SWM Serviceability Report – Stage 7 and 8 has not been approved and will be reviewed in detail after the final Drainage engineers report has been approved by Council with all appeal periods exhausted and relevant development applications completed.

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*As part of the development of Stages 7 and 8, the existing Walden Drive outlet structure will be modified to increase the outflow up to 2.4 cms during the 100 year SCS design storm event. Flows within the Kizell Drain downstream of the Beaver Pond are increased. However, further downstream in Watt's Creek [at KFP3 near March Road ] these differences become less significant.*

*The replacement of the March Road [culvert] and removal of the K4 culvert significantly reduce water levels within the vicinity of the Nordion property between 0.38 m and 1.28 m. Water levels remain within the channel under ultimate development flows. This provides an improvement over existing conditions.*

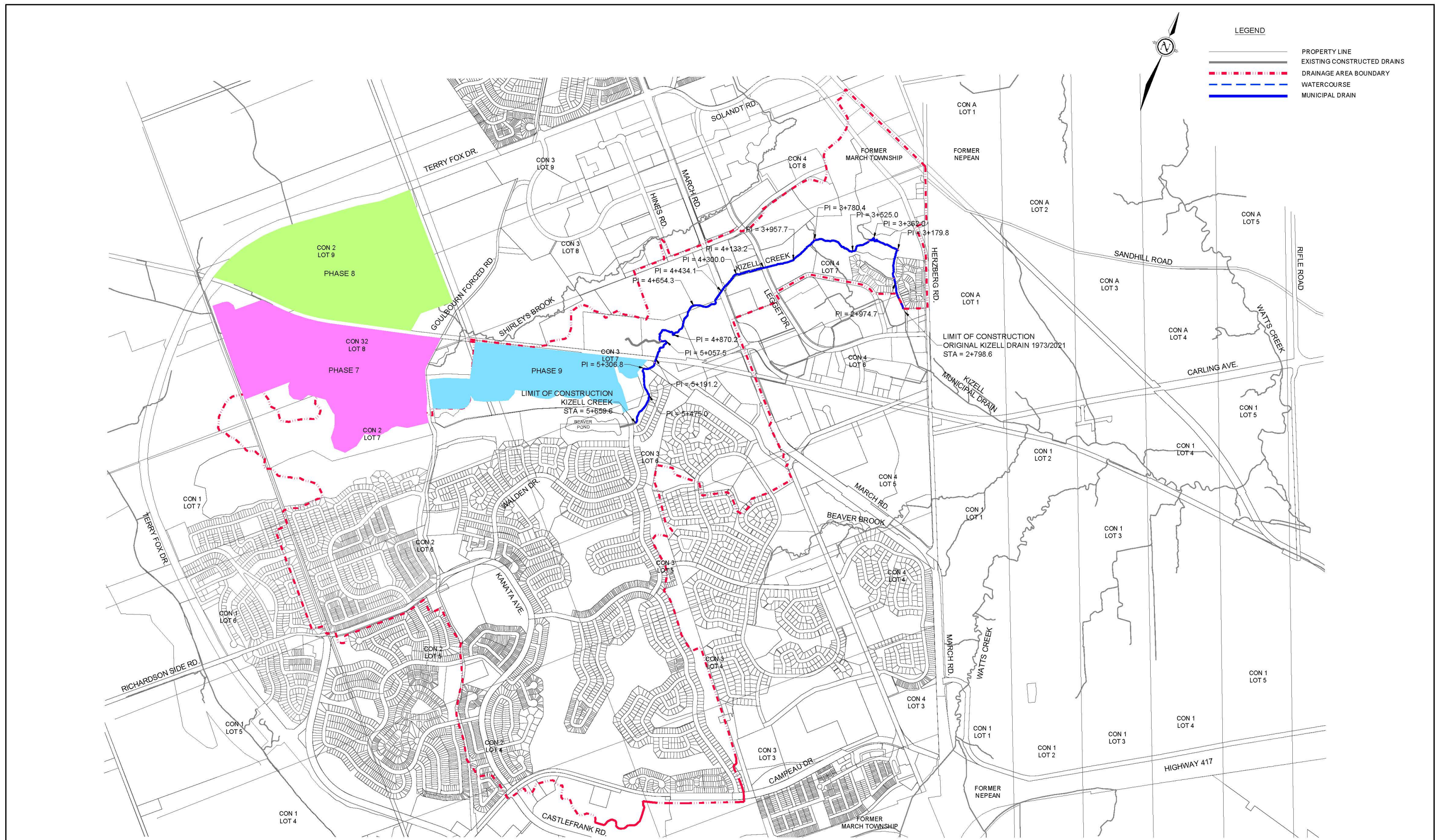
*The model results show that the difference in water levels downstream of the Canadian National Railway are negligible with differences less than 0.02 m. Upstream of the Canadian National Railway, there are increases in water level between 0.0 and 0.68 m during the 100 year design storm event. IBI understands that there will be recommendations made by the drainage engineer with respect to the Kizell Drain. It is anticipated that once these improvements are incorporated into the hydraulic model, existing drainage issues along the Kizell Drain will significantly improve with the removal of pinch points. IBI will then determine the additional improvements, if any, required along the drain to support the increased outflows from Beaver Pond.*

## Appendix C

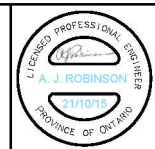
### Drawings

- Drainage Area Plan 19049-A1
- Culvert and Erosion Control Plan  
19049-A2
- Profile Drawings 19049-P1 thru 19049-  
P5
- Cross Sections 19049-C1

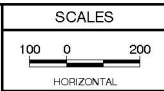




No.	DATE	REVISION	BY
1	06.08.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers Ontario  
 Licensed Engineering Technologist  
 21/10/15  
 Name: L. FRANKLIN  
 Number: 10050/1508  
 Limitation: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.  
 Association of Professional Engineers of Ontario



