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Alternative Terms of Reference:

Third Party Review of the Carp River Restoration Plan and Associated Projects

Background

The Carp River is located in the west end of the City of Ottawa. It has a total watershed area of 306 square kilometres and is predominantly rural in character, except for the upper watershed (approximately 5500 hectares to Richardson Side Road) which is urbanized and in which there continues to be considerable urban growth. The upper reaches of the Carp River have been significantly altered and are characterized by shallow gradients with limited baseflow and aggraded conditions.

The Carp River Restoration Plan (CRRP) and associated projects have been under consideration for approximately eight years. The genesis of these projects began with the Carp River Watershed/Subwatershed Study (CRWSS, Robinson Consultants Inc., December 2004) which was undertaken in 2000 and ultimately approved by City Council in 2005 (available here: <http://www.mvc.on.ca/planning/carpriver.pdf>). A key recommendation of the CRWSS was the implementation of two-zone floodplain policy through a reach of the upper Carp River within a proposed development area known as Kanata West, a 725 hectare area brought into the urban boundary in 2000. The Kanata West Concept Plan, outlining general land use and development principles for this area, was approved by City Council in 2003. While recommending the implementation of two-zone floodplain policy for this area, the CRWSS also recommended further detailed studies (updated hydrology, hydraulics and floodline mapping) to confirm that two-zone policy application would not result in negative impacts.

Subsequent to the completion of the CRWSS, a series of Municipal Class Environmental Assessment (Class EA) studies were undertaken in support of the CRRP and the servicing and transportation needs for the Kanata West development area. The Kanata West Landowners' Group (KWO) and the City of Ottawa were co-proponents in the Class EA process. As proposed in the Class EAs, the CRRP would result in the creation of 28 hectares of developable land from the regulatory (100-year) floodplain in exchange for the rehabilitation of an upper reach of the Carp River, to be largely paid for by the Kanata West development proponents. Modeling completed for the Class EAs indicated that post- to pre-development peak flow controls were not required, that pre-development riparian storage within the reach would be matched in the post-development condition and that flood levels would be reduced in the post-development condition.

The Class EAs were posted for the 30-day public review period in July 2006 and were approved by the City, Mississippi Valley Conservation (MVC), the Ministry of Natural Resources (MNR), and the Ministry of Transportation (MTO). The Class EA studies included:

- i) Flow Characterization and Flood Level Analysis: Carp River, Feedmill Creek and Poole Creek (CH2MHill, October 2005);

- ii) Post-Development Flow Characterization and Flood Level Analysis for Carp River, Feedmill Creek and Poole Creek (CH2MHill, June 2006);
- iii) Carp River, Poole Creek and Feedmill Creek Restoration Class Environmental Assessment (Totten Simms Hubicki, June 2006).
- iv) Kanata West Master Servicing Study Volumes 1 and 2 (Stantec, June 2006); and
- v) Kanata West Transportation Master Plan (Delcan, June 2006).

A total of four Part II Order requests were submitted to the Minister of the Environment for the Kanata West Class EAs.

Since the posting of the Class EAs in 2006, a number of errors and shortcomings in the supporting hydrologic and hydraulic modeling have been identified by City staff as well as the Part II Order requesters. In particular, in early 2008, City staff identified that none of the hydrographs representing runoff from the 700 ha Kanata West development area had been read by the post-development hydraulic model. In addition, the City of Ottawa's Auditor General has investigated the file and recently released his findings that question the validity of the policy application and technical work completed in support of the CRRP. (The Auditor General's report is available here: <http://ottawa.ca/calendar/ottawa/citycouncil/ara/2008/05-08/Carp%20Audit%20APRIL%2022%2008.htm>)

At the request of the City, the consultants who completed the modeling for the Class EAs have adjusted the post-development modeling such that all post-development hydrographs are now read by the hydraulic model and an error in drainage area has been corrected (hereafter this version to be indicated as the "updated post-development modeling"). Resulting flows and water levels have been recalculated and adjustments made to the restoration concept.

In response to the modeling errors that have come to light and the Auditor General's findings, City Council has directed staff to engage a third party consulting firm to undertake an independent review of the project. The Terms of Reference that follow outline the objectives, scope of work, and detailed tasks required of the independent review.

