

# DEAD & YORK CREEK Subwatershed Plan

FINAL REPORT



April, 1998

Project completed by LOWER TRENT CONSERVATION for the TOWNSHIP OF MURRAY

April, 1998

#### **FUNDING SUPPORT**

- Township of Murray
- Ministry of Natural Resources
- Bay of Quinte Remedial Action Plan

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# **Executive Summary**

The Dead and York Creek Subwatershed Plan was completed by Lower Trent Conservation for the Township of Murray, in cooperation with the Bay of Quinte Remedial Action Plan (QRAP) and City of Trenton. The work was initiated in 1996 and completed in early 1998.

The Subwatershed Plan encompasses the lands draining into Dead Creek, York Creek and the Dead Creek Marsh, north of the Murray Canal. Adjacent lands draining into the Bay of Quinte were included in the study area. This area is located in the southeastern portion of Murray Township and southwest portion of the City of Trenton (and is entirely within the new City of Quinte West, formed on January 1, 1998.)

The study was initiated in response to development pressure in Murray Township, adjacent to the City of Trenton. The need for a stormwater management strategy was the driving force. The *State of the Watershed Report*, completed for the study area in early 1996, consolidated the existing background information about the watershed and identified the issues that needed to be addressed in the Subwatershed Plan:

- recommendations to assist the municipality with interpretation and implementation of the Provincial Policy Statement (relating to land use planning)
- stormwater management
- natural heritage protection and enhancement
- identification of recreational opportunities

Preparation of the Subwatershed Plan was directed by a Steering Committee comprised of Municipal, QRAP and Conservation Authority representatives. A Technical Review Committee made up of representatives from various agencies and a Watershed Interest Group comprised of community members provided input at various points throughout the study. The Subwatershed Plan was completed by Conservation Authority staff, with various technical components completed by consultants:

Contour mapping: Photomap Air Surveys Inventory and Assessment of Natural Features: Totten Sims Hubicki Associates Comprehensive Impact Assessment: Ecological Services Hydrology/Stormwater Management Strategy: Totten Sims Hubicki Associates

Four natural areas within the watershed have been inventoried: the Wooler Road Woods, Dead Creek Escarpment Woods and Alvar, Dead Creek Marsh, and Dead Creek Headwater Woods and Wetland. All four of these areas are recognized in the Subwatershed Plan as significant natural areas and the Dead Creek Marsh is identified as a Provincially Significant Wetland. These core areas and connecting natural linkages contribute to the health of the watershed, helping to protect water resources and providing habitat for a number of wildlife species. The Subwatershed Plan recommends the establishment of natural buffers along the watercourses and the Bay of Quinte, which will enhance the existing natural heritage system. The natural features of the watershed are also valued because of their potential to provide future recreational opportunities and because they form an integral part of the rural countryside. As the new City of Quinte West emerges and urban growth expands outward from Trenton, efforts should be made through community planning and private stewardship to protect the character of the rural area. The Plan provides landowner advice with regards to land management practices and encourages good stewardship. It also provides suggestions for community enhancement in terms of future recreational opportunities and countryside preservation.

The Subwatershed Plan provides planning recommendations to help protect the natural environment and direct development away from natural hazards (flooding and erosion prone lands). The recommendations are intended to provide direction to the Municipality with its responsibility to "have regard to" the Provincial Policy Statement (issued under the Planning Act) and at the same time provide flexibility to help address community concerns with development restrictions. The Municipality will consider the recommendations in consultation with the community when it prepares/amends its planning documents. The recommendations include development setbacks from watercourses, establishment of buffers adjacent to natural features, and requirements for site-specific impact assessments for proposed development within the recommended setbacks.

Stormwater management is a critical component of this Subwatershed Plan. It is well accepted that urbanization can have adverse impacts on streams and other receiving water bodies. The resulting change in hydrologic regime from increased stormwater runoff may cause flooding, streambank erosion and water quality problems such as pollutant loadings, temperature effects, baseflow reduction, habitat changes and groundwater impacts.

Rather than dealing with stormwater management on a site-by-site basis, the preferred approach is to develop a strategy for the entire developing area that considers development pressure, natural systems and land ownership. The Subwatershed Plan sets out the framework up front; it reduces the amount of work required by each individual developer; optimizes facilities from the Municipality's perspective; and allows for a better designed and functioning system that fits with the natural processes and landscape.

The Subwatershed Plan's stormwater strategy calls for three ponds: one to service the "developing area" that drains into York Creek and one to service the "developing area" within the Dead Creek watershed north of the escarpment. The third pond would be required if major development occurs in the Dead Creek watershed to the south of the creek, east of 2nd Dug Hill Road. More general stormwater management recommendations are provided for other potential development areas: adjacent to York Subdivision and for the industrial-designated lands along the Wooler Road.

The Subwatershed Plan includes an implementation and monitoring plan. Agencies and groups responsible for implementing each recommendation, along with a time-frame, are identified. An Implementation and Monitoring Committee, comprised of representatives from the Municipality, QRAP and Conservation Authority, will meet each year to review the progress with implementing the plan. By working together, the health and diversity of the natural features in the area can be maintained and enhanced as economic growth and development occur in the Dead and York Creek watersheds.

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**APPENDICES** (under separate cover)

- Appendix A: Public/Agency Consultation
- Appendix B: Hydrology/Stormwater Management Strategy
- Appendix C: Inventory and Assessment of Natural Features
- Appendix D: Comprehensive Impact Assessment
- Appendix E: Water Quality Results

# 1. Why a Subwatershed Plan?

This Subwatershed Plan has been completed for the Dead Creek watershed and the upper reaches of the York Creek watershed. These watersheds are located within the Township of Murray and City of Trenton, soon to be the western portion of the new City of Quinte West. Because of urban development pressure in the upper portions of these watersheds and potential impacts on the environment, this area was identified as a top priority for subwatershed planning by Lower Trent Conservation (LTC), the Bay of Quinte Remedial Action Plan (QRAP), and the municipalities.

### **1.1 PLANNING ON A WATERSHED BASIS**

As development pressures increase in a geographic area, so do the potential impacts on the local ecosystem. Care needs to be taken to ensure that stormwater management is addressed in a coordinated and comprehensive fashion, potential development constraints are identified, and significant natural features protected. Because watersheds follow natural boundaries, they are the ideal unit for planning, managing and protecting our precious land and water resources (Figure 1). Watershed planning is based on the ecosystem approach. It recognizes the importance of natural systems and cycles and the interconnections between man and the environment.

There are two levels of watershed planning. Watershed plans are broader documents, often completed for large watersheds. The plan may make recommendations for resource protection in rural and urban areas. The Bay of Quinte Remedial Action Plan Stage 2 Report: *Time to Act* is, in effect, a watershed plan for the Bay of Quinte. In contrast, subwatershed plans are more detailed and are generally completed for urbanizing watersheds (areas undergoing or expected to undergo urban growth). The subwatershed plan includes specific management strategies and recommendations to deal with one or more resource management issues and to ensure that future development is compatible with the natural environment. While subwatershed plans may be completed for an entire watershed, they more often focus on a portion of a watershed, hence the term "subwatershed."

