SUBJECT: Chedoke Golf Course Channel Municipal Class Environmental Assessment (PW07157) - (City Wide)

RECOMMENDATION:

(a) That the General Manager of the Public Works Department be authorized and directed to file the Chedoke Golf Course Channel Municipal Class Environmental Study Report as per the Municipal Class Environmental Assessment (June 2000), on the public record with the Municipal Clerk for a thirty day public review;

(b) That upon the completion of the thirty day public review and final approval, the General Manager of the Public Works Department be authorized and directed to include the projects identified in the Chedoke Golf Course Channel Municipal Class Environmental Study Report in the 2008 Capital Budget submission;

(c) That upon the completion of the thirty day public review and final approval, the General Manager of the Public Works Department be authorized and directed to proceed with the implementation of the recommended Schedule B undertakings as set out in the Class EA Study.

Gerry Davis
Acting General Manager
Public Works

EXECUTIVE SUMMARY:

Following the major storm event that occurred on August 19, 2005, it was discovered that a significant portion of the concrete lining of a steep channel down the Niagara
Escarpmont between Scenic Drive and Highway 403, called the Chedoke Golf Course Channel, had failed. A large amount of sediment and debris had eroded and washed down the channel causing the inlet to the conduit across Highway 403 to become blocked. The high energy flows of the system resulted in considerable erosion damage along the channel.

The extent of the failure and potential risks to users of both Highway 403 located at the base of the channel as well as the Chedoke Radial Trail (Bruce Trail) that runs along the escarpment across the channel, combined with the sensitivity of the surrounding natural environment led the City of Hamilton to initiate a Municipal Class Environmental Assessment Study for the Chedoke Golf Course Channel.

The purpose of the study was to consider a wide range of alternatives to address the channel failure and erosion damage, to evaluate their environmental impacts and to ultimately identify the preferred alternative in accordance with the Municipal Engineers Association Class Environmental Assessment process.

The study area is primarily situated in Ward 1, but because the Chedoke Radial Trail is a significant commuter route and recreational trail, this project is considered to have City wide implications. Alternatives were identified for both the channel and for the trail crossing of the channel and these were analyzed and evaluated based on a number of factors including: erosion control, risk of drainage system blockage, construction requirements, long-term stability, construction costs, operation and maintenance requirements, aquatic habitat impacts, vegetation and terrestrial habitat impacts, and enhancement opportunities (both natural environment and aesthetics). The alternatives were reviewed with the public at a Public Information Centre held on October 11, 2007 and a number of agencies were contacted or consulted including the Hamilton Conservation Authority (HCA), Niagara Escarpment Commission (NEC), Bruce Trail Association, Friends of Chedoke, Ministry of the Environment (MOE), Ministry of Transportation (MTO), Indian and Northern Affairs, and Six Nations.

The preferred alternative to address the channel involves regrading and relining the channel and installing engineered cascades near the trail crossing. The preferred alternative for the trail crossing involves installation of a Bailey bridge with a span of approximately 20 metres.

The estimated construction cost for the recommended works is $1.75 million (please see Appendix A for Plan & Profile Drawings).

**BACKGROUND:**

A number of areas within the City of Hamilton experienced flooding during the major storm events that occurred throughout the summer of 2005. Flooding was noted along Highway 403 in the vicinity of the Chedoke Golf Course area. The flows encroached onto the highway to such an extent that only one lane reportedly remained passable. It was discovered that a significant portion of the concrete lining of one of the steep channels, called the Chedoke Golf Course Channel (see Figure 1 in Appendix A), had failed and that a large amount of sediment and debris had eroded and washed down the channel causing the inlet to the conduit across Highway 403 to become blocked. The Study Area is primarily located in the Ward 1 district; however due to the recreational
appeal of the trail and its usage as an important commuter route this project is deemed to have City wide implications.