Objectives:

The objectives of this review are to:

- i) Determine whether the CRRP, as currently envisioned, is consistent and complies with all pertinent policies, procedures, legislation and guidelines.
- ii) Assess the adequacy of the modeling results available to date to proceed with the CRRP and associated projects as currently envisioned;
- iii) Subject to the findings of i) and ii), prepare an interim development plan that will detail what, if any, further development may proceed in the interim (i.e., until the ultimate CRRP and its implementation plan are confirmed and approved) without increasing flood risk or creating other unacceptable impacts; and

- iv) In light of the findings of i) and ii), make detailed recommendations for the additional work necessary to revise the CRRP such that the requirements of all pertinent policies, legislation and guidelines are met or complied with.

Scope of Work:

The scope of this review is composed of three separate phases of work including:

- i) Phase 1: Review of Policy and Modeling Approaches;
- ii) Phase 2: Risk Assessment and Preparation of an Interim Development Plan; and
- iii) Phase 3: Work Plan for the Redesign of the Carp River Restoration Plan and Associated Projects.

As determined by the findings of Phases 1 and 3, the actual redesign of the CRRP would be considered Phase 4 and external to the scope of this Terms of Reference.

Phase 1: Review of Policy and Modeling Approaches

1. Project Start-up

Following the initial review of background documentation, a series of separate interviews/consultations will be held with all interested parties to further expand and improve the third party reviewer's understanding of the project history, various issues and concerns. The parties to be interviewed will include:

- i) City project staff;
- ii) Auditor General/Auditor General's engineering consultant;
- iii) Agency staff: MVC; MTO; MNR; MOE.
- iv) Part II Order requesters;
- v) Kanata West Class EA consultants;
- vi) KWOG representative(s).

Detailed notes of the interviews/consultations will be taken and published in the Phase 1 report.

2. Policy and Legislative Review

Make an independent determination as to whether the CRRP as currently envisioned meets the requirements of all pertinent policies, guidelines, and legislation. This will include as a minimum:

- i) A review of how provincial floodplain policy was applied to this project:
 - Was it consistent with the intent of Sections 2.2.1 and 3.1 of the Provincial Policy Statement?
 - Was it consistent with the guidance provided by the Ministry of Natural Resources' Technical Guide - River & Stream Systems: Flooding Hazard Limits (2002)?
 - Was the approach taken to floodplain management in keeping with the general practices of other Conservation Authorities across the province in comparable situations (i.e., greenfield development, similar watershed conditions, etc.)?
 - Was the approach to floodplain management consistent with the body of Ontario Mining and Lands Commissioner decisions?

- Is the application of adaptive management methods to the determination of existing and ultimate flood hazard limits appropriate?
- ii) A review of the project's compliance with all other relevant policies and legislation, including but not necessarily limited to:
- Environmental Assessment Act: Was the Municipal Class EA appropriate for the nature of the undertaking? Was the appropriate schedule for the undertaking selected?
 - Planning Act/Provincial Policy Statement
 - Conservation Authorities Act
 - Lakes and Rivers Improvement Act
 - Drainage Act: Consult with Municipal Drainage staff and the Ministry of Agriculture, Food and Rural Affairs as required regarding the possible status of the Carp River as a municipal drain including the 1909 Ontario Court of Appeal decision and any other pertinent documentation.
 - Common law/riparian rights: Was adequate consideration given to the riparian rights of existing and future riparian owners upstream, downstream and within the study reach?

3. Modeling Review

Review the modeling prepared in support of the CRRP to make an independent determination as to whether the work completed is consistent with established guidelines and standard engineering practices for a project of this scope, including:

- Technical Guide - River & Stream Systems: Flooding Hazard Limits (MNR, 2002);
- Lakes and Rivers Improvement Act Technical Guidelines (MNR);
- Ottawa Sewer Design Guidelines (City of Ottawa, November 2004);
- Stormwater Management Requirements for Land Development Proposals (MTO, 1999);
- Guide for Preparing Hydrology Reports for Water Crossings (MTO, 2003);
- Drainage Directives (MTO, 2007);
- Adaptive Management of Stream Corridors (Watershed Science Centre, 2001).

This task will include as a minimum:

i) Existing Conditions Modeling:

A review of the existing conditions modeling as documented in: Flow Characterization and Flood Level Analysis: Carp River, Feedmill Creek and Poole Creek (CH2MHill, October 2005). This will include a review and consideration of:

- The models selected (hydrologic and hydraulic): Were they appropriate for the required analyses?
- The adequacy of the streamflow monitoring program to support calibration/validation of the modeling (both the currently available data as well as the proposed streamflow monitoring program).