This plan has been developed using the subwatershed planning approach for the developing area and the broader watershed planning approach for the remainder of the watershed.

#### Figure 1 What is a Watershed?

Nothing exists in isolation ... everything is connected to everything else. If we alter one part of the environment, the effects will be felt elsewhere, like ripples on a pond after a stone is thrown in.

Municipal boundary



### **1.2 REGIONAL CONTEXT**

The study area is located within the Township of Murray and the City of Trenton (Figure 2). Dead Creek flows into the Dead Creek Marsh; York Creek flows into Hutchinson Creek which empties into the Murray Canal. Both of these watersheds are part of the larger Bay of Quinte watershed.

The Bay of Quinte area is one of the oldest settled areas in Ontario. The arrival of colonists to this area in the late 1700's marked the beginning of dramatic cultural changes to the natural landscape (QRAP Coordinating Committee, 1990). Over the years, the natural shoreline has progressively become more developed as a result of urban, industrial, and agricultural activity. The many rivers and streams in the Quinte area have acted as pathways for the disposal of by-products of this human activity into the Bay. The result has been a degraded ecosystem affected by excessive nutrient enrichment, bacteriological and heavy metal contamination, and loss of wildlife habitat (QRAP Coordinating Committee, 1990).

In 1975, the International Joint Commission identified the Bay of Quinte as an area of environmental concern (QRAP Coordinating Committee, 1990). The Bay of Quinte Remedial Action Plan was developed to provide recommendations for the reduction of contaminant loading to the Bay, thereby improving, enhancing and protecting the Bay's ecosystem and the surrounding land (QRAP Coordinating Committee, 1993).

As the population around the Bay of Quinte is expected to grow at an annual rate of 1.1 percent by the year 2001 (QRAP Coordinating Committee, 1993), changes in land use, especially urban growth, can be expected. Continual intensification of development can aggravate a number of environmental problems, including water quality (OMOE, 1991). In order to address environmental concerns relating to urbanization, the QRAP Coordinating Committee (1993) identified the need for subwatershed planning for areas slated for new urban development (Recommendation No. 34, QRAP: Stage 2 Report - *Time to Act*).

With pressure to expand the urban centre of Trenton outward into Murray Township, the need for a subwatershed plan was apparent. The Subwatershed Plan was to address watershed issues that transcend municipal boundaries. Now, with Municipal amalgamation slated for January 1, 1998, the political boundaries will disappear. However, the watershed issues still remain. Completion of this Subwatershed Plan is quite timely, as it will provide the new Municipality with direction in preparing its planning documents and facilitating the urgent development pressures along the "Trenton-Murray" boundary.



### **1.3 WATERSHED ISSUES**

A State of the Watershed Report, was completed for the study area in 1996. This report consolidated the existing background information and identified the issues that needed to be addressed in the Subwatershed Plan. The issues identified relate directly to future development and its compatibility with the natural environment. They include:

- stormwater management
- recommendations to assist the Municipality with interpretation and
- implementation of the Provincial Policy Statement
- natural heritage protection and enhancement
- recreational opportunities

### **1.4 GOALS AND OBJECTIVES**

The goals of this project are:

• To create a community vision of what the watershed should look like in the future by bringing together all the players--interested citizens, developers, community groups, agencies and the Municipality

• To establish the framework for an ecosystem-based approach to environmental protection, water management and land use planning for the Dead & York Creek subwatersheds

• To ensure that development within the Dead and York Creek subwatersheds contributes to improving the health of the watershed and the Bay of Quinte.

• To cut the costs of development by completing studies upfront and reducing the need for site-specific studies

• To eliminate lengthy review periods and delays in the development process by identifying agency concerns and objectives upfront

• To increase public awareness of watershed planning and the ecosystem approach.

Specific objectives include:

• To identify opportunities and constraints for urbanizing areas

• To identify and evaluate natural areas and systems

• To develop a stormwater management strategy for the developing areas

• To make recommendations for implementation of the applicable natural heritage, water quality and quantity, and public health and safety policies set out in the Provincial Policy Statement

• To assist with implementation of the applicable recommendations set out in the QRAP Stage 2 Report.

• To focus conservation and restoration work in the watershed

- To identify potential recreation opportunities
- To develop an implementation plan

# 2. Study Approach and Methods

### **2.1 STUDY ORGANIZATION**

### 2.1.1 Study Coordination

Lower Trent Conservation, as Project Manager, was responsible for overall coordination of this Subwatershed Plan and delivery of the final project. The study framework includes three committees, which were established to ensure the final plan was acceptable in terms of municipal, technical, and community interests.

### 2.1.2 Committee Structure

### Steering Committee

A Steering Committee, consisting of representatives from Lower Trent Conservation, the Township of Murray, City of Trenton, and QRAP helped guide the development of the Subwatershed Plan. The Steering Committee was responsible for ensuring that the project was completed within the projected time lines and budget. It was also responsible for ensuring that the views of other stakeholders (agencies, developers and the public) were given due consideration and that the final plan included recommendations that were locally acceptable.

### Technical Review Group

Ministries and agencies were invited to participate on a Technical Review Group. This committee was consulted at various stages throughout the study to provide input and review recommendations and documents. Participation on the committee included representatives from the Bay of Quinte Remedial Action Plan; Ministry of Environment and Energy; Haliburton, Kawartha, Pine Ridge District/Hastings and Prince Edward Counties Health Unit; Ministry of Agriculture and Rural Affairs; and Trent-Severn Waterway.

### Watershed Interest Group

The Watershed Interest Group was formed to ensure that public concerns were being addressed. Representatives with various interests were invited to participate, including farmers, developers, landowners, business people, and members of interest groups. Nine individuals agreed to sit on this committee.

These three committees met periodically during the study period. It was beneficial at certain points to bring all the committees together; therefore, three joint committee meetings were held. A complete record of the meetings is included in Appendix A, *Public/Agency Consultation*. The individuals on these committees are listed at the front of this document.

### 2.1.3 Technical Studies

Lower Trent Conservation was responsible for hiring specialists to complete specific

technical studies. These technical studies form appendices to this document.

The firm of Totten Sims Hubicki Associates was hired to complete the Hydrology/Stormwater Management Strategy (Appendix B).

Totten Sims Hubicki Associates was also hired to complete the *Inventory* and Assessment of Natural Features (Appendix C).

Ecological Services was hired to complete a *Comprehensive Impact Assessment* for the Northern Half of Dead Creek Marsh, Dead Creek Escarpment Woods and Alvar and Wooler Road Woods (Appendix D).

Contour mapping was completed by Photomap Air Surveys at a scale of 1:2000. This mapping covers most of the study area and is on file at the Conservation Authority and Municipal offices (hard copies and digital files).

Other technical components of the project were completed by Conservation Authority staff:

- Plotting regional flood lines based on HEC2 output (pencil plots). These are on file at the Conservation Authority office.
- Water quality sampling. Water quality analysis was completed by the Ministry of Environment and Energy. The results are provided in Appendix E (*Water Quality Results*).
- Geo-referenced, digital mapping was completed in-house for use in technical overlays, displays, and reports.