The failure of the lining exposed the highly erodible material beneath leaving the channel susceptible to further erosion damage. The high energy flows of the system resulted in considerable damage along the channel. The extent of the failure and potential risks to users of both Highway 403 located at the base of the channel as well as the Chedoke Radial Trail (Bruce Trail) that runs along the escarpment across the channel, combined with the sensitivity of the surrounding natural environment led the City of Hamilton to initiate a Class Environmental Assessment Study for the Chedoke Golf Course Channel.

Initial failure of the channel lining is believed to have occurred during the severe August 19, 2005 storm event (please see Figure 2 in Appendix A). Based on the site reconnaissance work, geotechnical investigations and detailed survey work, it is clear that the lining of the channel has completely failed downstream of the trail crossing. It appears that the lining broke first at the toe of its steepest section just below the trail crossing.

A number of factors contributed to the failure. High flows during major storm events and high flow velocities cause the flows to shoot out of the culverts at the trail crossing and land near the bottom of the steepest channel section. The existing lining of the steep section of channel does not have a sub-drainage system and this combined with undermining caused by cracks in the lining and the culverts at the trail crossing also contributed to the failure. Since the initial failure, conditions have continued to deteriorate and failure will likely accelerate with each significant storm event.

The trail crossing area of the Chedoke Golf Course was deemed to be unstable during the course of the study due to undermining of the CSP culverts across the trail and the ongoing erosion at the bottom of the steep section of channel downstream. The trail area had been closely monitored, a crack that had formed on the trail above the CSP culverts was observed to be expanding further putting the crossing at risk of failure. As such the trail closed in August of 2007.

The purpose of the Chedoke Golf Course Channel Municipal Class Environmental Assessment study was to consider a wide range of alternatives to address the channel failure and erosion damage, to evaluate their environmental impacts and to ultimately identify the preferred alternative in accordance with the Municipal Class Environmental Assessment (Class EA) process. Concurrent with the Class EA process, Public Works staff have been working to install a temporary crossing to address trail safety concerns and to allow the Chedoke Radial Trail to be re-opened to the public.

PROBLEM, OPPORTUNITIES AND CONSTRAINTS

Problem Statement

As a consequence of the failure of the Chedoke Golf Course Channel lining, parts of the channel have down cut considerably causing instability and erosion of the side slopes and adjacent vegetation. Since the failure, significant amounts of sediment, rock and debris have accumulated in the stilling/sediment basin at the inlet to the conduit that crosses Highway 403 and must be removed on a regular basis to prevent a blockage which would increase the risk of flooding of the highway. Without the restoration of the
channel, further down cutting and side slope failures will occur and the potential for blockage and highway flooding will increase. In addition, the three culverts that convey flows under the Chedoke Radial Trail have been undermined and the crossing area has become unstable due to the undermining and ongoing erosion of the channel downstream. As a result, the trail in this area was deemed to be a hazard to public safety during the course of the study and has been temporarily closed to the public.

Opportunities

A number of opportunities have been identified during the course of the study, which have been incorporated into the development of alternatives to address the problem. There is an opportunity to enhance the vegetation and habitat in the vicinity of the channel through the site restoration and landscaping plan. An aesthetic benefit could be provided along the trail with the landscape plan as well as with construction of engineered cascades along the channel in the vicinity of the Chedoke Radial Trail crossing. In addition, the need to reconstruct the trail crossing presents an opportunity to provide an aesthetically pleasing multi-use crossing.

Constraints

Chedoke Radial Trail: The trail is a heavily used multi-use trail that needs to be maintained. The crossing of the channel must accommodate and be safe for all users.

Site Access: Site access is a major construction consideration. Vehicular access is limited to the Chedoke Radial Trail and the access off of Highway 403 near the bottom end of the channel. Due to the nature of Highway 403, it is likely that access from the highway will be limited to certain hours by the Ministry of Transportation. Vehicles cannot access the channel from Scenic Drive in the vicinity of the storm sewer outlet to the channel due to the waterfalls that exists at the sewer outlet; however materials could be lowered from this location. Access from the reservoir area is restricted due to existing vegetation.