**Robinson**  
 Consultants

350 Palladium Drive  
 Ottawa, ON K2V 1A8  
 (613) 592-6060 rcil.com

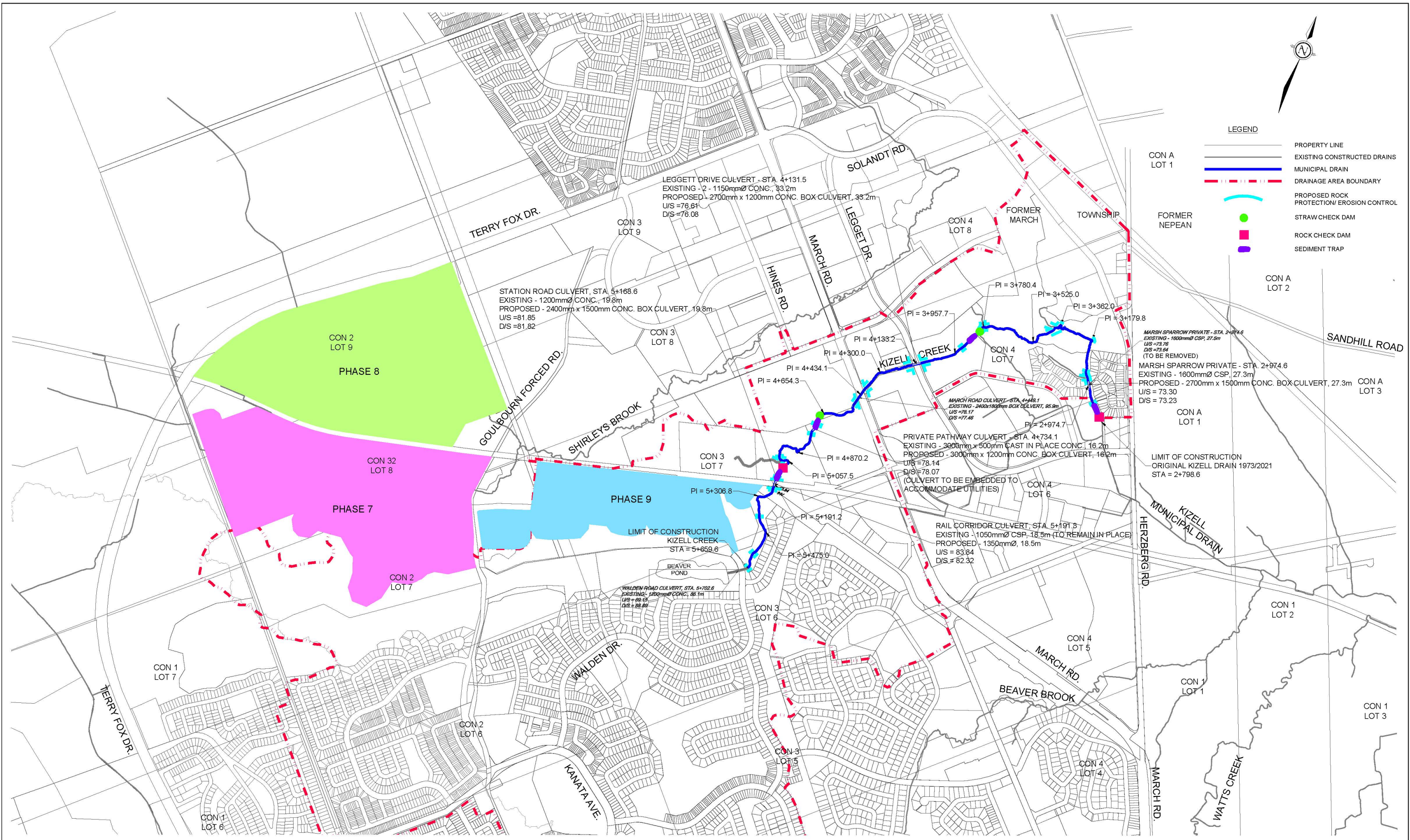
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CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

CITY OF OTTAWA  
 KIZELL CREEK  
 KNL PHASE 7 and 8  
 PRELIMINARY REPORT

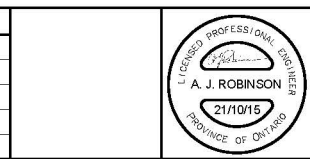
DRAINAGE AREA PLAN

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-A1

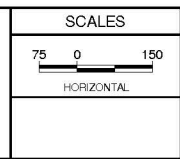




No.	DATE	REVISION	BY
1	06.09.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
Ontario  
21/10/15  
Licensed Engineering Technologist  
Name: L. FRANKLIN  
Number: 100901858  
Limitations: Providing plans, non-technical content of reports and other non-technical services for submission under the Ontario Drainage Act.  
Association of Professional Engineers of Ontario



**Robinson**  
Consultants

350 Palladium Drive  
Ottawa, ON K2V 1A8  
(613) 592-6060 rcii.com

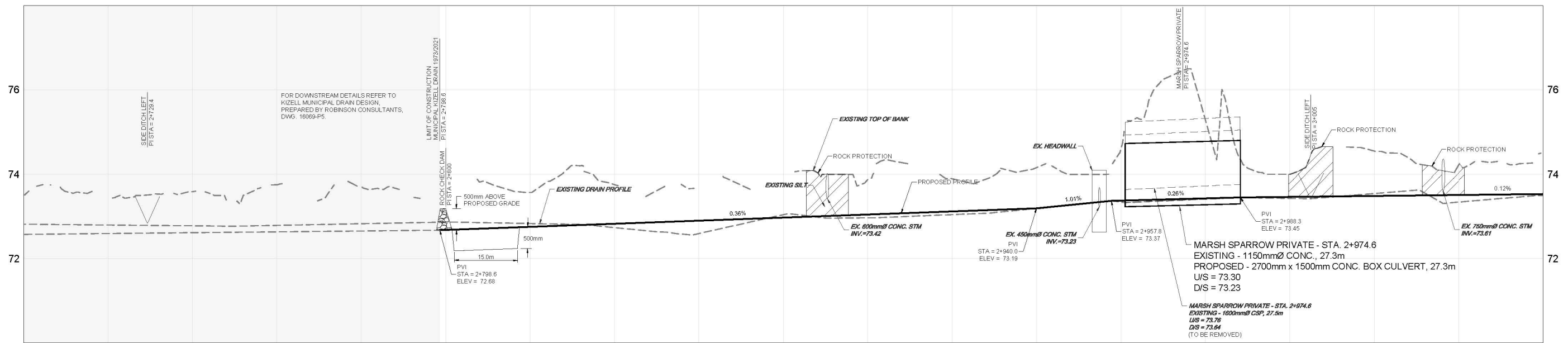
DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