### **2.2 BACKGROUND STUDIES**

### 2.2.1 State of the Watershed Report

In 1996, a *State of the Watershed Report* was completed for the study area by Lower Trent Conservation. This project was completed to identify the available background information, provide a summary of the watershed characteristics and condition, and to identify issues.

### 2.2.2 Contour Mapping

Detailed contour mapping was completed by Photomap Air Surveys as part of this project for use in delineating drainage boundaries, identifying natural features, developing a stormwater strategy, identifying flood potential along the watercourses, and to help with

preparation and review of future development proposals.

The mapping was based on the Conservation Authority's 1:10,000 coloured air photography (Airborne Sensing Corporation, 1993). It was felt that little change had occurred in the watershed since 1993, and that new photography was not warranted.

The mapping was done utilizing Flood Damage Reduction Program (FDRP) specifications and fits with the OBM grid. The scale of the mapping is 1:2000, with 1 metre contour intervals (and interpolated 0.5 metres contours).

The mapping covers most of the watershed area, with the exception of the developed area within Trenton and portions of the southwestern part of the watershed that are not expected to experience substantial growth within the near future (see Figure 3). Maps are available in paper copies or digital format (AutoCAD).

### 2.2.3 Hydrology/Stormwater Management Strategy

The Hydrology/Stormwater Management Strategy, completed by Totten Sims Hubicki Associates in 1997, was completed to:

- prepare a hydrological model of pre and post development runoff response
- to identify pre and post development flood plain elevations and prepare pencil flood lines
- to analyze pre and post development water quality runoff for key parameters
- to provide an overview of groundwater resources
- to identify potential stormwater management measures under the future development scenario to maintain pre-development runoff peaks and achieve the water quality standards of the Bay of Quinte stormwater implementation strategy
- to model and evaluate a range of stormwater management measures and define a preferred combination of facilities, to achieve the water management objectives
- to provide preliminary engineering design input re: location, size and outflow hydrograph and quality control performance for the preferred stormwater management plan. This will provide the basis to guide and support future site development applications and detailed engineering design at site plan submission stage
- recommend an implementation strategy including phasing, cost-sharing and municipal/developer responsibilities re: post-development maintenance and performance monitoring

#### Water Quantity Analysis

Two hydrologic models were used to model runoff in the two watersheds for the 2, 5, 10,



25, 50, 100 year, and regional storm events. The SWMM model (in the urban areas) and OTTHYMO-89 model (in the rural areas) were used along with a 6 Hour SCS Type II rainfall distribution with a 4 hour duration to model the flows within Dead Creek and York Creek for all return periods. The contour mapping was used to delineate the drainage areas.

#### Water Balance

Static water levels were plotted and contours of water levels were drawn based on data in a MOEE Groundwater Bulletin Report. Groundwater yield was also examined. This information was used to provide general recommendations regarding potential impacts of development on groundwater.

#### Water Quality Analysis

Three pollutants were selected for use in the water quality analysis: suspended solids, total phosphorus, and bacteria. Screening level water quality equations from the USEPA document Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water - Part 1 were used to determine the impact of development within the Dead and York Creek subwatersheds.

#### **Hydraulics**

The U.S. Army Corps of Engineer's water surface profile program HEC-2 was used to estimate water levels within Dead Creek and York Creek for existing and proposed land uses during the 2, 5, 10, 25, 50, 100 year, and regional storm events. The topographic mapping was used along with site visit information to develop HEC-2 models. This information was used to produce pencil flood line mapping.

#### Stormwater Management Plan

The results of the technical studies identified above, were used in conjunction with known information about future development potential within the area and the natural systems to develop stormwater management options for the watersheds.

A complete description of the methods and results are provided in Appendix B—the Hydrology/Stormwater Management Strategy.

#### 2.2.4 Flood Plain Mapping

Pencil flood line mapping was completed for both creeks based on the HEC2 analysis produced by Totten Sims Hubicki Associates. Pencil flood line mapping is an informal type of flood line mapping which is not in accordance with the standards defined in the Ministry

of Natural Resources (MNR) Technical Guidelines. They are hand-drawn and do not provide detailed cross-section locations nor corresponding water surface elevations. Pencil flood lines give an indication of the flood hazard for use in assessing the impacts resulting from development and may be considered for use in planning documents.

The regional flood line has been plotted by Conservation Authority water resources engineering staff. It is shown on a set of mylar-based contour maps and is available in digital format (AutoCAD). The 100-year flood line for Dead and York Creek were plotted by Totten Sims Hubicki Associates as part of their Hydrology/Stormwater work. This flood line is also identified on the mapping. The flooding which occurs in York Subdivision during the 100 year event has also been plotted on these maps. These flood levels were outlined in the York Subdivision Drainage Improvement Study (Totten Sims Hubicki Associates, 1983): they are not affected by York Creek water levels.

Mapping has also been completed for the Bay of Quinte shoreline to Flood Damage Reduction Program (FDRP) standards, which shows the static flood level. Hard copies and digital mapping are on file at the Conservation Authority office. The Ministry of Natural Resources recommends that 0.1 metres be added to the static 100-year water elevation (75.7 m G.S.C.) to compensate for storm surge, bringing the flood level to 75.8 m (OMNR, 1991). To identify the flooding hazard for the Great Lakes - St. Lawrence River System, as set out in the Provincial Policy Statement, a 15 metre setback is recommended beyond the flood level. For large inland lakes, the recommended setback is 5 metres from the flood level.

Since the west end of the Bay of Quinte is sheltered and not open to the lake, the potential for wave uprush on the Bay will not be as great as on the open lakeshore. To ensure that the recommended setbacks do not result in over-regulation in the planning documents, it is recommended that the "large inland lake" policies be applied. Based on this policy the flooding limit would extend 5 metres inland of the 75.8 m G.S.C. flood level. However, flexibility should be maintained to allow a developer, the Municipality, or an agency to undertake a site specific study should there be concern that this setback is inappropriate for a particular development.

### 2.2.5 Dynamic Beach Hazards

According to the Ministry of Natural Resources (1995) there are no dynamic beaches along the Bay of Quinte shoreline in the study area.

### 2.2.6 Erosion Hazards

The approach recommended by the Ministry of Natural Resources for calculating erosion hazards along the Great Lakes is to take the greater of:

• (the stable slope allowance) + (an erosion allowance of 30 m or 100 times the average annual recession rate)

and

- a 30 metre\* erosion allowance
- \* For inland lakes the erosion allowance is 15 metres.

No historical erosion problems have been identified for this reach of shoreline. The 1953 and 1993 aerial photography for this area have been visually compared and no erosion was evident. Based on this, the recession rate can be considered as negligible. The shoreline along the Bay within the study area is comprised of a low bank, in most areas less than a metre in height. This shoreline already appears to be stable. For this type of shoreline it is difficult to apply the 3:1 stable slope allowance.