Minimize Vegetation Impact: Up to a 5 metre wide access corridor will be needed along one side of the channel to facilitate construction works. The east side of the channel is preferred due to the less mature nature of the vegetation and habitat. The east side of the channel was also assessed to have no archaeological potential.

Maintain an Open Channel: A permanent open channel should be maintained down the escarpment given its role in supplying nutrients to downstream fish habitat in Chedoke Creek.

Construction Duration and Timing: Construction and restoration works will likely require between 4 and 6 months to complete. Winter construction should be avoided due to risks associated with frozen conditions. The Hamilton Conservation Authority advised that construction will not be permitted between March 1 and June 30. July to November would be the most preferred construction window.

Temporary Flow Diversion: A temporary diversion of the channel flows will be required in order to undertake construction under dry conditions. The flows will need to be piped down the escarpment in order to protect the vegetation and prevent erosion of the steep slopes. The diversion could occur in stages as construction proceeds along the channel.
The following alternatives were identified and evaluated to determine their ability to address the channel stability concerns. Alternatives were screened with respect to the following factors:

1. Long-Term Stability
2. Constructability
3. Cost

**Alternative 1:** represents the ‘Do Nothing’ alternative, which must be evaluated with other alternatives as part of the Class EA process. In this case, ‘Do Nothing’ means that the ongoing channel failure and erosion would be left to continue. This alternative was screened out because it would not protect the channel from further erosion and failure and the resulting consequences and risks.

**Alternative 2:** involves redirecting flows from the Mountview Neighbourhood away from the channel to another outlet. Reconstruction of a smaller lined channel would still be required to control erosion and adequately convey the remaining flow from the escarpment. This alternative was screened out because Alternative 2 was not deemed to be technically feasible.

**Alternative 3:** involves providing flow control above the escarpment in a storm water detention facility in order to minimize the requirements to safely convey flows down the escarpment. Similar to Alternative 2, this alternative would still require reconstruction of a smaller lined channel to control erosion and adequately convey the discharge from the detention facility. Alternative 3 was investigated as part of the Mountview Neighbourhood Storm Drainage Study. For detention storage to be effective in reducing peak flow rates it needs to be incorporated in the downstream part of the catchment area. However there are no significant open spaces where above ground storage could be provided in the downstream part of the catchment area, and property acquisition was not deemed to be cost-effective. Below ground storage is associated with very high construction costs and as such was not deemed to be cost-effective. Thus Alternative 3 was screened out and not considered further.

**Alternative 4a:** (please see Appendix A for Plan & Profile Drawings) involves regrading and relining of the channel with Fabriform. Since the hydraulic analysis of the capacity of the existing channel prior to failure was determined to be adequate, the size of the channel would not change significantly. This alternative also involves profile modifications near the crossing of the Chedoke Radial Trail to eliminate the abrupt grade change that has caused flow separation during major storms (projectile flow). The relined channel would incorporate design enhancements to improve the long-term stability of the liner. These enhancements would include an extensive sub-drainage system, incorporation of a geo-fabric liner and keying-in the lining every 10 to 20 metres. This alternative was short listed and carried forward for further analysis because it would protect the channel and adjacent slopes from further erosion and vegetation damage, would be reasonably cost effective and constructible.

**Alternative 4b:** (please see Appendix A for Plan & Profile Drawings) is identical to Alternative 4a, except through the steep section of the channel (approximately 30 metres) immediately below the trail crossing. In this section, engineered reinforced cascades would be constructed instead of the Fabriform lining in order to create an
aesthetically pleasing channel feature and to provide additional stability. This alternative was shortlisted and carried forward for further analysis because it would protect the channel and adjacent slopes from further erosion and vegetation damage, would be reasonably cost effective and constructible.