CITY OF OTTAWA  
KIZELL CREEK  
KNL PHASE 7 and 8  
PRELIMINARY REPORT

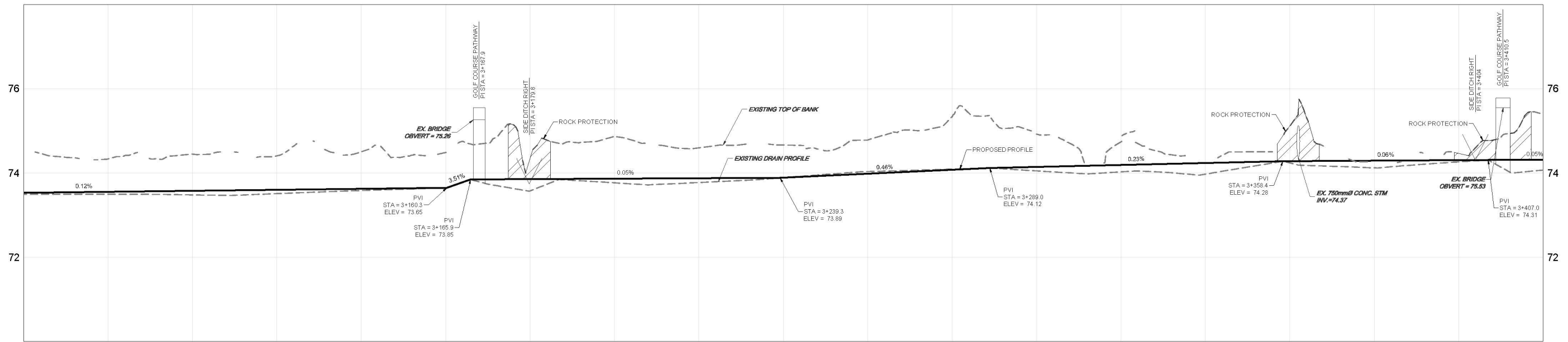
CULVERT AND  
EROSION & SEDIMENT  
CONTROL PLAN

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-A2



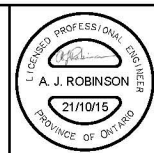


STATION	2+000	2+200	2+400	2+600	2+800	2+800	2+820	2+840	2+860	2+880	2+900	2+920	2+940	2+960	2+980	3+000	3+020	3+040	3+060																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
PROPOSED GRADE						72.68		72.75		72.83		72.90		72.97		73.05		73.12		73.19		73.26		73.33		73.40		73.47		73.54		73.61		73.68		73.75		73.82		73.89		73.96		74.03		74.10		74.17		74.24		74.31		74.38		74.45		74.52		74.59		74.66		74.73		74.80		74.87		74.94		75.01		75.08		75.15		75.22		75.29		75.36		75.43		75.50		75.57		75.64		75.71		75.78		75.85		75.92		75.99		76.06		76.13		76.20		76.27		76.34		76.41		76.48		76.55		76.62		76.69		76.76		76.83		76.90		76.97		77.04		77.11		77.18		77.25		77.32		77.39		77.46		77.53		77.60		77.67		77.74		77.81		77.88		77.95		78.02		78.09		78.16		78.23		78.30		78.37		78.44		78.51		78.58		78.65		78.72		78.79		78.86		78.93		79.00		79.07		79.14		79.21		79.28		79.35		79.42		79.49		79.56		79.63		79.70		79.77		79.84		79.91		79.98		80.05		80.12		80.19		80.26		80.33		80.40		80.47		80.54		80.61		80.68		80.75		80.82		80.89		80.96		81.03		81.10		81.17		81.24		81.31		81.38		81.45		81.52		81.59		81.66		81.73		81.80		81.87		81.94		82.01		82.08		82.15		82.22		82.29		82.36		82.43		82.50		82.57		82.64		82.71		82.78		82.85		82.92		82.99		83.06		83.13		83.20		83.27		83.34		83.41		83.48		83.55		83.62		83.69		83.76		83.83		83.90		83.97		84.04		84.11		84.18		84.25		84.32		84.39		84.46		84.53		84.60		84.67		84.74		84.81		84.88		84.95		85.02		85.09		85.16		85.23		85.30		85.37		85.44		85.51		85.58		85.65		85.72		85.79		85.86		85.93		86.00		86.07		86.14		86.21		86.28		86.35		86.42		86.49		86.56		86.63		86.70		86.77		86.84		86.91		86.98		87.05		87.12		87.19		87.26		87.33		87.40		87.47		87.54		87.61		87.68		87.75		87.82		87.89		87.96		88.03		88.10		88.17		88.24		88.31		88.38		88.45		88.52		88.59		88.66		88.73		88.80		88.87		88.94		89.01		89.08		89.15		89.22		89.29		89.36		89.43		89.50		89.57		89.64		89.71		89.78		89.85		89.92		89.99		90.06		90.13		90.20		90.27		90.34		90.41		90.48		90.55		90.62		90.69		90.76		90.83		90.90		90.97		91.04		91.11		91.18		91.25		91.32		91.39		91.46		91.53		91.60		91.67		91.74		91.81		91.88		91.95		92.02		92.09		92.16		92.23		92.30		92.37		92.44		92.51		92.58		92.65		92.72		92.79		92.86		92.93		93.00		93.07		93.14		93.21		93.28		93.35		93.42		93.49		93.56		93.63		93.70		93.77		93.84		93.91		93.98		94.05		94.12		94.19		94.26		94.33		94.40		94.47		94.54		94.61		94.68		94.75		94.82		94.89		94.96		95.03		95.10		95.17		95.24		95.31		95.38		95.45		95.52		95.59		95.66		95.73		95.80		95.87		95.94		96.01		96.08		96.15		96.22		96.29		96.36		96.43		96.50		96.57		96.64		96.71		96.78		96.85		96.92		96.99		97.06		97.13		97.20		97.27		97.34		97.41		97.48		97.55		97.62		97.69		97.76		97.83		97.90		97.97		98.04		98.11		98.18		98.25		98.32		98.39		98.46		98.53		98.60		98.67		98.74		98.81		98.88		98.95		99.02		99.09		99.16		99.23		99.30		99.37		99.44		99.51		99.58		99.65		99.72		99.79		99.86		99.93		100.00
EXISTING FIRM BOTTOM	72.62	72.60	72.70	72.70	72.68	72.67	72.68	72.74	72.60	72.04	72.97	73.05	73.12	73.19	73.38	73.41	73.43	73.46	73.49	73.51	73.53																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

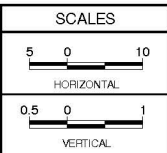


STATION	3+000	3+080	3+100	3+120	3+140	3+160	3+180	3+200	3+220	3+240	3+260	3+280	3+300	3+320	3+340	3+360	3+380	3+400	3+420
PROPOSED GRADE	73.53	73.56	73.56	73.60	73.63	73.65	73.66	73.67	73.68	73.69	73.69	74.08	74.15	74.19	74.24	74.28	74.29	74.31	74.32
EXISTING FIRM BOTTOM	73.50	73.50	73.46	73.51	73.59	73.65	73.69	73.77	73.78	73.89	74.03	74.09	74.05	74.03	73.97	74.24	74.12	74.27	74.07

No.	DATE	REVISION	BY
1	06.09.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
Ontario  
21/10/15  
Licensed Engineering Technologist  
Name: L. FRANKLIN  
Number: 50501336  
Limitations: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.  
Association of Professional Engineers of Ontario



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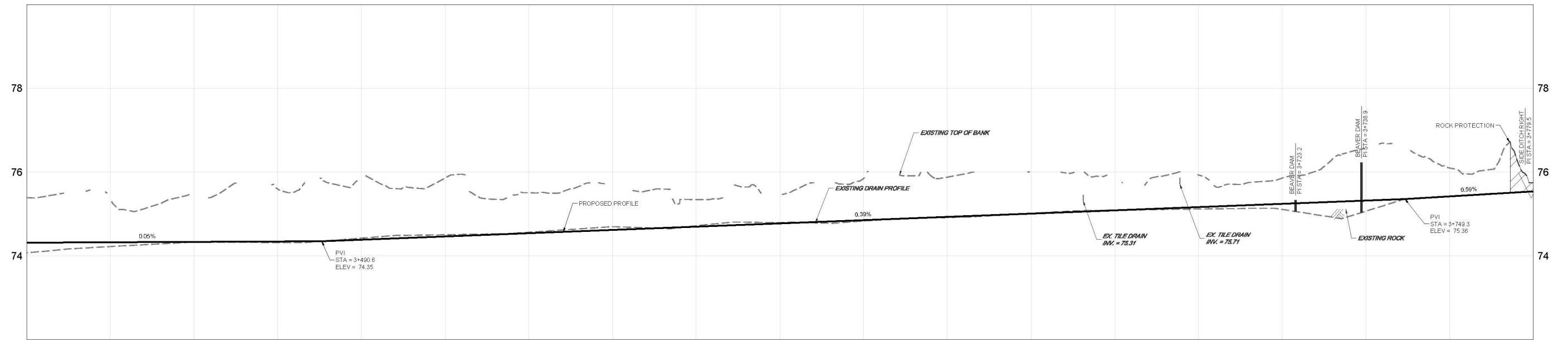
350 Palladium Drive  
Ottawa, ON K2V 1A8  
(613) 592-6060 rcii.com

DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

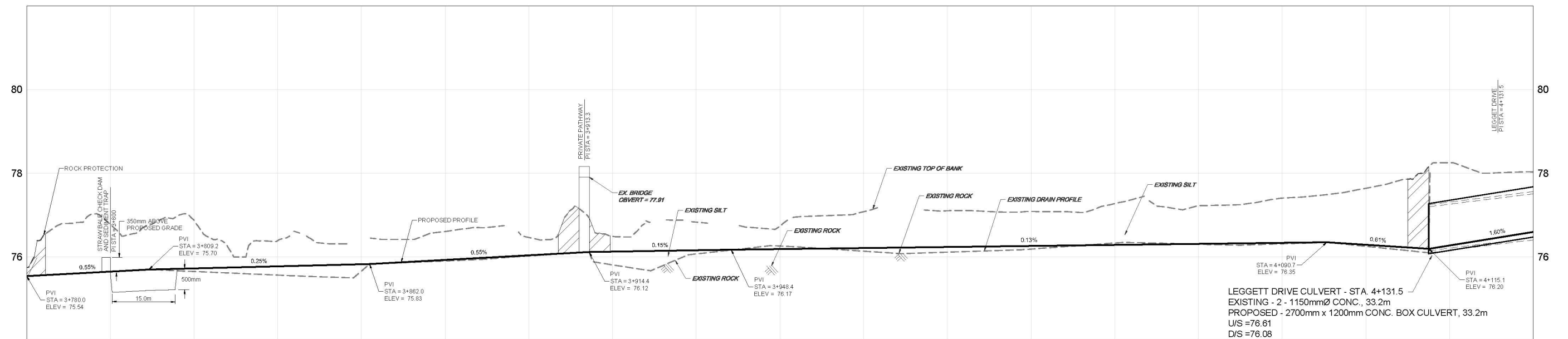
**CITY OF OTTAWA**  
**KIZELL CREEK**  
**KNL PHASE 7 and 8**  
**PRELIMINARY REPORT**

**DRAIN PROFILE**  
**STA. 2+700 TO STA. 3+420**

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-P1



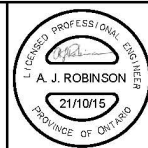
PROPOSED GRADE	74.32	74.33	74.34	74.35	74.39	74.47	74.54	74.62	74.70	74.78	74.86	74.93	75.01	75.09	75.17	75.25	75.32	75.42	75.54
EXISTING FIRM BOTTOM	74.07	74.27	74.39	74.52	74.63	74.67	74.67	74.70	74.72	74.80	74.84	74.82	74.82	74.89	74.92	75.11	75.07	75.43	75.54
STATION	3+420	3+440	3+460	3+480	3+500	3+520	3+540	3+560	3+580	3+600	3+620	3+640	3+660	3+680	3+700	3+720	3+740	3+760	3+780



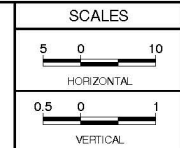
PROPOSED GRADE	75.54	75.65	75.73	75.78	75.83	75.93	76.04	76.13	76.16	76.19	76.24	76.26	76.29	76.31	76.34	76.29	76.27	76.60	
EXISTING FIRM BOTTOM	75.54	75.65	75.65	75.67	75.65	75.60	76.02	76.01	76.07	76.26	76.14	76.11	76.19	76.33	76.30	76.31	76.25	76.60	
STATION	3+780	3+800	3+820	3+840	3+860	3+880	3+900	3+920	3+940	3+960	3+980	4+000	4+020	4+040	4+060	4+080	4+100	4+120	4+140

LEGGETT DRIVE CULVERT - STA. 4+131.5  
 EXISTING - 2 - 1150mmØ CONC., 33.2m  
 PROPOSED - 2700mm x 1200mm CONC. BOX CULVERT, 33.2m  
 U/S = 76.61  
 D/S = 76.08

No.	DATE	REVISION	BY
1	06.08.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
 Ontario  
 21/10/15  
 Licensed Engineering Technologist  
 Name: L. FRANKLIN  
 Number: 102501958  
 Limitations: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.  
 Association of Professional Engineers of Ontario



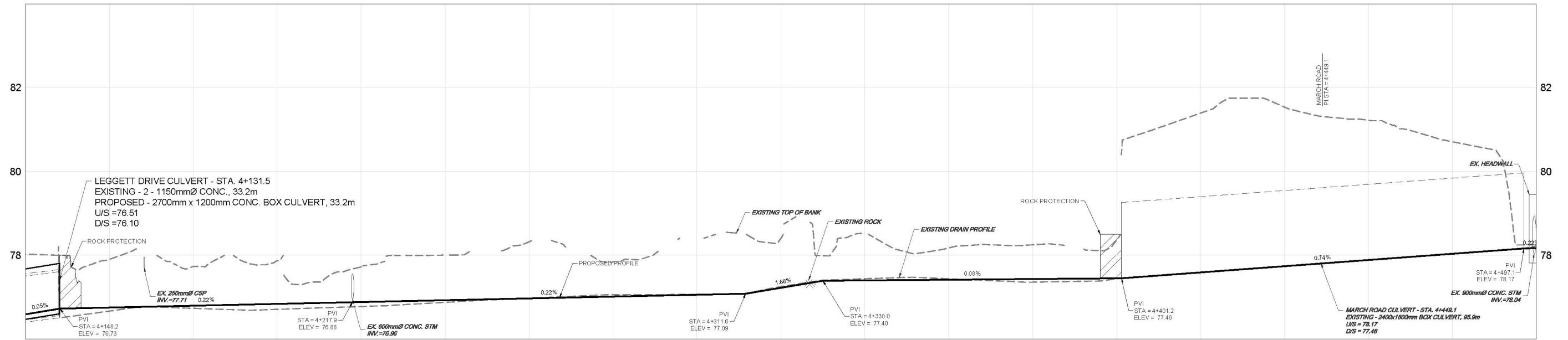
350 Palladium Drive  
 Ottawa, ON K2V 1A8  
 (613) 592-6060 rcii.com

DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

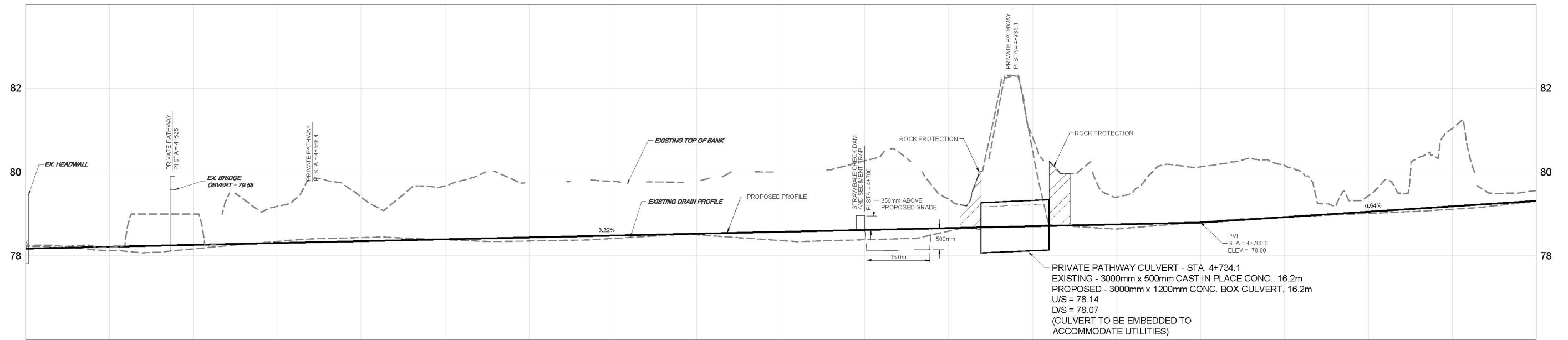
CITY OF OTTAWA  
 KIZELL CREEK  
 KNL PHASE 7 and 8  
 PRELIMINARY REPORT