Since the shoreline is sheltered (not open to the lake) and erosion potential would be more similar to a large inland lake than the open coast of Lake Ontario, it is recommended that the 15 metre erosion allowance (recommended for inland lakes) be used instead of the 30 metre erosion allowance. Based on the above discussion the stable slope allowance and recession rate will not be applied and the 15 metre erosion allowance will be used to define the erosion limit. The 15 metre setback should be measured from the toe of the slope or from the average long-term Lake Ontario water level for June (75.0 metres), which ever extends furthest inland.

### 2.2.7 Water Quality Analysis

Since no water quality data was available for the watercourses, a monitoring program was set up to establish baseline data and to compare the results with provincial and national water quality objectives for the support of a healthy ecosystem. The samples were collected by Lower Trent Conservation staff and analyzed at the Ministry of Environment and Energy laboratory.

Single grab samples were taken monthly at five stations from November, 1995 to December, 1996. During winter freeze-up and extended dry periods, sampling was not possible. Four stations were located on Dead Creek: Station 1 in the headwaters, Station 2 west of 2nd Dug Hill Road, Station 3 east of Wooler Road and Station 4 at the railway culvert that outlets to the Bay. One station (Station 5) was located on York Creek at Powerline Road (see Figure 4).

The set of parameters included: nitrate, nitrite, Kjeldahl nitrogen, ammonia, total phosphorus, suspended solids, turbidity, E-Coli, Faecal Streptococci, Pseudomonas



aeruginosa, and Biochemical Oxygen Demand (BOD).

The results are shown in Appendix E-Water Quality Results. Values that exceed Provincial Water Quality Objectives (PWQO), Canadian Water Quality Guidelines (CWQG) or Ministry of Health Recreational Water Quality Guidelines have been highlighted.

Limited water quality data for a storm sewer outfall to Dead Creek was also collected through the *City of Trenton Pollution Control Study* (Phase 1).

As part of the State of the Watershed Report, a Benthic Invertebrate Survey was completed for four sites (see Figure 4) along Dead Creek using the "kick method" to provide an indication of habitat condition. The results are discussed in the earlier report.

### 2.2.8 Natural Areas Inventories

The most recent wetland evaluation of the Dead Creek Marsh was completed by Jon Boxall and Ed Poropat in 1993 using the MNR Southern Ontario Wetland Evaluation. The summary of the evaluation is included in Appendix C and a copy of the evaluation is on file at the Conservation Authority office.

Three Natural Area inventories were completed by Vivian Brownell in 1993 and summarized in Waterfront Natural Areas - Part 1: An Overview of Natural Areas Along the Lake Ontario Waterfront from Burlington to Trenton (Brownell, 1993a) and Waterfront Natural Areas - Part 2: Biological Inventory and Evaluation of 28 Natural Areas Along the Lake Ontario Waterfront from Burlington to Trenton (Brownell, 1993b). The areas inventoried include:

- the Dead Creek Marsh (boundaries differ from the MNR wetland as it includes only the area north of the Murray Canal and includes upland areas)
- Wooler Road Woods
- Dead Creek Escarpment Woods and Alvar

To determine significance, each area was evaluated in terms of ten selection criteria:

- landform representation, rarity and diversity
- hydrological function
- vegetation community representation and diversity
- vegetation community rarity
- quality of habitats and communities
- species diversity
- species of concern

- · habitat for seasonal concentrations of wildlife
- area size, shape, and buffering capability
- linkage and clustering

If two of the ten criteria were met, the area was identified as a Significant Natural Area along the Waterfront. These same criteria were later used in identifying Significant Natural Areas in the lower Trent region and are an acceptable means of identifying significance of natural habitat areas for use in implementation of the natural heritage policies in the Provincial Policy Statement. Brownell (1993b) provides an explanation of how these criteria were applied.

As part of this study two further inventories were completed.

- a wetland evaluation of the Dead Creek Headwater Wetland using the MNR Wetland Evaluation, and
- an inventory of the Dead Creek Headwater Woods using the criteria used by Vivian Brownell in her work along the Waterfront and in the lower Trent region.

These inventories were completed by Jeff Kaiser, as part of the Totten Sims Hubicki Associates report on the natural features (Appendix C).

Information relating to natural areas outside of the inventoried wetlands was collected by Conservation Authority staff through aerial photograph interpretation and site visits.

### 2.2.9 Comprehensive Impact Assessment

A Comprehensive Impact Assessment was completed by Ecological Services in 1997 for the Provincially Significant Dead Creek Marsh and two significant natural areas: the Wooler Road Woods and the Dead Creek Escarpment Woods and Alvar (Appendix D). This study was based on a review of the inventories, municipal planning documents, site inspections and a review of the pertinent literature. The report makes recommendations to help meet the objectives of the Provincial Policy Statement with regards to development on lands in or adjacent to significant natural heritage features. The recommendations have also been applied to the Dead Creek Headwater Woods and Wetland.

### 2.2.10 Community Input

Community involvement in developing this Subwatershed Plan began in 1995 with preparation of the *State of the Watershed Report*. Interviews with watershed residents and a landowner questionnaire provided information about the area and helped to identify watershed issues. The initial survey was sent to 165 residents/landowners in the area in January 1996. Fifty-seven questionnaires were returned. A mailing list of interested citizens was developed from the questionnaire.

With initiation of the Subwatershed Plan in 1996, a public consultation program was developed to allow opportunities for public input. A Watershed Interest Group was formed to represent the interests of the community. This group was comprised of nine representatives from the watershed and met with Conservation Authority staff, consultants, the Steering Committee and Technical Review Group periodically throughout the study to provide input. Newsletters were used to provide updates to the public, and public meetings and questionnaires used to gather public input.

A complete record of the public consultation program--newsletters, questionnaires, meeting minutes, notices of public meetings--are included in Appendix A.

# 3. Watershed Features

A watershed is more than a water collecting system. It is a network of diverse, interconnected habitats that are home to communities of plants and animals. The backbone of the watershed is its stream and valley corridors, which link the headwaters to the stream's mouth, and also link lowland, or streamside habitats to upland or tableland habitats (Metropolitan Toronto Region Conservation Authority, 1994). In this chapter, the physical and biotic features of the watershed and the linkages between them are described.

### **3.1 WATERSHED DELINEATION**

Prior to European settlement, a large expanse of cattail marsh and swamp, now known as the Dead Creek Marsh, extended from the Bay of Quinte to Stoneburg Cove. Three small creeks (Dead Creek, York Creek and Hutchinson Creek) drained land from the north into the wetland.

The Murray Canal, a five mile canal extending from the Bay of Quinte to Presqu'ile Bay, was constructed between 1882-1890 (Calnan, 1987). The canal bisected the Dead Creek Marsh, resulting in six isolated wetlands (Boxall and Poropat, 1993) as well as redefining the original watershed and altering the hydrologic flow of the upper Bay of Quinte (QRAP Coordinating Committee, 1993). Dead Creek still flows into the marsh on the north side of the Murray Canal. However, Hutchinson Creek and its tributary, York Creek, no longer flow into the marsh but now drain directly into the Murray Canal through a culvert under the canal road. The Dead Creek Marsh is connected hydrologically with the Bay of Quinte by a culvert under County Rd. 33. There is no evidence of a culvert connecting the marsh with the Murray Canal (Alyea, pers. comm.).