**Alternative 5a**: involves construction of a storm sewer to convey major storm flows and construction of a smaller channel lined with Fabriform to convey low flows (minor flows). The smaller lined channel would incorporate the same design elements as Alternative 4a. A concrete flow diversion structure would be required just upstream of the trail crossing. The enclosure of the major flows and the smaller channel design provides a larger area for restoration works and environmental enhancement. This alternative was shortlisted and carried forward for further analysis because it would protect the channel and adjacent slopes from further erosion and vegetation damage, would be reasonably cost effective and constructible.

**Alternative 5b**: is identical to Alternative 5a, except through the steep section of the channel (approximately 30 metres) immediately below the trail crossing. In this section, engineered reinforced cascades would be constructed as in Alternative 4b. This alternative was shortlisted and carried forward for further analysis because it would protect the channel and adjacent slopes from further erosion and vegetation damage, would be reasonably cost effective and constructible.

**Alternative 6**: is similar to Alternative 5a/b, except that the storm sewer would be installed using trenchless technology (e.g. tunneling) and would intercept flows from the sewer on Scenic Drive. In this alternative, a weir structure would be required to allow low flows to remain on the surface and to maintain an open channel down the escarpment to continue to supply nutrients to downstream fish habitat in the Chedoke Creek. Alternative 6 was also screened out and not considered further due to its excessively high construction cost.

**Alternative 7**: involves reinstatement of a natural channel, meaning that the channel design would not incorporate hard engineered surfaces, but would be based on natural channel design principles (i.e. would include meanders, natural substrate, varied channel characteristics, bioengineered banks). This alternative was screened out because due to the high energy of the system, Alternative 7 would not provide long-term channel and slope stability and could result in conditions that would present a greater risk of erosion than current conditions. It is clear that the Fabrifor m lining was installed to prevent excessive erosion along the channel and to protect the slope of the escarpment. Alternative 7 was not deemed to be feasible.

Analysis and Evaluation of Feasible Alternatives

The four feasible alternatives (4a, 4b, 5a, 5b) for the Chedoke Golf Course Channel were analyzed and evaluated in terms of the following factors and indicators:

- Erosion Control / Risk of Blockage: reduction of erosion potential along channel and escarpment and change in the risk of blockage of the drainage system
- Constructability: construction requirements
- Long-term Stability: estimated life expectancy
- Costs: construction costs and operation/maintenance requirements
- Natural Environment Impacts: aquatic habitat impacts, vegetation / terrestrial habitat impacts, enhancement opportunities (natural environment and aesthetics)
Based on the analysis and evaluation, it is evident that Alternatives 5a and 5b would present some risk of system blockage and construction difficulties due to the required construction of sewers and maintenance holes and the diversion structure. Alternatives 5a and 5b also have higher associated construction costs. All of the alternatives were evaluated to have similar environmental impacts overall, however Alternative 4b was deemed to be the most aesthetically pleasing. Alternative 4b has the cost savings and ease of construction associated with the Fabriform lining as well as the aesthetic and long-term stability benefits of the engineered cascades along the steeper section of the channel downstream of the trail crossing. For these reasons Alternative 4b was identified as the preferred alternative.

TRAIL CROSSING ALTERNATIVES

The Chedoke Radial Trail was closed by the City in the vicinity of the study area in August 2007. This was due to instability of the trail crossing of the Chedoke Golf Course Channel. Public works staff have been working to find a temporary solution to safely reopen the Chedoke Radial Trail by the end of November 2007 for the period of time before construction of the channel works begin. It is anticipated that the trail will be closed again for a time during construction, but will be permanently reopened thereafter.

A number of alternatives were considered for the permanent reconstruction of the trail crossing of the channel. These are summarized below:

**Alternative 1:** Reconstruct Culvert Crossing. This alternative would look similar to the existing culvert crossing but would be shifted a few metres to the south (upstream) away from the steep channel section below the existing trail crossing.