DRAIN PROFILE  
 STA. 3+420 TO STA. 4+140

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-P2

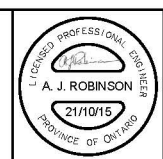


PROPOSED GRADE	76.60	76.75	76.80	76.84	76.89	76.93	76.97	77.02	77.06	77.23	77.40	77.42	77.44	77.45	77.60	77.74	77.89	78.04	78.17
EXISTING FIRM BOTTOM		76.67	76.74	76.71	76.78	76.86	76.96	77.06	77.07	77.28	77.44	77.44	77.56	77.44					78.22
STATION	4+140	4+160	4+180	4+200	4+220	4+240	4+260	4+280	4+300	4+320	4+340	4+360	4+380	4+400	4+420	4+440	4+460	4+480	4+500

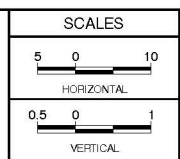


PROPOSED GRADE	78.17	78.22	78.26	78.31	78.35	78.39	78.44	78.46	78.53	78.57	78.62	78.66	78.71	78.75	78.80	78.83	78.87	78.91	78.96	79.01	79.16	79.31
EXISTING FIRM BOTTOM	78.22	78.13	78.17	78.36	78.44	78.59	78.36	78.42	78.50	78.57	78.59	78.59	80.52	78.64	78.61	78.67	78.67	78.61	78.11	78.30		
STATION	4+500	4+520	4+540	4+560	4+580	4+600	4+620	4+640	4+660	4+680	4+700	4+720	4+740	4+760	4+780	4+800	4+820	4+840	4+860			

No.	DATE	REVISION	BY
1	06.08.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
Ontario  
21/10/15  
Licensed Engineering Technologist  
Name: L. FRANKLIN  
Number: 90261353  
Limitations: Providing plans, non-technical content of reports and other non-technical services for submission under the Ontario Drainage Act.  
Association of Professional Engineers of Ontario



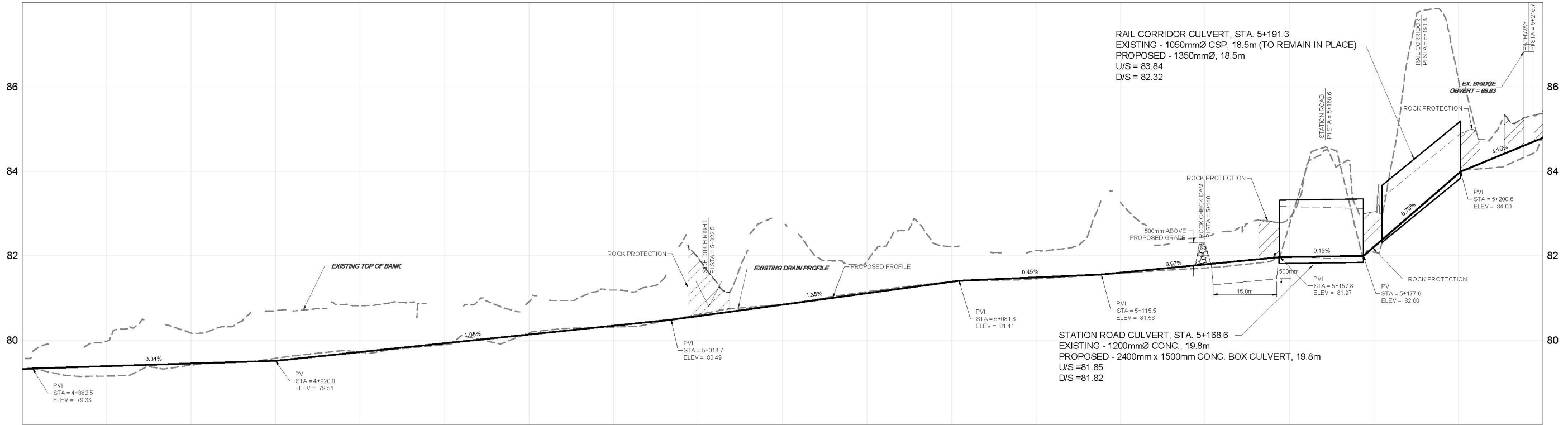
**Robinson Consultants**  
350 Palladium Drive  
Ottawa, ON K2V 1A8  
(613) 592-6060 rcii.com

DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

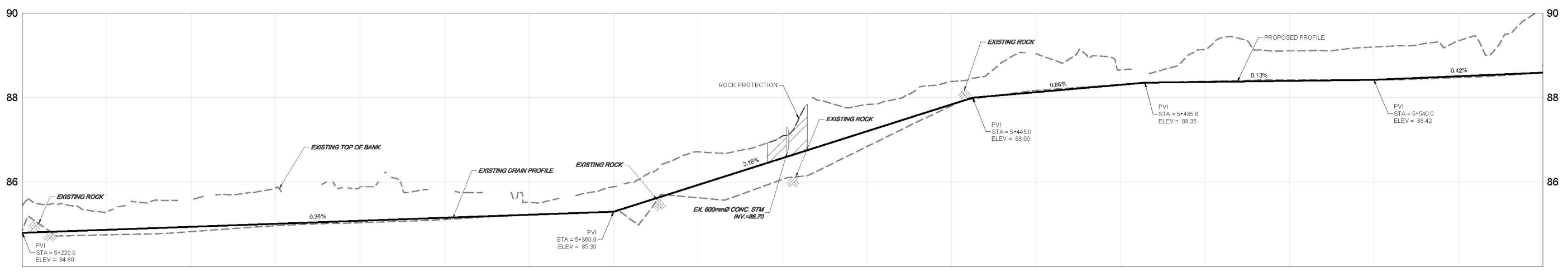
**CITY OF OTTAWA**  
**KIZELL CREEK**  
**KNL PHASE 7 and 8**  
**PRELIMINARY REPORT**

**DRAIN PROFILE**  
**STA. 4+140 TO STA. 4+860**

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
EWG. No.	19049-P3

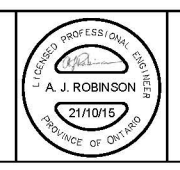


PROPOSED GRADE	79.31	79.39	79.45	79.51	79.72	79.93	80.14	80.35	80.57	80.84	81.11	81.39	81.49	81.60	81.79	81.97	82.21	83.95	84.79
EXISTING FIRM BOTTOM	79.30	79.15	79.41	79.57	79.72	79.90	80.17	80.31	80.61	80.85	81.15	81.39	81.46	81.69	81.71	82.73	82.09	84.85	84.85
STATION	4+860	4+880	4+900	4+920	4+940	4+960	4+980	5+000	5+020	5+040	5+060	5+080	5+100	5+120	5+140	5+160	5+180	5+200	5+220