The watershed boundary for this study is defined as all the land area north of the Murray Canal that drains directly into Dead Creek or the Dead Creek Marsh as well as the lands draining into York Creek north of the old Grand Trunk railway line. Land within Roseland Acres/Princess Acres and along County Rd. 33 drains directly into the Bay of Quinte and has also been included in the study area. The watershed boundaries are shown on Figure 5.

While the southern portion of the study area is bounded by well recognizable features, the Murray Canal and the Bay of Quinte, the other boundaries are more difficult to define. The east boundary of the watershed is located within the City of Trenton. Stormwater from the area west of Dufferin Avenue, drains into Dead Creek. The northern boundary of the Dead Creek watershed is in the area of County Rd. 2; the Mayhew Creek watershed is to the north. A kame moraine, which extends westward from Mount Pelion, marks the division between these two watersheds. The northern boundary of the watershed cuts across County Rd. 2 and the Wooler Road (County Road 40). The western watershed



divide runs in a general southerly direction from York Subdivision, crosses McMaster Road, and continues southward to English Settlement Road and the Dead Creek Marsh.

The watershed area is approximately  $11.5 \text{ km}^2$  (1150 ha). Eighty-five percent of the watershed is located in Murray Township with the remaining 15% in the City of Trenton.

### **3.2 PHYSICAL LANDFORMS**

Geology, topography, soil types and climate influence the distribution of water and natural biotic communities on the landscape, as well as human use of the land. An understanding of these physical characteristics is essential in determining the suitability of land use activities including development, agriculture, recreation, stormwater management and waste disposal (eg. septic systems).

### 3.2.1 Bedrock Geology

The underlying limestone bedrock in the Dead and York Creek subwatersheds is of the Lindsay Formation. It was created by the deposition and compaction of calcareous sediments originating from seas that engulfed Eastern Ontario during the middle of the Ordovician period, approximately 415 to 430 million years ago (Freeman, 1979). Boreholes taken at the Carrying Place Landfill Site (Dillon, 1991) and well water records (OMOEE, 1995) indicate that the limestone is highly fractured with many seams of dark grey clay.

An exposed bedrock plateau runs in an east-west direction across the watershed. This limestone plain ends in a partially buried escarpment, 5 m to 12 m in height. The south-facing escarpment extends from the Dead Creek Marsh to Trenton, where the escarpment comes to a point known as Mount Pelion. Below the escarpment, the bedrock appears to be buried more deeply by overburden, probably as a result of nearshore deposition by Lake Iroquois.

### 3.2.2 Physiography

The Dead and York Creek watersheds are identified as part of the Iroquois Plain Physiographic Region<sup>1</sup> by Chapman and Putnam (1984), representing lands that were inundated by the post-glacial Lake Iroquois which proceeded Lake Ontario. The scraping action of ice and the sorting of sediments by meltwater that occurred during the recession of the Wisconsinan ice front during the Pleistocene Epoch (12,500 years ago) formed many

<sup>&</sup>lt;sup>1</sup> Other sources (Brownell, 1993b; Mirynech, 1963) indicate that the Prince Edward Peninsula Region extends into the watershed

of the surface features of the watershed (Waterfront Regeneration Trust, 1995). Lake Iroquois covered the lowland area around Lake Ontario when the last glaciers were receding (Chapman and Putnam, 1984) and formed a flat plain. As a result of this inundation, landforms have been somewhat smoothed over and soils in the region have developed from both glacial and lacustrine deposits. Since the area was once an old lake bed, the topography is quite flat with the exception of the limestone escarpment that bisects the watershed in an east-west direction.

#### The Escarpment

The Dead Creek Escarpment is clearly the most significant physical feature in the watershed. It accounts for the main variation in topographic relief within the watershed and is the principal factor in the origin of Dead Creek itself. No research discussing the origin of the escarpment has been found, but it is clearly of ancient origin. The fact that the Dead Creek Escarpment is buried by glacial materials demonstrates that its origin certainly predates the most recent (Wisconsinan) glaciation (Appendix C). However, its character was certainly accentuated by the "Trent embayment" of post-glacial Lake Iroquois (Chapman & Putnam, 1984).

The development of moderately large benches or shelves in limestone bedrock in response to precipitation and freeze-thaw cycles over many years is not uncommon (Gosselin <u>et al.</u>, 1975) and this may explain the development of the Dead Creek Escarpment. What is missing to support such a hypothesis is the limestone rubble and talus that would have accumulated at the base of the escarpment. For the most part, these appear to have been carried away by glacial movements, likely to have been dropped in the Lake Ontario basin. Some small accumulation of waterworn limestone cobbles has been noted in the uppermost basin of the Dead Creek Headwater Woods and Wetland (Appendix C).

The escarpment's uppermost strata are best revealed in the road cut near the south end of the Wooler Road. East of Wooler Road, an upper bench of the escarpment was used as the bed of the long-defunct Grand Trunk Rail Line.

#### **Physiographic features**

The physiography of the area can be divided into four distinct areas, as shown in Figure 6.

A ridge of sand and gravel, known as the *Trenton kame moraine*, extends from Trenton to Smithfield (Chapman and Putnam, 1984). This deposit marks the boundary between the watersheds of Dead Creek and Mayhew Creek. The ridge formed by glacial meltwater streams, was smoothed over when the area was submerged, to form a gently rolling hill on the south side. The north side of the deposit is very steep flanked, particularly near Mount Pelion. Gravel and sand have been extracted at several locations along the formation. An



operating gravel pit exists at the northern boundary of the watershed, east of 2nd Dug Hill Road.

South of County Rd. 2, a *clay plain*, formed by glacio-lacustrine activity, stretches across the watershed (Chapman and Putnam, 1984). The water well records for Northumberland County (OMOEE, 1995) indicate that overburden depth in York Subdivision, a residential area at the Wooler Road/County Rd. 2 intersection, ranges from 6.0 metres to greater than 13.8 metres.

A sand plain, created by glacio-lacustrine activity, extends southward from the clay plain to the Murray Canal (Chapman and Putnam, 1984). Surficial deposits, consisting of a deep layer of glacial till composed of blue/grey clay with bands of gravel, are overlain by post-glacial sand. A few wells in this area extend through approximately 22 metres of overburden (OMOEE, 1995).

Chapman and Putnam (1984) include the limestone escarpment in the sand plain. Other sources indicate that the shallow layer of drift (less than 0.3 metres) that covers the bedrock along the Dead Creek Escarpment forms the northern margin of the Prince Edward Peninsula Region (Brownell, 1993b; Mirynech, 1963). Dillon (1991) illustrates the proximity of the bedrock to the surface at the Carrying Place Landfill Site located along the escarpment (Figure 7).

A *limestone plain* follows along the Trent River and is marginally within the eastern portion of the watershed (Chapman and Putnam, 1984).