**Alternative 2:** Salvaged City of Hamilton Bridge. This alternative involves installation of a bridge that was previously used by the City. It has a one-piece steel frame and wood deck and a span (length) of approximately 17 metres. Some retrofits would be required to ensure that the bridge would meet current safety standards.

**Alternative 3:** Bailey Bridge. This alternative involves installation of a pre-fabricated modular truss bridge (see example below) with a span of approximately 20 metres. The railings would need to be designed to meet current safety standards.

**Alternative 4:** Pre-Fabricated Bridge. This alternative involves installation of a pre-fabricated one-piece truss bridge as shown in Figure 13. The span (length) would be approximately 20 metres. The railings would need to be designed to meet current safety standards.

Evaluation of Trail Crossing Alternatives

The trail crossing alternatives were evaluated in terms of long-term stability, constructability, aesthetics, risk to public safety, and costs. Based on the analysis of the alternatives, it is evident that Alternative 1 is the least preferred with respect to long-term stability and future maintenance requirements and would not provide a significant aesthetic enhancement. Alternatives 2 and 4 would present significant construction difficulty since site access is limited and these bridges are not modular. These alternatives are considered less preferable. Alternative 3 is moderately priced, would provide an aesthetic enhancement to the area and long-term stability and would improve public safety. Thus Alternative 3 was identified as the most preferred alternative.
ALTERNATIVES FOR CONSIDERATION:

Alternative 1: Implement one of the other short listed Channel and Crossing Alternatives

Under this alternative, the City of Hamilton’s Chedoke Golf Course Channel Municipal Class Environmental Assessment Study report would need to be revised, and an additional point of public contact would be required to obtain public feedback on the new preferred alternative. Staff would report back to the Public Works Committee in early spring of 2008 with the results of the public consultation, and to request authorization to file the report on the public record.

This alternative is not recommended. Significant analysis has gone into finding a remedial solution that addresses the environmental, social, and economic and safety concerns. Moving forward with implementation and not delaying construction would offset compounding the safety, erosion and slope stability concerns already existing.

Alternative 2: Do not endorse the Chedoke Golf Course Channel Municipal Class Environmental Assessment Study

Under this alternative, the City of Hamilton’s Chedoke Golf Course Channel Municipal Class Environmental Assessment Study is not approved by Council and Schedule B undertakings are not filed for a 30 day review period as per the Municipal Class Environmental Assessment process. Significant amounts of sediment, rock and debris will continue to accumulate in the stilling/sediment basin at the inlet to the conduit that crosses Highway 403 and will continue to be removed on a regular basis to prevent a blockage which would increase the risk of flooding of Highway 403. This would involve unknown, but likely significant, maintenance costs. Without the restoration of the channel, further down cutting and side slope failures will occur and the potential for blockage and highway flooding will increase.

In addition, the three culverts that convey flows under the Chedoke Radial Trail have been undermined and the crossing area has become unstable. As a result, the trail in this area was deemed to be a hazard to public safety during the course of the study and has been temporarily closed to the public. Finding a permanent solution to address the instability of the trail crossing will be delayed if the Class EA report is not endorsed.

This alternative is not recommended.

FINANCIAL/STAFFING/LEGAL IMPLICATIONS:

Financial Implications:

The estimated construction cost for Alternative 4b is $1.75 million. This could involve but not limited to the following list of works:

1. Temporary diversion of channel flows;
2. Removal of fallen trees and woody debris from the channel;
3. Localized repairs to the channel lining south (upstream) of the trail crossing;
4. Localized repairs to the stilling/sediment basin at the inlet to the conduit across Highway 403;
5. Break up and compaction of the existing broken/undermined channel lining;
6. Regrading and preparation of the surface;
7. Installation of a sub-surface drainage system;
8. Installation of engineered cascades along the steep channel section north (downstream) of the trail crossing (upstream extent to be confirmed during detailed design);
9. Installation of a new Fabriform lining between the cascades and the stilling/sediment basin;
10. Installation of a 20-metre span Bailey bridge over the channel along the trail;
11. Restoration of disturbed areas; and
12. Landscaping.