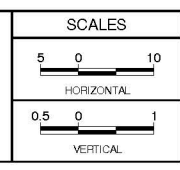


PROPOSED GRADE	84.79	84.87	84.94	85.01	85.08	85.15	85.22	85.30	85.33	85.56	87.20	87.84	88.13	88.30	88.37	88.39	88.42	88.50	88.59
EXISTING FIRM BOTTOM	84.85	84.75	84.83	84.87	85.04	85.11	85.22	85.29	85.63	86.06	86.84	87.80	88.17	88.31	88.39	88.42	88.42	88.47	88.59
STATION	5+220	5+240	5+260	5+280	5+300	5+320	5+340	5+360	5+380	5+400	5+420	5+440	5+460	5+480	5+500	5+520	5+540	5+560	5+580

No.	DATE	REVISION	BY
1	06.08.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers Ontario  
 21/10/15  
 Licensed Engineering Technologist  
 Name: L. FRANKLIN  
 Number: 10050/8359  
 Limitations: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Training Act  
 Association of Professional Engineers of Ontario



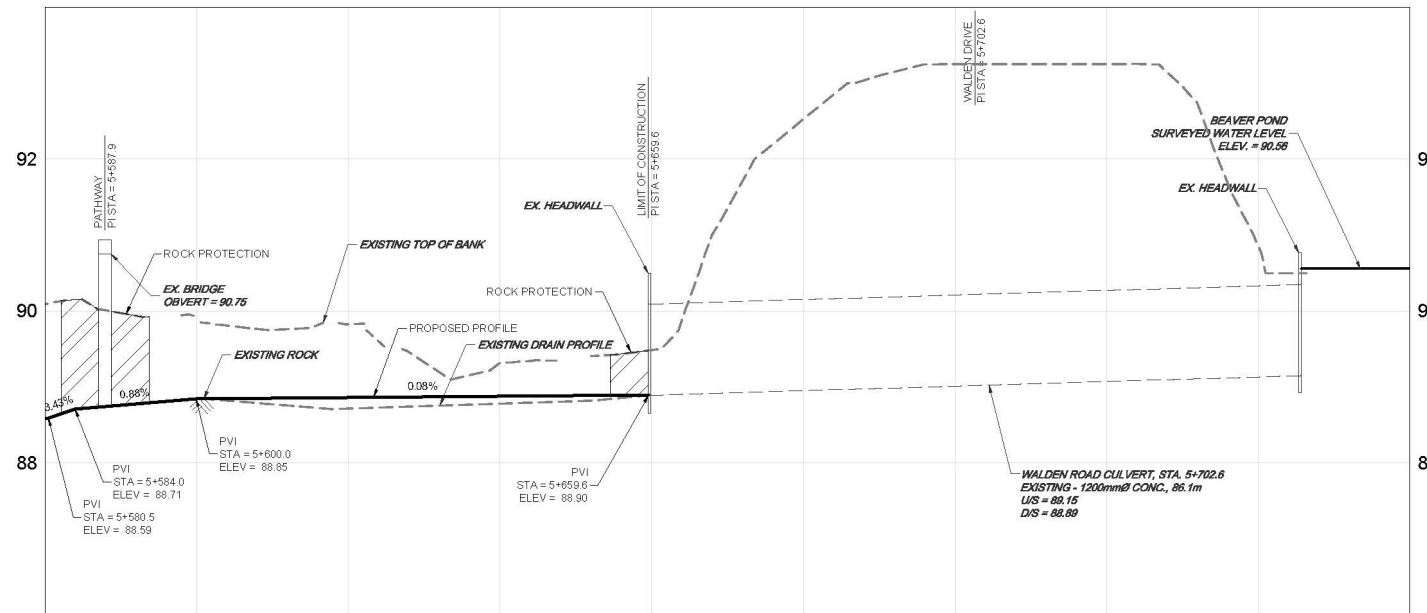
350 Palladium Drive  
 Ottawa, ON K2V 1A8  
 (613) 592-6060 rcil.com

DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

CITY OF OTTAWA  
 KIZELL CREEK  
 KNL PHASE 7 and 8  
 PRELIMINARY REPORT

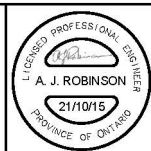
DRAIN PROFILE  
 STA. 4+860 TO STA. 5+580

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-P4

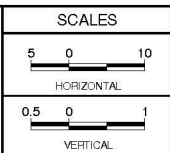


PROPOSED GRADE	88.59	88.85	88.86	88.88						
EXISTING FIRM BOTTOM	88.59	88.85	88.72	88.79						
STATION	5+580	5+600	5+620	5+640	5+660	5+680	5+700	5+720	5+740	5+760

No.	DATE	REVISION	BY
1	06.03.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
Ontario  
21/10/15  
Licensed Engineering Technologist  
Name: L. FRANKLIN  
Number: 100501826  
Limitations: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.  
Association of Professional Engineers of Ontario