### 3.2.3 Soils

As a result of variation in surface deposits, topography and accumulation of organic material, a range of soils have developed within the watershed. Figure 8 shows the distribution of soil types as described in the Northumberland County Soils Map (Hoffman and Acton, 1974). Descriptions of each of these soils are provided in Table 1.

To assist with developing the hydrologic models and stormwater management options, the different soil types within the watershed have been classified into three main categories:

- Sandy Loam soils (SCS Hydrologic Soil Group AB);
- Loam soils (SCS Hydrologic Soil Group B);
- Silty Clay Loam soils (SCS Hydrologic Soil Group C).

The location of these major soil classes is shown on Figure 9. The soils within the different classes have different abilities to infiltrate precipitation. Generally sandy soils have higher infiltration capacities than heavier soils (clay and loam). The majority of the soils in the study area are loam and silty clay loam, both of which have relatively low infiltration





SCALE VERT. 1:150 HORIZ. 1:500

Cross-section A-A1

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Source: Dillon, 1991



Table 1 Soils			
SOIL TYPES	LOCATION	DESCRIPTION	
Pontypool gravelly sands	occur no <del>r</del> th of County Rd. 2	underlying layers of gravel and sand permit rapid drainage (Hoffman and Acton, 1974).	
Smithfield and Schomberg silty clay loams, Bondhead loams, Newcastle silt loams)	occur near County Rd. 2 (Hoffman and Acton, 1974).	well drained soils that have developed on lacustrine deposits very few limitations for the production of agricultural crops (OMAF, 1962).	
Simcoe silty clay loam	occur in the northern portion of the watershed from 2nd Dug Hill Road to Hendrick's Road.	poor soil drainage (Hoffman and Acton, 1974) may pose constraints for construction and septic tanks (Dunne and Leopold, 1978)	
Fa <del>r</del> mington loam	overlies the bedrock adjacent to the escarpment.	natural vegetation adapted to the droughty conditions associated with this soil type occur along the escarpment. high runoff rate due to the limited soil volume for infiltration. generally this area is unsuitable for crop growth (OMAF, 1962).	
Marsh and Muck Soils	-the Dead Creek Marsh represents the largest formation of marsh and muck soils. muck can also be found along 2nd Dug Hill Road. may occur in other locations where wetland exists along the base of the escarpment.	Marsh are mineral soils that are formed in areas flooded by shallow water where there is little decay of organic matter. Muck consist of organic deposits that have accumulated in shallow lakes or wet, undrained depressions.	
Tecumseth and Grandby sandy loams	occur in the Old Carrying Place Road area	poor drainage is characteristic of these soils (Hoffman and Acton, 1974).	


capacities. However, the soils in the north east corner of the watershed are sandy with high infiltration capacities.

Characteristics such as soil texture, permeability, and soil depth affect the drainage of the land, runoff rates, and groundwater recharge (Driscoll, 1986; Dunne and Leopold, 1978) and consequently the suitability of the land for particular land uses (Hoffman and Acton, 1974). These factors are important considerations for stormwater management.

# **3.3 CLIMATE**

The Dead and York Creek watersheds lie within the South Slopes climatic region of Ontario, which stretches from London to Kingston. It is characterized by an annual mean temperature of 7.5 C (45 F). The region experiences an annual mean precipitation of 80-85 cm (32-34 inches) and an annual growing season of between 200 - 210 days. Local physiography, land use and the nearshore effects of the Bay of Quinte and Lake Ontario affect the climate of this area (Totten Sims Hubicki Associates, 1995).

While long term recorded climate appears to be stable, short term fluctuation and events can cause significant environmental impacts. These impacts can affect water quality, biological production, species composition in water bodies and agricultural production (Totten Sims Hubicki Associates, 1995).

# **3.4 WATER RESOURCES**

The hydrologic cycle is the basic natural cycle affecting water movement. It involves numerous processes including precipitation, infiltration and runoff. The surface water and groundwater regime are controlled by climate and the physical features of a watershed.

## 3.4.1 Surface Water

The study area is drained by two watercourses--Dead Creek and York Creek. A small hill marks the divide between the drainage basins of Dead Creek and York Creek. Some areas within the study area drain directly into the Bay of Quinte, Murray Canal and the Dead Creek Marsh.

Lands above the escarpment are relatively level and for the most part are poorly drained due to the shallow soils that overlie the bedrock. Limestone plains are frequently fractured and fissured and there may well be some bedrock capture of surface drainage. Seepage on the face of the Dead Creek Escarpment is reported by Brownell (1993b) and Totten Sims Hubicki Associates (Appendix C). Shallow bedrock depressions on the escarpment plateau result in areas of flooded or seasonally wet soils that cannot be readily drained by surface drains due to relatively low topographic gradients.

Lands below the escarpment are also generally flat, though sloping slightly to the south west. A low divide causes drainage from about half of the area to flow directly to the Bay of Quinte, via diffuse surface flow or roadside drains. Drainage from the northern half of this area is captured by Dead Creek. Soils are generally sandier and deeper than those above the escarpment and this may reflect some nearshore deposition by post-glacial Lake Iroquois (White, 1996).

#### Dead Creek

Dead Creek flows from Hanna Park in Trenton along the foot of the limestone escarpment to the northeast corner of the Dead Creek Marsh. It is approximately 6 km in length, with a mean slope of 0.12%.

A wooded wetland area within Hanna Park forms the headwaters of the creek, with the stream originating immediately downstream of a storm sewer outlet south of the McGill Street - Parkside Drive intersection. Immediately downstream of the storm sewer outlet the stream is relatively steep (0.6%) with cobbles and small boulders lining the stream bed. The adjacent lands are part of the Trenton Escarpment Natural Habitat Area, acquired by the Conservation Authority in 1977 to serve as a buffer zone for storm and flood water runoff within the City of Trenton (LTRCA, 1987).

As the stream approaches 2nd Dug Hill Road, from the east, it becomes much flatter (0.1% slope) and wetlands and areas of ponding occur. An in-stream pond exists directly east of 2nd Dug Hill Road. The stream bed and overbanks are covered with short grasses since the adjacent lands are pastured. Immediately west of 2nd Dug Hill Road, pasturing does not occur and dense grasses grow within the stream bed. The creek slope is approximately 0.3%. On both sides of the Wooler Road the land is once again used for pasture and no dense grass vegetation is found within the creek or on its overbanks. East of the Dead Creek Marsh the slope of the creek flattens to approximately 0.1% and vegetation consistent with the marsh occurs.

Water exists year round in Dead Creek, but flow tends to be minimal except during periods of heavy rainfall or snow melt. Surface water from land north of the escarpment drains southward through roadside ditches and ephemeral streams flow over the escarpment into Dead Creek. Water flowing over the escarpment forms small cascading streams.

The extent of the regional flood has been mapped for Dead Creek (Figure 10). The escarpment marks the extent of flooding on the north side of the creek, but the flood plain tends to be quite wide in places, because of the flat topography. In the area of 2nd Dug Hill Road, a spill occurs in a southerly direction.

