

An aerial photograph of a lush green landscape. In the upper center, a river flows through a wooded area. Below the river, a multi-lane bridge spans a valley. The surrounding area is covered in dense green trees and grass. The York Region logo is superimposed over the upper part of the image.

York Region

Bayview Avenue Extension Project



Submission to:

Transportation Association of Canada
for the Environmental Achievement Award 2002

Abstract

The Bayview Avenue Extension project is a deserving candidate for the 2002 Environmental Achievement Award for its innovative design used to minimize environmental impacts, at the same time, improving environmental features and enhancing knowledge of locally significant ecosystem elements, in particular a nationally threatened amphibian species.

The project features these innovative environmental achievements:

Environmentally Responsible Road Alignment successfully mitigated impacts to the nearby Jefferson Forest, Lake Wilcox, Forester March and adjacent wetland areas.

Wetland Habitat Creation Project led to the development of diverse habitat zones for a variety of animal and plant species.

Amphibian Roadway Crossings were specifically designed to protect and enhance the amphibian population, in particular the Jefferson Salamander, while adding to research and knowledge base of a rare, nationally threatened species.

Jefferson Ravine Bridge Crossing provides unimpeded passage for large and small mammals, including white-tailed deer, reptiles and amphibians, working with existing topography to achieve a unique crossing feature.

Extensive Vegetation and Landscaping Enhancements screen nearby sensitive areas from roadway intrusions and provided intensified buffering to disturbed areas.

Detailed Environmental Analysis was completed to ensure complete compliance with environmental legislation for the Oak Ridges Moraine.

Project Details - Bayview Avenue Extension

- Four-kilometre, two-lane rural arterial road
- Grading constructed for an ultimate four-lane facility
- Located within the Town of Richmond Hill and is situated on the Oak Ridges Moraine
- Total gross expenditures for the project approximately \$ 16 million
- Fully funded and maintained by the Regional Municipality of York.
- Achievement of mitigation measures involved consultation with Conservation Authorities, Provincial Ministries and countless experts.



The above view northbound shows the Bayview Avenue extension at its constructed four-lane width in the area of the ravine crossing.

Background

The Regional Municipality of York is responsible for 3,100 lane kilometres of roads in providing Regional infrastructure. Bayview Avenue is a major component of this network, extending from the Steeles Avenue boundary shared with the City of Toronto to Davis Drive in the Town of Newmarket. Bayview Avenue was discontinuous from Stouffville Road to Bloomington Road, placing added pressure on the existing, local road structure, until the Bayview Avenue extension was completed in late 2002.

Regional forecasts, published in the 1994 Regional Official Plan, predicted that population and employment growth would double by 2021. A subsequent Secondary Plan for the area projected that the population in the immediate area would more than triple in the same period. When these growth rates were applied to traffic analysis, the forecasted volumes greatly exceeded available road capacity. In addition, York Region concluded that major impacts could be expected on local Oak Ridges/Lake Wilcox community if Bayview Avenue was not made continuous and expanded.



The background studies and designs in support of the Bayview Avenue project were completed by York Regions consulting engineers, McCormick Rankin Corporation and Ecoplans Limited. Extensive consultation with the Toronto and Region Conservation Authority (TRCA), Ministry of Natural Resources, Ministry of the Environment, local special interest groups and the general public was a key contribution to project success.

1.0 Road Alignment Adjustments to Minimize Intrusion

The Individual Environmental Assessment (IEA) for the proposed completion of Bayview Avenue addressed the need to further minimize impacts on surrounding landscape. The following adjustments in alignment resulted, indicating York Region's commitment to minimize intrusion:

- To provide for a better crossing location between Lake St. George and Lake Wilcox.
- To avoid existing wetland areas whenever possible.
- Away from Lake Wilcox.
- Westerly to increase the buffer between the roadway and the Jefferson Forest block to the east.

2.0 New Wetland Habitats

One of the key principles of the Bayview Avenue environmental assessment was the need for sensitive treatment of all wetlands, not only those identified as Provincially Significant. While avoidance of wetland areas was almost fully achieved, constraints in the study corridor meant it was not possible to avoid four small wetland pockets and the edge of the Forester Marsh.

Approximately 1.5 hectares of wetland habitat was intruded upon in the Wilcox-St. George wetland complex. The Regional Municipality of York developed a "wetland habitat creation project" in cooperation with the Toronto and Region Conservation Authority to provide a north-south wetland linkage, and to complement existing outdoor education programs.

2.1 Mitigation Measures

The Wetland Habitat Creation Project involved the development of three wetland cells, totaling 1.5 hectares. They were created on lands owned and managed by the Toronto and Region Conservation Authority, called the Lake St. George Field Centre, in an open field area bordered by Lake St. George to the south and the Forester Marsh to the north.

Some of the more notable features:

- Sculpted edge and a variety of depths and substrate materials resulting in pool depressions, wetland/upland areas on the margins, and upland mounds.
- Enhanced visual screening and topographic diversity made these zones less susceptible to human disturbance by keeping them well removed from Bayview Avenue.
- Three different types of wetland habitats were created:
 1. A "Do Nothing" cell that was excavated, but received no subsequent treatment (such as plantings or seedbank material).
 2. A planted wetland cell that was excavated and then subsequently planted with nursery herbaceous stock as well as upland tree and shrub plantings.
 3. An excavated wetland cell that was lined with wetland substrates salvaged for the wetland zones.

