

August 27, 2018

Project # P1658(p)

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Attention: Kevin Murphy

Subject: Terms of Reference for McKinnon's Creek Alteration & Restoration Project

Dear Mr. Murphy,

The Environmental Management Plan (EMP) and Master Servicing Study (MSS) prepared for the Mer Bleue Expansion Area provided direction regarding alterations and restoration on McKinnon's Creek to address servicing of the development area and environmental and functional improvements to the receiver. A conceptual plan was prepared by IBI in support of the overall servicing strategy for the Mer Bleue Expansion Area in the 2017 MSS.

The following pages describe the proposed workplan to support the alteration and restoration program for McKinnon's Creek. Based on the MSS and EMP, it covers the work required to:

1. complete a detailed design submission for the alteration to McKinnon's Creek downstream of the urban area;
2. undertake the work required to assess and design for the southern woodlot flow contribution; and
3. prepare a plan of vegetation planting and reinstatement of aquatics corridor features through the McKinnon's Creek urban corridor to mitigate/compensate for tributary losses in the urban area.

McKinnon's Creek Project Introduction

Urban Reach: Avalon West Pond to Wall Road



- Upper section (previously altered circa 2008). Requires reconsideration of existing engineered design and restoration of natural environment
- Urban area tributaries and municipal drains (recommended management actions)

Rural Reach: Wall Road to ROW



- Rural reach alterations including stabilization and natural environment enhancements
- Rural area tributaries and municipal drains (recommended management actions)
- Management of Southern Woodlot

Specifically, the detailed design of McKinnon's Creek is expected to be undertaken as a single, integrated design from the Avalon South Pond outlet to the downstream extent of the proposed lowering (at the un-opened road allowance, just upstream of Navan Road). This proposal will support the first iteration of a detailed design and the supporting documentation.

The purpose of the proposed works is to:

- ⊕ Provide sufficient/appropriate downstream outlet for Mer Bleue expansion area development.
- ⊕ Consider further alterations to the urban reach upstream of Wall Road to improve function of the Avalon West Pond
- ⊕ Restore the previously altered urban reach section to improve aquatic habitat and conveyance characteristics. [supporting compensation for urban HDF]
- ⊕ Rehabilitate and improve the natural features associated with both reaches of McKinnon's Creek (aquatic, amphibious, vegetation corridor). [supporting compensation for urban HDF]
- ⊕ Support headwater systems and their functions as per recommended management actions.
- ⊕ Compensate for any remaining upstream/headwater environmental losses.
- ⊕ Stabilize the channel in so far as erosion and meander to conserve land.
- ⊕ Improve the channels ability to support downstream flood mitigation.

Additional works will be required in future phases, but are not included in this proposal:

- ⊕ Consultations with stakeholders and review agencies.
- ⊕ Revisions to initial detailed design.
- ⊕ Land acquisition, if required.
- ⊕ Monitoring plan.

Summary:

Establish Existing Conditions

1. Field work to establish existing conditions. Field work was previously undertaken in support of the 2017 MSS and EMP. Some additional fieldwork is required for confirmation and/or supplementation of the existing information, where necessary.
2. Compile information from existing conditions reports (previous and existing).
3. Confirm/refine recommendations in EMP.

Design

4. Modeling for flows, flooding mitigation etc.
5. Engineered channel design
6. Geomorphological natural channel design (natural channel, erosion, attention to low flows restoration)
7. Aquatic habitat and compensation (in stream and connection with HWDF)
8. Vegetation/Planting plan
9. Preliminary review for hydro line, municipal drain, SNC and DFO requirements

Workplan and detail

The work plan is based on requirements outlined in the EMP and MSS prepared for the Mer Bleue Expansion Area. Several items associated with the channel design, and stormwater management

and restoration/compensation were deferred to draft plans and detailed design, including the confirmation of previously established erosion thresholds associated with the Mer Bleue Urban Expansion. The work plan provided below is separated into **field work** and **design / restoration work**.

Field Assessment

1. Survey watercourse

JD Barnes will provide survey information identifying:

- property owners;
- location and elevation of stream bed, low flow channel and top of bank for the main channel and up each tributary as far as required;
- culvert crossings (invert and obvert, diameter, length and surface elevation) in the main channel.

2. Flows

JFSA and DSEL will confirm design flows for:

- proposed servicing and potential functional improvements of existing infrastructure;
- undertake analysis of existing culverts;
- baseflow maintenance in main stem and tributaries to be retained; and
- identify opportunities for flood mitigation.

3. Geomorphology

Geomorphix will complete one round of reach-level rapid assessments and provide instream observations to support detailed design. Reach-by-reach observations would be collected along the main watercourse and tributaries to be maintained in the study area. Observations will include the following:

- Characterization of stream form, process, and evolution using the Rapid Geomorphological Assessment (RGA; VANR, 2007; MOE, 2003);
- Assessment of the ecological function of the watercourse using the Rapid Stream Assessment Technique (RSAT; Galli, 1996);
- Stream classification using a modified Downs (1995) and a modified Brierley and Fryirs (2005) River Styles Classification approach;
- Identification, documentation, and mapping of areas of channel erosion, aggradation, or migration;
- Instream estimates of bankfull channel dimensions;
- Bed and bank material composition and structure; and
- Comment on the relationship between the geomorphologic character and hydrology of the streams.