- The accuracy of the various data and information used to set up the models (i.e., existing land use, drainage areas, existing condition of the Carp River corridor, existing SWM controls in place, parameter selection, etc.).
- The infiltration and runoff parameters used in the model to estimate surface runoff volumes.
- The impact of reported drainage area errors.
- The calibration of the hydrologic and hydraulic models to existing conditions (2005): Have the models been adequately calibrated and validated for the purposes of this project? Were the methods used to calibrate to the water levels measured on September 9, 2004 appropriate? Does the subsequent sensitivity analysis undertaken provide any further confidence in the existing conditions models?
- The selection of design storms used to establish existing condition flows and water levels for the regulatory event.
- The selection and orientation of cross sections used to model the existing floodplain conditions.
- The routing of hydrographs to produce existing flows and water levels including steady and unsteady flow computations.
- The modeling of existing road crossings.
- The comments submitted as of the posting of the Class EAs in 2006 by the various Part II Order Requesters.

ii) Post-development Modeling:

A review of the recently updated post-development conditions modeling as documented in: Post-Development Flow Characterization and Flood Level Analysis for Carp River, Feedmill Creek and Poole Creek (CH2MHill, June 2006); Kanata West Master Servicing Study Volumes 1 and 2 (Stantec, June 2006); and Hydraulic Design Brief, (Totten Simms Hubicki, 2008). This will include a review and consideration of:

- The accuracy of the various data and information used to set up the post-development models (i.e., ultimate land use as per the current Official Plan and on-going projects such as the Highway 417 expansion, parameter selection, etc.).
- The decision to exclude the Fernbank lands in a developed condition in the preparation of the modeling supporting the (2006) Class EAs.
- The methodology used to determine the required stormwater management criteria including quantity/quality/erosion control and water balance.
- The acceptability of any increases in existing flood levels and/or velocities from the perspective of liability to the City, riparian rights, etc., for the 2 to 100 year return period events.
- The selection of design storms used to establish the post-development condition flows and water levels for the regulatory event.
- The selection and orientation of cross sections used to model the proposed floodplain alterations.
- The modeling of future road crossings.
- The routing of hydrographs to produce post-development flows and water levels including steady and unsteady flow computations.
- The modeling of proposed fill and cut areas and proposed stormwater management facilities.

- The appropriateness of calculations to demonstrate the matching of existing riparian storage within the reach for future and interim conditions: Has it been adequately demonstrated that riparian storage has been maintained in the study reach under proposed future conditions? Is the current modeling/calibration adequate to make this determination? Is the proposed method of matching riparian storage for a range of return periods (2 to 100 year events) for the entire study reach acceptable in lieu of balancing the proposed fill volumes with cut volumes on an incremental (0.3 meter) basis? Have the proposed stormwater management facilities and habitat ponds been appropriately modeled with respect to riparian storage calculations? Has the excess (post-development runoff) been appropriately dealt with (i.e., not double-counted) in the riparian storage calculations? Is the use of on-line storage (i.e, providing additional storage within the proposed river corridor) to reduce or mitigate post-development flood level increases an acceptable practice (as opposed to providing additional off-line storage)?
- The impact of road crossings on flows and water levels within, upstream and downstream of the study reach and the potential impact of ice and ice jams on water levels within, upstream and downstream of the study reach.
- The adequacy of the draft Implementation Plan (Delcan, July 2007) in terms of ensuring that flood risk is not increased throughout the construction period and phasing of the CRRP.
- The comments submitted as of the posting of the Class EAs in 2006 by the various Part II Order Requesters.
- The detailed comments resulting from further review of the modeling by City staff in late 2007/early 2008.

4. Review of Other Related Issues:

A number of other concerns regarding policy, modeling and other technical issues have been raised throughout the study process. A review of the remaining issues raised will also be undertaken and the third party reviewer will comment on:

- The appropriate timing within the planning process for consideration of geotechnical hazards within the floodplain, including slope stability issues.
- The appropriate timing for the completion of updated floodplain mapping to Flood Damage Reduction Program (FDRP) standards.
- Whether a sediment balance can be achieved; the need for quantitative estimates of sediment volumes and sediment transport capacity; and the impacts of any erosion and sedimentation within the restoration reach and downstream.
- The criteria recommended for stormwater quality treatment.

5. Analysis and Summary Brief

As required, and subject to the results of the policy application/legislation/modeling review, provide detailed recommendations as to how the project should be modified to ensure it is consistent with all policies, legislation and guidelines. Based upon the findings of the review, prepare a draft summary brief that recommends the steps required to rectify any policy/modeling shortcomings.