## York Creek

York Creek originates south west of the County Rd. 2 - 2nd Dug Hill Road intersection. It conveys flows in a southwesterly direction for 10 km through agricultural lands at a mean slope of 0.19%. Ultimately York Creek joins with Hutchinson Creek which in turn outlets into the Murray Canal. In its upper reaches, York Creek resembles a small ditch or drainage swale and flows through agricultural land with a slope of approximately 0.33%. Immediately east of Wooler Road, the creek widens into a flat flood prone area, vegetated with dogwood and willow, and the slope decreases to 0.2%. West of Wooler Road, the creek has been recently channelized (in 1995). To the east of McMaster Road, it becomes less defined as it enters a small patch of hardwood swamp. Runoff from a portion of York Subdivision is discharged at the south end of the subdivision to an old field and drains towards this hardwood swamp (Totten Sims Hubicki Associates, 1983). The slope of the creek is 0.1% in this area. The slope increases to 0.5% and the channel becomes well defined in the agricultural lands between McMaster and Powerline Road. South of Powerline Road, the watercourse becomes significantly more steep (1.1% slope) and enters into a relatively large area of bushland. Further south, York Creek crosses the abandoned Grand Trunk rail line. Below the railway line, the creek again has undergone recent channelization, as it flows westward into Hutchinson Creek. Water flows in the creek only during periods of high precipitation or spring-melt.

The extent of the regional flood has been mapped for York Creek (Figure 10). Because of the flat topography, the flood plain tends to be quite wide. Between 2nd Dug Hill Road and Wooler Road, two spills occur during the regional storm, and water from York Creek flows into the Dead Creek watershed.

## Dead Creek Marsh

The Dead Creek Marsh north of the Murray Canal, is a 69 hectare area (Boxall and Poropat, 1993) consisting of an open body of water which extends from the Murray Canal to the Bay of Quinte. Cattail marsh and swamp vegetation surround the open water.



The hydrology of the Dead Creek Marsh is maintained by the Bay of Quinte via culverts under County Rd. 33 and the abandoned CNR line, as well as direct seepage. It is also maintained by drainage from Dead Creek and indeterminate drainage from the Dead Creek Escarpment. Presumably, these sources are needed to maintain the wetland in its current form. During periods of low water, the culverts have become blocked with debris (eg. grasses, cattails), restricting flow into the Bay of Quinte. During spring runoff and following heavy rainfalls when water flow is high, the vegetation is usually flushed out of the culverts into the Bay. More recently, large cattail mats have caused blockage of the culvert in the spring, causing the wetland to flood onto adjacent upland. Such blockage has the potential to interfere with fish migration.

#### Murray Canal

This five mile long canal extends from west to east in a linear fashion from Presqu'ile Bay to the Bay of Quinte at Twelve O'Clock Point, separating Prince Edward County and the southern tip of Northumberland County from the mainland of Ontario. Canal construction began in 1882, the work done by horses and slush scrapers (Calnan, 1987). The hummocky terrain directly north of the Canal Road is the result of emptying the scrapers. The canal is lined with cut limestone walls and rip-rap. Dredged approach channels occur at both ends. The 100-year flood is contained within the canal.

#### Bay of Quinte

The Dead Creek watershed drains into the west end of the upper bay of the Bay of Quinte. The shoreline adjacent to the watershed is low lying and consequently the banks are stable with little erosion potential (Cairns and Noble, 1985). However, shoreline development has physically altered the nature of the shoreline. Aerial photographs taken in 1953 show a continuous marsh stretching between the Murray Canal to the mouth of Dead Creek and trees along the shoreline. Over the years, much of the marsh has been destroyed and parts of the shoreline have been hardened by retaining walls and stone.

The extent of flooding during the 100-year storm event has been mapped under the Flood Damage Reduction Program (FDRP). The FDRP mapping (Figure 11) shows the 100 year water level but does not account for wind set up and wave uprush. These processes need to be factored in when considering development adjacent to the Bay.

## 3.4.2 Groundwater

Land use planning plays an important role in the protection of groundwater resources (Driscoll, 1986). Decisions which consider areas of rapid surface water infiltration, groundwater movement, or the ground's capacity to adsorb contaminants (Driscoll, 1986) are very important in maintaining quality and supply of the resource.



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## DEAD & YORK CREEK SUBWATERSHED PLAN

## 3.4.2.1 Direction of Flow

Information on groundwater sources was obtained through the well water records for Northumberland County (OMOEE, 1995), while a landowner questionnaire provided general information on well water quality and supply. Static water levels were plotted on a plan of the watershed and contours of water level were drawn. Drawing 6 in Appendix B illustrates the groundwater contours. This drawing shows that the flow of groundwater in the area is towards the Bay of Quinte.

The Trenton Moraine that borders the Mayhew Creek watershed and the Dead and York Creek subwatershed consists of a deposit of permeable sand and gravel. This deposit may permit rapid surface water infiltration (Hoffman and Acton, 1974) to groundwater, and should be considered as an important recharge area. However, there is no documentation as to the direction of groundwater movement in this area (Sandu, 1996).

At the escarpment, the ground water surface slopes steeply down towards the Dead Creek Marsh (Dillon, 1991) and discharges into the marsh (Dillon, 1991). Figure 7 shows the groundwater table at the escarpment. Numerous springs and seeps were noted along the limestone escarpment (Brownell, 1993b). Due to the proximity of the Bay of Quinte, the marsh is not considered as a regionally significant discharge area (Brownell, 1993b).

## 3.4.2.2 Groundwater Yield

A significant number of the wells in the area have groundwater yield less than 6 gallons per minute (Appendix B). This is generally considered as the minimum required for a typical domestic yield. This needs to be kept in mind as development occurs in the watershed since increased impervious area will reduce infiltration and may have a negative impact on the groundwater resource as a whole.

## Bedrock Aquifer

Limestone bedrock provides the main source of groundwater for domestic wells in the watershed. The majority of wells extend deep into the bedrock (OMOEE, 1995) due to the limited thickness of the overburden.

Dry wells were sporadically recorded throughout the watershed, possibly a result of irregular fractures in the bedrock (Totten Sims Hubicki Associates, 1995). Well water quality and supply was considered good for most of the year by surveyed landowners/residents (White, 1996). Several landowners noted that low supply and detectable levels of sulphur, salt or iron in the water occurred during dry summers. One landowner with property adjacent to English Settlement Road indicated that well water quality was consistently poor.

## Overburden Aquifer

Overburden well yields are generally considered very low by the MOE (1968) in the Lake Ontario drainage basin. However, a number of domestic wells in York Subdivision, Princess/Roseland Acres and surrounding the Old Carrying Place Road obtain groundwater from above the bedrock. Well water records (OMOEE, 1995) for these areas indicated a layer of grey-blue clay existing directly above deposits of gravel or sand. Water was located in gravel or sand layers directly above the bedrock.

Most surveyed landowners in these areas indicated excellent quality and supply (White, 1996). However, poor quality well water was noted by two landowners in Roseland Acres. The poor quality was attributed to the close proximity of neighbouring septic tank systems.