These are standard, accepted techniques for geomorphological assessments.

Detailed Geomorphological Assessments: A detailed assessment would be completed for a reference reach. This provides comparative observations for the proposed design. We also propose to revisit the erosion sites established for the MESP to confirm the erosion thresholds. This information will also be used to determine suitable restoration/stabilization

methods and appropriate dimensions for the realigned feature. Two (2) detailed assessments would be completed to confirm field conditions for the existing erosion thresholds for stormwater management design planning. Specifically, the detailed assessments would include the following:

- Longitudinal profile survey of the channel;
- Detailed cross sections surveyed at eight to ten locations;
- Detailed instream measurements at each cross-section location including bankfull channel geometry, riparian conditions, bank material, bank height/angle, and bank root density;
- Bed material sampling at each cross section following a modified Wolman (1954) pebble count;
- Velocity and discharge measurements taken on the day; and
- Confirmation of erosion threshold criteria for receiver

4. Natural Features and Functions

Kilgour and Associates will review the existing field assessments and update and provide additional information on aquatic and terrestrial habitat (including SAR species) in the main corridor, tributaries and retained forest.

- Establish seasonal water level fluctuations in southern woodlot, identify function in woodlot and contribution to McKinnon's Creek.

Channel Design and Natural Feature Restoration

A conceptual channel design was developed as part of the MESP. There were several items deferred to detailed design including tie-ins with minor tributaries, bank and valley protection, finalization of channel cross-sections, hydraulic sizing of materials, and inclusion of habitat features. Further, concerns regarding exacerbation of downstream flooding from urbanization should be reviewed and considered. Aquatic habitat enhancements and establishment of appropriate vegetation along the corridor are required. As such, we will utilize design elements, such as bioengineering and spatially variable bed morphology to improve habitat elements. Specific design activities would include:

1. Modeling for flows, including baseflows in tributary and main channel, southern woodlot contributions, culvert sizing, flooding mitigation etc.
2. Engineered channel design
 - Coordination with JFSA and geomorphologist (GeoMorphix)
 - Preparation of plan and profile drawings of urban and rural reaches McKinnon's Creek
 - Preparation of cross-sections along McKinnon's Creek and in lower tributary reaches where required
 - Incorporation of fluvial design with engineering design
3. Geomorphological natural channel design (natural channel, erosion)
 - Coordination with civil engineers (DSEL)

- Develop appropriate details for the channel design including profile, planform, cross-sections, necessary bioengineering details, and hydraulically-sized substrate material
 - Design input into restoration of low flow channel in upper reaches
 - Ensure design elements are cognizant of any development constraints
4. Natural Hazards – erosion and flood plain
 - As part of the channel design the hazard constraints will be identified, addressed and mapped where necessary. Currently the erosion hazard is defined by the meander belt width. Once the new valley corridor is designed the erosion hazard will be delineated using the erosion setback plus the stable top of slope. Information on the potential to alter flood plain elevations to be discussed with SNC.
 - Aquatic habitat and compensation (in main stem and connections with tributaries) and riparian corridor enhancement coordination with NAK, DSEL, Geomorphix. Design input into restoration of low flow channel in upper reaches
 5. Landscape and Planting Plan, NAK in coordination with Kilgour
 - McKinnon’s Creek urban and rural sections
 - retained rural tributaries (compensations opportunities and restoration due to grade changes)
 - compensation requirements for urban HDF losses
 - restoration of instream aquatics structure in main urban channel
 6. Design considerations for hydro line, municipal drain, DFO and SNC requirements.
 - Given constraints associated with the hydro towers we will illustrate how the design addresses and reduces hazard to the existing infrastructure.
 - Maintenance and access requirements for Municipal Drainage staff work will be addressed.
 - DFO assessment requirements for HADD and mitigation will be addressed.
 - Conservation Authority local regulatory policies will be considered.
 7. Compilation of a design package clearly showing plan, profile and cross sections, as well as a completed planting plan. Preparation of a technical design brief outlining geomorphological conditions, design considerations, hydraulic sizing of materials, individual natural heritage design element details and compensation strategy for review by review agencies and stakeholders.
 8. Construction Budget estimate.
 9. Circulation to approval Authorities for comments:
 - City of Ottawa staff
 - Municipal Drainage staff
 - South Nation Conservation
 - Department of Fisheries and Oceans

- Hydro One

The above proposed Terms of Reference has been prepared by:

- ⊕ J.F. Sabourin and Associates Inc.
- ⊕ David Schaeffer Engineering Ltd.
- ⊕ GEO Morphix Ltd.
- ⊕ Kilgour and Associates Ltd.
- ⊕ J.D. Barnes Ltd.
- ⊕ NAK Design Strategies

Please contact me with any questions. I look forward to hearing from you,



Jocelyn Chandler, RPP, MCIP
Planner/Project Manager, JFSA