This approach has provided an "outdoor laboratory" where the pattern of resulting wetland development and wildlife use can be tracked over time. Another key facet of the project is that identified archaeological sites have been protected and integrated into the design along with a trail system thereby providing both natural and cultural heritage experiences for Field Centre visitors.

Ultimate road alignment of the Bayview Avenue Extension (yellow) and the straighter, more direct original alignment of the rural road



2.2 Educational Community

The new wetland habitat provides significant benefits to the research and educational community as follows:

- Opportunities for study, complementing the Toronto and Region Conservation Authority's outdoor education programs.
- The various types of wetlands employed support the development of the scientific information base for wetland habitat construction.
- Multi-year monitoring program of vegetation success, water level change and wildlife use is now in place.
- Lake St. George Field Centre now has an area for the study of amphibian breeding, general and local wetland habitat characteristics and a variety of ecological, research and interpretive benefits of potentially Provincial importance.

3.0 Amphibian Roadway Crossings

During the construction tender process, Jefferson Complex Salamanders were observed in the area of Stouffville Road east of the proposed Bayview Avenue extension. The genetically pure member of the Jefferson Complex Salamander, is rare in Ontario and designated threatened at the national level.

The Jefferson Salamander had not been observed in the study area during the initial review and inventory of the wildlife resources conducted as part of the Individual Environmental Assessment. When York Region was advised of the species identification and sensitivity, immediate action was taken to:

- Confirm the presence and importance of this amphibian to the project area.
- Assess amphibian migration movements
- Determine appropriate mitigation measures to be considered for incorporation into the construction project.
- Identify a post-construction monitoring plan to assess the success of mitigation measures.



3.1 Survey Method and Preliminary Findings

The study protocol was developed by the Region with assistance from Ecoplans Limited and input from the Ministry of Natural Resources, Ministry of the Environment and staff of University of Guelph zoological department. During the extensive spring sampling effort in 2002, a series of drift fence zones, totaling 2.2 kilometres, were used to direct animals to 238 small amphibian collection containers installed at various locations. The preliminary research included specimen sampling, drift fence reconnaissance and road mortality review.

The study confirmed the existence of the Jefferson Complex Salamander in the study area, though not in large numbers, and one true Jefferson Salamander. Migration movements of other amphibian species were also documented. Following the survey, a detailed literature review was conducted on amphibian crossings, including published papers and symposia, Internet and in-house files. In addition, Regional staff and consultants liaised with experts at the United States Department of Natural Resources Conservation (University of Massachusetts).

These studies and research added to the amphibian information base for the Jefferson Complex Salamander as well as other species found in the area. Had this immediate action not been taken by the Regional Municipality of York, these scientific advancements and environmental protection measures would not have been installed as a part of the construction project and valuable data may not have become available on this nationally threatened species.

"The Bayview Avenue extension has long been identified as a critical link in the York Region transportation network", said Regional Chair Bill Fisch. "The extension is necessary to address existing transportation needs and is needed now. At the same time, York Region is committed to continue listening to the concerns of the environmental Groups".

York Region Media Release, September 7, 2001



3.2 Mitigation Measures

After confirming the existence of the Jefferson Salamander in the study area, the value of incorporating some mitigation measures into the Bayview Avenue Extension construction plan was substantiated. The research disclosed that there is a high risk of amphibian mortality while crossing roads to and from overwintering and spring breeding ponds.

In order to assist in amphibian movements, five strategically located culverts were installed under Bayview Avenue. Prior to their installation in this project, no specific tunnel design was known for a species such as the Jefferson Salamander, requiring a somewhat experimental range of design features and dimensions to be considered.

These tunnels or culverts were filled with moist soil integrating native substrates to mimic natural conditions. Special interlocking, landscape-stone fence features were installed to direct amphibians to the tunnels. Culverts were positioned to avoid tunnel flooding or high velocity flows through the tunnel. Furthermore, different culvert designs were used in order to test features and benefit the performance measurement information base on the structural design used.

Culverts were constructed of concrete or corrugated steel, and some were fitted with manholes in order to aid in maintaining soil moistness as well as to provide ambient light.

3.3 Commitment by York Region to Monitoring During and After Construction

The monitoring program to survey spring salamander movement is scheduled for 2003 consisting of night surveys under suitable spring migration conditions. Post-construction monitoring of the features will involve assessing amphibian use of the culverts such as species behaviour in the tunnels and amount of time required for tunnels to be crossed. As well, amphibian road crossing activity and mortality, and funnel fence zones will be reviewed. These surveys will provide information on the effectiveness of the various crossing designs and locations. Solar-powered lights will be tested on some culverts in the spring 2003 monitoring, to provide anecdotal evidence regarding light cues during migration.