**Robinson**  
Consultants

350 Palladium Drive  
Ottawa, ON K2V 1A8  
(613) 592-6060 rcil.com

DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

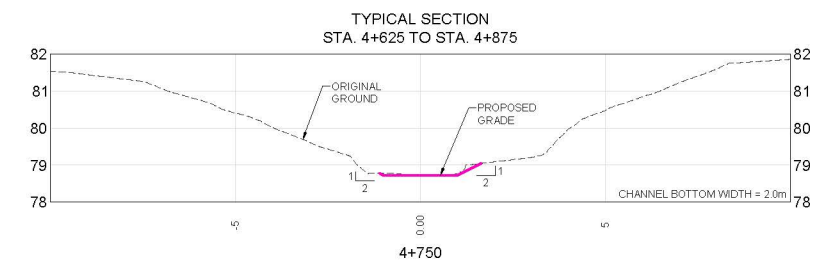
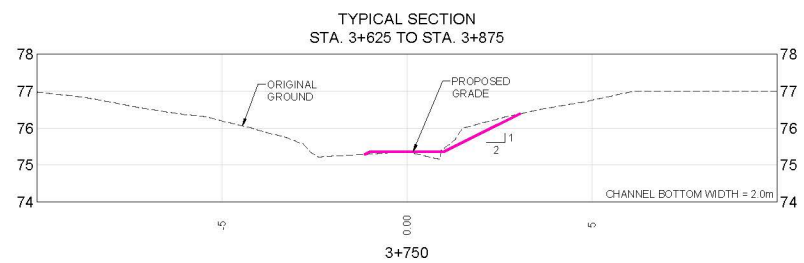
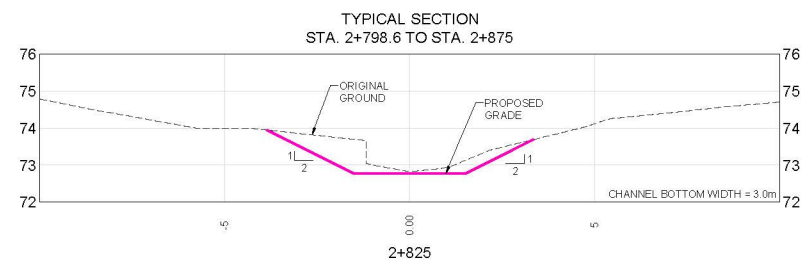
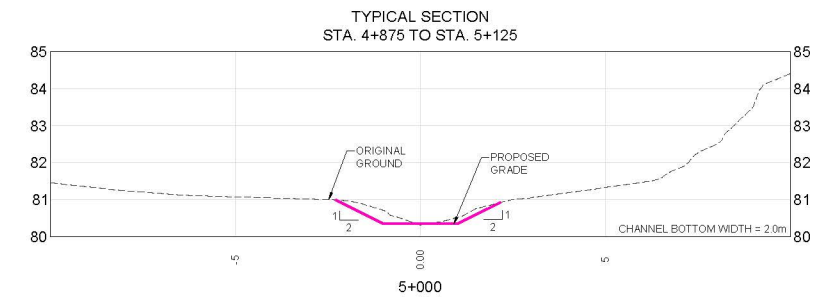
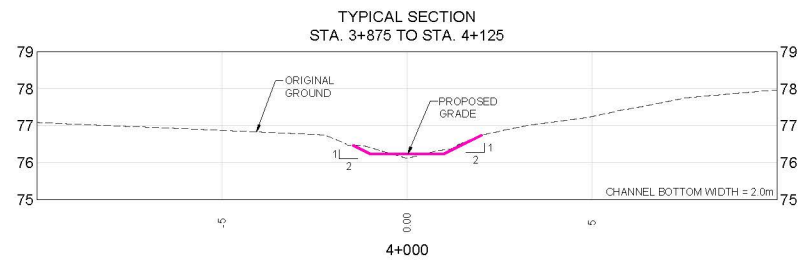
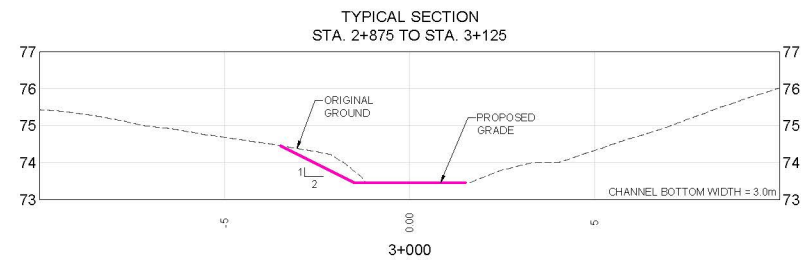
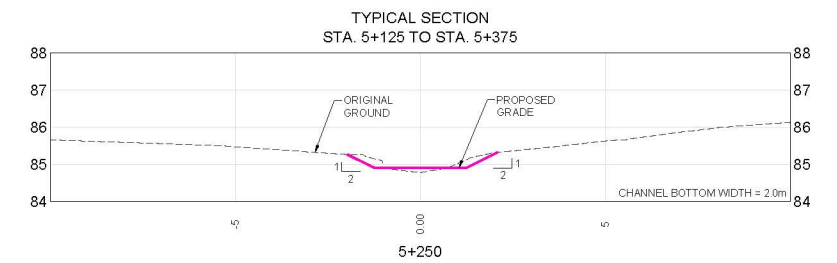
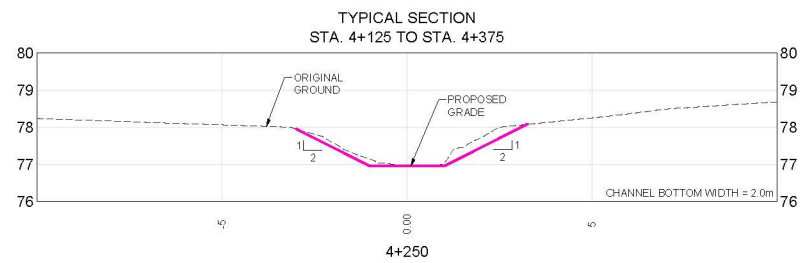
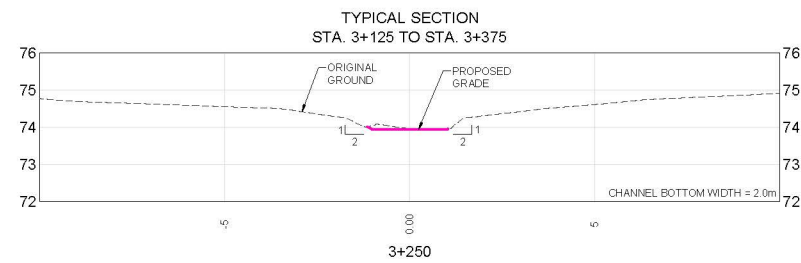
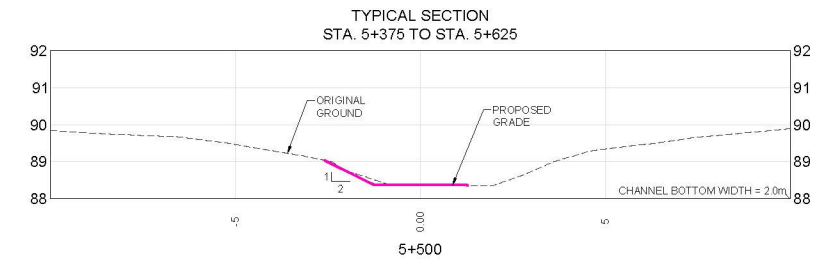
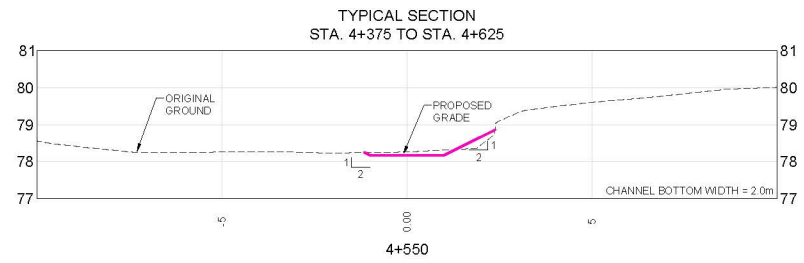
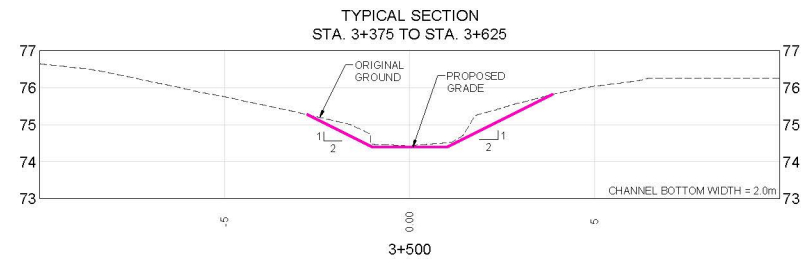
CITY OF OTTAWA

KIZELL CREEK  
KNL PHASE 7 and 8  
PRELIMINARY REPORT

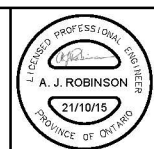
DRAIN PROFILE  
STA. 5+580 TO STA. 5+760

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-P5





No.	DATE	REVISION	BY
1	05.08.21	ISSUED FOR PRELIMINARY REVIEW	AJR
2	15.10.21	ISSUED FOR DISTRIBUTION REPORT	AJR



Professional Engineers  
Ontario  
21/10/15  
Licensed Engineering Technologist  
Name: L. FRANKLIN  
Number: 100501025  
Limitation: Providing plans, non-technical content of reports and other non-technical advice for submission under the Ontario Drainage Act.  
Association of Professional Engineers of Ontario