Design and construction of the recommended works will be included in the 2008 Capital Budget submission under Project ID# 5180655646 Chedoke Golf Course Channel.

**Staffing Implications:**
None

**Legal Implications:**
Municipal undertakings such as road improvements, stormwater, water and wastewater projects are subject to Ontario’s Environmental Assessment Act. The Act allows for the approval of Class Environmental Assessments and the municipality has the option of following the planning process set out in the Municipal Engineers Association Class Environmental Assessment (June 2000). This study has followed Master Plan Approach 2 in Appendix 4 - Master Plans, of the Municipal Engineers Association Municipal Class Environmental Assessment document (June 2000). The Master Plan Class EA document for this study has been completed and will fulfill Phases 1 and 2 of the Class EA process. The City is required to file the report on the public record for a minimum thirty day review period. Only Schedule B projects and not the Master Plan itself will be subject to the Part II Order appeal process (bump-up). Schedule C projects must complete Phases 3 and 4 of the Class EA process, prior to filing on public record.

### POLICIES AFFECTING PROPOSAL:

Implementation of The Chedoke Golf Course Channel Municipal Class Environmental Assessment Study will require permits from the HCA (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, NEC (Development Permit), and the MOE (Permit to Take Water). The Public Works Strategic Plan Vision for 2017 would also be a document which affects this proposal. This project would be aligned with the Communities Vision driver under the priority to be a leader in the “greening” and stewardship of the City by maintaining slope stability and functionality of the Watercourse Channel and aesthetics of the Channel crossing along the Chedoke Radial Trail.

### RELEVANT CONSULTATION:

Public consultation is one of the key components of the Municipal Class EA process. Points of formal contact were made with the public during the course of this Class EA Study to: i) provide notification of the Study Initiation and Public Information Centre; and ii) review the problem being addressed and preliminary analysis and evaluation of the alternatives at the Public Information Centre. Upon completion of this report, a
notification of completion of the Project File Report will be provided with details regarding the opportunity to review the report.

An advertisement was placed in the Hamilton Spectator and all Brabant Circulations to notify the public that the study had been initiated by the City of Hamilton. The notice also provided details for the Public Information Centre.

A Public Information Centre (PIC) was held on October, 11, 2007. The PIC was conducted as an informal open house where those who attended had the opportunity to review information panels on display and discuss the study with representatives of the Project Team. An Information Package that included a copy of the information display panels was also made available to all attendees. A total of 39 individuals attended the PIC. Comment sheets were received from 12 individuals and one comment was received via e-mail.

Prior to finalizing the recommendations of the study, the comments received from the public during and following the Public Information Centre were reviewed. These are summarized as follows:

- Most attendees expressed satisfaction with the study in general and concurred with the selection of the preferred alternatives for the channel works and the trail crossing.
- Many attendees expressed concern regarding the manner in which the trail had been closed and would have preferred that the trail remained open with a “use at your own risk” sign posted instead.
- Most attendees expressed a desire to have the trail re-opened as soon as possible and that consideration be given to keeping as much of the trail open as possible during construction.
- A few attendees requested that a non-slip deck be considered for the trail crossing to ensure maximum safety for cyclists.
- Two attendees suggested that the engineered cascades associated with the preferred channel alternative begin above the trail crossing so that they could be better viewed by the public.
- One attendee suggested that the public might like to be involved in the construction of the works in a voluntary manner or to assist the City with responding to public inquiries during construction.
- One attendee did not agree with the preferred channel alternative. This attendee indicated that the channel should not have been lined in the first place and that the channel lining would fail again. It was recommended that the problem be addressed with better debris catchers and a maintenance program at the inlet to the conduit across Highway 403 and that any works be funded by the Ministry of Transportation (MTO), or be cost-shared between the MTO and the City of Hamilton.