6. Present draft Phase 1 findings and finalize Phase 1 summary brief.

Phase 2: Risk Assessment and Preparation of an Interim Development Plan

Subject to the findings and recommendations from Phase 1, prepare an interim development plan that will identify what, if any, further development may proceed in the interim without increasing flood risk until such time as the ultimate solution for the Carp River Restoration Plan, associated works and a detailed implementation plan is available and approved. This interim development plan will:

- Provide an assessment of the sensitivity to increased flood levels of existing development in, upstream and downstream of the study reach (existing subdivisions/basement elevations, commercial areas/parking lots, existing Highway 417 crossings, etc.).
- Identify measures that can be undertaken in a timely manner that will mitigate any potential for increased flood risk in the interim, e.g., potential improvements at existing crossings, requiring a vertical freeboard for new development, SWM overcontrols, etc.
- Identify the maximum amount and location of further development that may proceed in the interim without increasing flood risk. This will be informed by a conservative analysis that more closely reflects the actual response of the existing watershed as evidenced by the water levels measured on September 9, 2004. This will involve adjustments to the existing conditions modeling (to the extent possible within reasonable ranges of standard parameters) such that it more closely reflects the observed water levels (this will necessarily have to be undertaken in advance of having additional streamflow to adequately calibrate the modeling). This conservative analysis will also assess/account for the impact on existing (2005) flood levels of development within Kanata West that has already proceeded.
- Subsequent to the above-noted adjustments to the existing conditions modeling, revise the post-development condition modeling incorporating additional recommended revisions as per the findings of Phase 1.
- Identify required interim/temporary SWM and other measures to be implemented as determined by the revised modeling (i.e., adjusted as per Phase 1 recommendations).
- Prepare a report detailing the draft interim development plan, present the recommendations, and finalize the plan.

Phase 3: Work Plan for the Redesign of the Carp River Restoration Plan and Associated Projects

Based upon the findings of Phase 1, prepare a detailed work plan for the redesign of the Carp River Restoration Plan and associated projects.

(However, as determined by the findings of Phases 1 and 3, the actual redesign of the CRRP would be considered Phase 4 and external to the scope of this Terms of Reference.)

List of Supporting Documentation (chronological order):

- i) Kanata West Concept Plan, approved March 2003:
<http://ottawa.ca/calendar/ottawa/citycouncil/occ/2003/03-26/pdc/ACS2003-DEV-POL-0011.htm>
- ii) City of Ottawa Official Plan, May 2003.
- iii) Carp Road Corridor Community Design Plan, City of Ottawa, May 2004:
http://ottawa.ca/residents/planning/community_plans/completed/carp_rd/images/carp_e_n.pdf
- iv) Carp River Watershed/Subwatershed Study, Robinson Consultants Inc., December 2004:
<http://www.mvc.on.ca/planning/carpriver.pdf>
- v) Flow Characterization and Flood Level Analysis: Carp River, Feedmill Creek and Poole Creek, CH2MHill, October 2005.
- vi) Post-Development Flow Characterization and Flood Level Analysis for Carp River, Feedmill Creek and Poole Creek, CH2MHill, June 2006.
- vii) Kanata West Master Servicing Study Volumes 1 and 2, Stantec, June 2006.
- viii) Carp River, Poole Creek and Feedmill Creek Restoration Class Environmental Assessment (Totten Simms Hubicki, June 2006).
- ix) Kanata West Transportation Master Plan, Delcan, June 2006.
- x) Audit of Carp River Watershed Study and Related Projects, City of Ottawa Office of the Auditor General, 2007: <http://ottawa.ca/calendar/ottawa/citycouncil/ara/2008/05-08/Carp%20Audit%20APRIL%2022%2008.htm>.
- xi) Carp River, Poole Creek and Feedmill Creek Restoration Design Brief, Totten Simms Hubicki, April 2007.
- xii) Carp River, Poole Creek and Feedmill Creek Restoration Final Design Drawings, Totten Simms Hubicki, May 2007.
- xiii) Terry Fox Drive Extension: Draft Preliminary Design Report: Richardson Side Road to March Road Volumes 1 and 2, Dillon Consulting, updated July 2007.
- xiv) Implementation Plan Final Draft Kanata West Development Area, Delcan Corporation, July 2007.
- xv) Carp River, Poole Creek and Feedmill Creek Restoration Final Design – Hydraulic Design Brief, Totten Simms Hubicki, October 2007.
- xvi) Fernbank Community Design Plan (<http://www.fernbankcdp.com>) Master Servicing Study, draft, April 2008.
- xvii) Fernbank Community Design Plan Environmental Management Plan, draft, April 2008.
- xviii) Hydraulic Design Brief, Totten Simms Hubicki, 2008.
- xix) Highway 417 Expansion - Eagleson Road to Highway 7 (on-going):
<http://www.highway417expansion.com/eng/home.shtml>