SCALES	
1	0 2
HORIZONTAL	
1	0 2
VERTICAL	

**Robinson**  
Consultants

350 Palladium Drive  
Ottawa, ON K2V 1A8  
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DESIGN	LF
CHECKED	AJR
DRAWN	JHB
CHECKED	LF
APPROVED	AJR

CITY OF OTTAWA  
KIZELL CREEK  
KNL PHASE 7 and 8  
PRELIMINARY REPORT

CROSS SECTIONS

PROJECT No.	19049
CONTRACT No.	
DATED	OCTOBER 2021
DWG. No.	19049-C1

Appendix D

Cost Estimate

**PRELIMINARY COST ESTIMATE  
KIZELL CREEK MUNICIPAL DRAIN  
(FOR CONSIDERATION OF KNL -- PHASE 7 & 8)**

**Robinson  
Consultants**

Project No: 19049  
Date: 15-Oct-21

Type	Item No.	Item	Unit	Cost/Unit	Quantity	Total	
<b>(Sta 2+798.60 to Sta 5+659.6)</b>						<b>2,861.00m</b>	
<b>Construction</b>							
<b>Construction</b>	<b>Site Preparation Activities</b>						
		Mobilization (maximum 2% of total construction cost)	LS	\$ 5,000.00	1.00	\$ 5,000.00	
		Erosion and Sediment Control Plan	LS	\$ 15,000.00	1.00	\$ 15,000.00	
		Erosion and Sediment Control Measures -- Minimum as Follows:					
		- Rock Check Dam c/w Sediment Trap	each	\$ 1,000.00	2.00	\$ 2,000.00	
		- Straw Bale Dam c/w Sediment Trap	each	\$ 500.00	2.00	\$ 1,000.00	
		- Additional Silt Fence (where required)	m	\$ 11.00	500.00	\$ 5,500.00	
		Clearing/Grubbing (including individual tree removals)	ha	\$ 8,500.00	4.00	\$ 34,000.00	
	<b>Excavation Activities</b>						
		Earth Ex. - Ditch (full construction) - Incl. removal off-site	m <sup>3</sup>	\$ 26.50	3500.00	\$ 92,750.00	
	<b>Reinstatement Activities</b>						
		Hand Seeding (assumed 15m wide)	m <sup>2</sup>	\$ 0.85	42900.00	\$ 36,465.00	
		Rock Protection - Erosion Control	m <sup>2</sup>	\$ 27.50	950.00	\$ 26,125.00	
	<b>Private Culverts</b>						
		Private Path -- Sta. 4+735.1 Proposed 1200x3000 Conc. Box @ 20m	m	\$ 3,000.00	20.00	\$ 60,000.00	
		Marsh Sparrow Pvt. -- Sta. 2+974.6 Proposed 1500x2700 Conc. Box @ 28m	m	\$ 3,000.00	20.00	\$ 60,000.00	
		Station Road (Nordion) -- Sta. 5+198.6 Proposed 1500x2400 Conc. Box @ 20m	m	\$ 3,000.00	20.00	\$ 60,000.00	
		Rock Protection - Culvert End-Treatment	each	\$ 2,500.00	6.00	\$ 15,000.00	
		Detailed Engineering Design (Road Culverts Only)	each	\$ 30,000.00	2.00	\$ 60,000.00	
	<b>Road Culverts</b>						
		Leggett Drive -- Sta. 4+131.5 Proposed 1200x2700 Conc. Box @ 34m	m	\$ 3,000.00	34.00	\$ 102,000.00	
		Rock Protection - Culvert End-Treatment	each	\$ 8,000.00	2.00	\$ 16,000.00	
		Detailed Engineering Design	each	\$ 30,000.00	1.00	\$ 30,000.00	
	<b>Rail Culverts</b>						
		Nyleen Rail Spur -- Sta. 5+191.3 Proposed 1350 Steel @ 20m. Jack and Bore (active rail)	m	\$ 17,500.00	20.00	\$ 350,000.00	
		Rock Protection - Culvert End-Treatment	each	\$ 10,000.00	2.00	\$ 20,000.00	
		Geotechnical Study	each	\$ 50,000.00	1.00	\$ 50,000.00	
		Detailed Engineering Design	each	\$ 30,000.00	1.00	\$ 30,000.00	
		Rail Monitoring (3 weeks)	wk	\$ 6,000.00	3.00	\$ 18,000.00	
		<b>Sub-Total - Construction Costs</b>					<b>\$ 1,088,840.00</b>
		<b>Contingency Allowance - Construction</b>					<b>\$ 110,000.00</b>
		<b>Total - Construction Costs</b>					<b>\$ 1,198,840.00</b>
	<b>Engineering/Administration</b>						
		Preliminary Engineer's Report	LS	\$ 80,000.00	1.00	\$ 80,000.00	
		S.4 Engineer's Report	LS	\$ 100,000.00	1.00	\$ 100,000.00	
	Contract Administration/Inspection (16 weeks)	wk	\$ 7,000.00	16.00	\$ 112,000.00		
	<b>Sub-Total - Routine Engineering</b>					<b>\$ 292,000.00</b>	
<b>Total - Engineering/Administration</b>						<b>\$ 292,000.00</b>	
<b>Other</b>							
	Carrying Cost(s)	L.S	(4% OF Costs Above)		\$ 59,633.60		
	Allowances	LS	(See Schedule)		\$ -		
<b>Total - Other Costs</b>						<b>\$ 59,633.60</b>	
<b>Sub-Total - Net Costs</b>						<b>\$ 1,550,473.60</b>	



**PRELIMINARY COST ESTIMATE  
KIZELL CREEK MUNICIPAL DRAIN  
(FOR CONSIDERATION OF KNL -- PHASE 7 & 8)**



Project No: 19049  
Date: 15-Oct-21

Type	Item No.	Item	Unit	Cost/Unit	Quantity	Total
<b>Special Benefits</b>						
<b>Developers -- KNL Phase 7 &amp; 8</b>		<i>Consideration is given that all work associated with the current constuction and Engineer's Report excluding other Special Benefits (as outlined below) are fully for the benefit of the developers of KNL -- Phase 7 &amp; 8. A "Special Benefit" is assessed to the Developers of KNL -- Phase 7&amp;8 for work associated with the current engineering and construction in the amount perscribed below.</i>				
		<b>Total - Developer --KNL Phase 7&amp;8 Costs</b>				<b>\$ 1,441,310.24</b>
<b>Road Authority</b>		<i>Under Section 69 of the Drainage Act, the "Road Authority" has the option to construct the required drainage works within the Road Right-Of-Way. It is assumed for the purpose of this estimate that the Road Authority will exercise this option. However, the items required to complete the Road Authority works have been included in this estimate. Additionally, the Engineering/Administration and Other fees, associated with the required Road Authority works, where required downstream of the works as noted below are considered payable as a Special Benefit by the Road Authority. It is estimated that 10% of the S.4. Engineer's Report will be associated with the required Road Authority Works.</i>				
		Special Benefit --Road Culverts	L.S.	\$ 148,000.00	50%	\$ 74,000.00
		Special Benefit -- Engineering/Administration	L.S.	\$ 292,000.00	10%	\$ 29,200.00
		Special Benefit -- Other Costs	L.S.	\$ 59,633.60	10%	\$ 5,963.36
		<b>Total - Road Authority Costs</b>				<b>\$ 109,163.36</b>
<b>Total Net Costs - For Distribution to Properties</b>						<b>\$ -</b>