A meeting was held with the Hamilton Conservation Authority (HCA) and the Niagara Escarpment Commission (NEC) on September 13, 2007. The purpose of the meeting was to review the work completed to date, including a preliminary assessment of alternatives to address the channel failure, and to discuss permit requirements. Consultation also took place with the Bruce Trail Association and Friends of the Chedoke Association.
The Ministry of Transportation, Ministry of the Environment, and Indian and Northern Affairs Canada were sent notifications of the study. Indian and Northern Affairs Canada have provided a response requesting that the proponent of such projects make efforts directly from the initiation of a project to identify and notify all potentially interested First Nations and other Aboriginal groups within the vicinity of a specific proposed project.

In addition, copies of the handout that was distributed at the PIC were sent to the HCA, NEC, MTO, and Six Nations following the PIC and copies of the Draft Project File Report were provided to HCA, NEC and MTO for review. The NEC has since responded to the PIC information sent to them. A report is going to the NEC at their November 15, 2007 meeting whereby they are simply endorsing the preferred alternative expressed in the PIC. A comment regarding the identification of the construction area was expressed in the communication to the City which will require a Development Permit from the NEC. Once the NEC deals with the internal report they will send an official letter to the City advising of their endorsement to the preferred alternatives.

Internal consultation and discussion occurred with City Staff members from Environmental Planning Section, Operations and Maintenance, Ward 1 Councillor Brian McHattie, Ward 8 Councillor Terry Whitehead, and Ward 12 Councillor Lloyd Ferguson.

**CITY STRATEGIC COMMITMENT:**

This project meets the City's strategic commitment to a healthy, Safe and Green City through putting forward a strategy that addresses issues related to our natural environment, including water quality and the health of aquatic resources. The Chedoke Golf Course Channel Municipal Class Environmental Assessment Study supports the goals of the Vision 2020 Sustainable plan by addressing water quality impacts, impacts on aquatic and terrestrial habitat, mitigate erosion concerns and strategy for flood control resulting from new and existing development.

In order to assess the alternatives, an evaluation system has been used to determine the suitability of each alternative, against appropriate “evaluation factors”. Each factor consists of an evaluation category defined by specific evaluation criteria. The evaluation categories are as follows:

By evaluating the “Triple Bottom Line”, (community, environment, and economic implications) we can make choices that create value across all three bottom lines, moving us closer to our vision for a sustainable community, and Provincial interests.

- **Community Well-Being is enhanced.** ☐ Yes ☐ No
  
  By addressing impacts/issues relating to the interaction of the community/ neighbourhood with the implementation of the proposed alternatives.

- **Environmental Well-Being is enhanced.** ☐ Yes ☐ No
  
  By addressing impacts that an alternative may have on how a system is intended to work, including how it would address impacts on flooding, water quality, and erosion, aquatic and terrestrial habitat.

- **Economic Well-Being is enhanced.** ☐ Yes ☐ No
  
  By addressing immediate and future costs and cost-benefit of the alternatives presented including maintenance. The ease of construction and accessibility for machinery and the potential impact of construction techniques and access on the private property.
Does the option you are recommending create value across all three bottom lines?

☑ Yes  □ No

Alternatives were screened and evaluated with respect to the following factors: long-term stability, constructability, aesthetics, risk to public safety, and costs. Recommended alternatives were identified and evaluated to determine their ability to address the channel stability and trail crossing concerns.

Do the options you are recommending make Hamilton a City of choice for high performance public servants?

☑ Yes  □ No

Project recommendations that meet the triple bottom line requirements and accomplish project objectives reinforces the City of Hamilton as a high performance work environment.
APPENDIX ‘A’
PW- 07 157
Figure 1: Study Area
Figure 2: Initial Fabriform Channel Failure Location
Alternative 4a and 4b Profile View