4.0 Dry Ravine Crossing

With commitment subsequently identified to maintain a future "green corridor" of the Bond Lake to the west, the decision was made by York Region to provide a valley bridge structure that would accommodate a broader range of wildlife and recreational opportunities while also facilitating the landscape conservation objective of the Oak Ridges Moraine legislation.

4.1 Mitigation Measures

The ultimate design solution was a 70 metre, three span, precast concrete girder bridge. This option was selected because it met design criteria, provided a completely unobstructed passage for wildlife and integrated well with existing topography. The bridge provided flexibility for wildlife and community design and was compatible with Regional financial capabilities.

5.0 Extensive Vegetation and Landscaping Enhancement

Concern was expressed by the Lake St. George Field Centre staff that existing vegetation along the westerly Toronto and Region Conservation Authority's lands might be impacted by roadway construction. In response, property enhancement measures were taken to ensure environmental impacts to the Field Centre edge were minimized.

5.1 Mitigation Measures

The westerly Toronto and Region Conservation Authority property limit enhancement measures included a 15-20 metre wide planting strip north of Bethesda Side Road to the frog pond. A continuous row of native coniferous and deciduous trees was planted at the outer limit of the planting strip. Between these and the right-of-way, trees and shrubs, which were salvaged from areas affected by wetland development, were planted. In addition, a landscaped berm was developed along the frog pond to shield it from headlights of vehicles and to provide for visual and topographic diversity. A longer, linear and landscaped berm was also designed for between the right-of-way and the Wetland Habitat Creation Project area to further protect wetlands from disturbance. The vegetation screening along the extension aided to minimize impacts from roadway vehicles on surrounding edge environments and enhance the aesthetic quality of the corridor.

6.0 Completion of Additional Environmental Analysis

Oak Ridges Moraine legislation

Before any construction was begun, the Regional Municipality of York followed procedures to ensure construction did not conflict with existing legislation for the area. In addition to standard reviews, York Region staff examined Oak Ridges Moraine legislation developed in November 1, 2001 to ensure that as the project was located on the Oak Ridges Moraine, project design would not conflict with newly approved legislation.

Archaeological investigation

Since the project is located on the Toronto and Region Conservation Authority's land, the process was followed to assuage it of archaeological concerns. The Toronto and Region Conservation Authority Archaeological Resource Management Unit completed an archaeological resources assessment of the area. The study located one lithic drill interpreted as an isolated find, thus, the area was cleared of any archaeological concerns. Archaeological finds were protected and found knowledge integrated into the wetland creation project.

Award Requirements Assessment

How the project contributed to the Protection and Enhancement of the Environment

- The design of the Bayview Avenue alignment minimized impact to the Jefferson Forest, Lake Wilcox Kettle Complex, Forester Marsh and wetland areas. Where edge impacts could not be avoided, the Environmental Management and Enhancement Plan was used to properly compose buffer plantings and structures to further protect the environmental areas.
- Three constructed wetland cells have provided habitat and breeding grounds for wildlife as well provide research, education and monitoring opportunities, such as the Toronto and Region Conservation Authority's outdoor education programs.
- The Amphibian Roadway Crossing Structures were designed to provide safe passage under the road for the Jefferson Salamander species as well as other amphibian species in the area. In addition, the preliminary study and ongoing monitoring program linked to the feature have added to the amphibian information base and knowledge of culvert crossing design techniques.
- The Jefferson Ravine Bridge Crossing has provided a broader range of wildlife and recreational opportunities and facilitates landform conservation objectives for the Oak Ridges Moraine legislation.
- Additional landscaping has provided the Field Centre, frog pond and wetland creation project with visual enhancement and shielding from the roadway to further protect them from disturbance.



Degree of Innovation in the Project

- The proposed amphibian crossing approach and design was highlighted on the Discovery Channel's Daily Planet in an October 12, 2002 episode.
- Bridge design and construction methods were employed to avoid altering the natural formation of the landscape.
- The innovative Wetland Habitat Creation Project, located on the Field Centre lands, protected archaeological finds, hereby providing both natural and cultural heritage features and opportunities.
- Preparation and implementation of a comprehensive Environmental Management and Enhancement Plan was an integral part of the detailed design and in the securing of project approvals.

Financial Implications

- Local native wetland plant material and substrates were salvaged and installed into new wetland cells to naturalize the wetlands inexpensively.
- During the Salamander Study, design related delays were lessened due to contractor involvement in the construction methodology and choosing of materials such as the special funnel fencing.
- The Regional Municipality of York worked closely with regulatory agencies such as the Ministry of the Environment, Ministry of Natural Resources and Toronto and Region Conservation Authority, as well as local environmental groups and the public, through the Environmental Assessment process, the detailed design process, and the Jefferson Salamander Study.

Overall Applicability to Transportation

- The Bayview Avenue extension has increased much needed capacity for the road network.
- The project has provided the opportunity to implement and monitor the amphibian crossing structure to test the effectiveness between design variations used for application in future design, which could be used to develop a new design standard.
- The project has provided a unique opportunity to advance the growing field of wildlife ecology and transportation in a sensitive environmental setting.



This proposal was prepared by the Regional Municipality of York
in partnership with Ecoplans Limited