## 3.4.2.3 Additional Groundwater Contamination Concerns

The following additional concerns have been noted:

• The Carrying Place Landfill Site, which closed soon after 1978 (Dillon 1991), is located on the south side of English Settlement Road and on the edge of the escarpment (Lot 11, Concession B). Two consulting firms, Dillon (1991) and Proctor and Redfern (1995) were involved with assessing the effect of landfill leachate on groundwater in the area. Samples measured within the wetland did not show any significant impairment or degradation of groundwater quality. As landfill operating records are not available for the site, little is known about the nature of the waste. The Dillon study (1991) mentioned that there may be some potential for an environmental impact if buried drums exist in the fill area.

• Well water from Lot 7, Concession B, tested in 1995, was found to have unsafe bacterial levels, possibly associated with the condition of septic systems in the area (MacLelland Water Technology, 1995).

## 3.4.3 Surface Water Quality

## 3.4.3.1 Bay of Quinte

Water quality problems in the Bay of the Quinte are attributed to excessive nutrient enrichment, bacteriological contamination, persistent toxic contaminants and destruction of fish and wildlife habitat. Tributary loadings of phosphorus, bacteriological and toxic contaminants associated with urban stormwater, agriculture and industrial activity, were identified by the QRAP Coordinating Committee (1993) as areas contributing to major water quality concerns in the Bay of Quinte. Quinte RAP's Stage 2 Report provides a description of the problems in the Bay and a series of recommendations aimed at restoring the Bay's ecosystem. The Dead and York Creek watersheds are but one small area of the Bay of Quinte watershed, but those lands closest to the Bay are of greatest concern.

#### 3.4.3.2 Dead and York Creek

Historical data on surface water quality for watercourses in the study area is not available; therefore, surface water quality testing was initiated and a benthic invertebrate survey completed during preparation of the *State of the Watershed Report* (1996).

#### Water Quality Data

Water sampling starting in November, 1995 and continued until December, 1996. No sampling was done through the winter months due to freeze-up of the watercourse. Five stations were sampled: four stations on Dead Creek and one on York Creek (see Figure 4).

The data is presented in Appendix E. Highlighted cells indicate values that exceed *Provincial Water Quality Objectives* (PWQO), *Canadian Water Quality Guidelines* (CWQG) or *Ministry of Health Recreational Water Quality Guidelines*. Values that exceed these guidelines are indicative of water quality problems. Table 2 provides the mean value for each station; the geometric mean was calculated for the bacteriological results. The data is meant to be used as base line data to compare with future water quality assessments to measure impacts of development on Dead Creek and York Creek. However, the results provide a general indication of the present water quality in the streams.

#### **Bacteriological Results:**

E. coli counts in samples collected from Stations 1 and 3 and faecal streptococci counts in samples collected from Stations 2 and 3 tend to exceed the 100 counts per 100 ml, recommended as the safety limit for bathing. The QRAP has identified bacterial contamination as a problem in the Bay that results in beach closures and human health implications. In urban areas, bacterial contamination can occur from sewage bypasses into the storm sewer system, stormwater runoff, and domestic pet and gull droppings. In the rural areas of the Dead and York Creek subwatersheds, livestock manure and faulty septic systems are most likely the major bacterial sources.

At Station 1, which receives runoff from the urban area, storm sewer runoff is most likely a high contributor of bacteriological contamination. The mean value for E. Coli and Faecal Streptococci is 132 counts per 100 ml and 89 counts per 100 ml, respectively. The mean value for Pseudomonas aeruginosa was 3 counts per 100 ml, indicating that human wastes are not a major concern at this location. In 1997, the *Trenton Pollution Control Planning Study (Phase 1)* was conducted on behalf of the City of Trenton and Environment Canada (XCG Consultants Ltd., 1997). Water sampling of the City's storm sewers in 1997 was conducted during dry and wet conditions for bacteriological testing. One of the sampling stations included the storm sewer at Parkside Drive that drains into Dead Creek. Dryweather contamination above 500 E. Coli per 100 ml and wet-weather contamination

## Table 2

Surface	Water Qu	uality Mo	nitoring I	Data - Sur	nmary		]	[				-	
Station Number		Total Nitrogen (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Kjeldahl (mg/L)	Ammonia (mg/L)	Total Phosphorus (mg/L)	Suspended Solids (mg/L)	Turbidity (FTU)	*E-Coli (c/100mL)	*Fecal Strep (c/100mt)	*Pseud.aur (c/100mL)	BOD (mg/L)
1	Mean	2.42	0.81	0.04	143	0.23	1. 0.51 I	41.56	9.47	132	89	3	2.48
	Std.Dev.	2.69	0.64	0.11	2.39	0.35	0.74	10740	28.33				3.87
	N	16	17	17	18	16	18	18	16	16	16	16	16
2	Mean	0.87	0.1	0.01	0.78			7.67	1.6	23		2	1.19
	Std.Dev.	0.47	0.19	0	0.49	1.19	0.08	17.26	2.36				0.68
	N	17	18	18	18	18	18	18	16	16	16	16	16
	Mean	39.19	0.16	0.19	39.01	13.22	5174	2919.41	278.52	832.15	282	4	97.64
	Std.Dev.	128.47	0.26	0.72	128.51	45.73	18.71	9297.49	700.17				342.25
	N	17	17	17	17	17	17	17	15	15	15	15	15
4	Mean	1.27	0.09	0.01	12	0.08	120.1	21.71	5.36	10	21	2	1.59
	Std.Dev.	1.73	0.14	<b>0</b> .01	1.74	0.06	0.2	32.77	7.8				1.51
	N	18	18	18	18	18	18	18	17	16	16	15	16
5	Mean	2.22	B 1127 m	0.01	0.94	0.03	2768 B	13.22	3.57	10	49	3	1.18
	Std.Dev.	1.87	1.26	0	0.91	0.07	0.17	18.62	6.12				0.98
		9	9	9	9	9	8	9	9	9	9	9	8
	Evaluation Criteria		0.5	0.06	0.1-0.5	0.02	0.03			100/100mL	100/100mL		

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Evaluation Criteria:

Nitrate and Kjeldahl based on Ministry of Environment Water Quality Data Series, 1980

Nitrite based on Canadian Water Quality Guidelines (CWQG)

Ammonia based on Provincial Water Quality Objectives (PWQO)

Total Phosphorus based on PWQO, to prevent excessive plant growth in rivers and streams

E-Coli and Fecal Strep based on recreational water quality guidelines published by the Ministry of Health

Note: Standard Deviation assumes that its arguments are a sample of the population, it is calculated using the 'nonblased' or 'n-1' method

\*Geometric mean calculated for E-Coli, Fecal Strep & Pseud.aur

Total Nitrogen = Kjeldahl N + Nitrite + Nitrate

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above 100,000 E. Coli per 100 ml were reported. The report recommends that the City should focus on tracking down possible sources of dry-weather contamination for this system and three other contaminated sanitary sewers within the City and ensure that there is no possibility of cross-connection with the sanitary sewage collection system. The report also suggested that dry-weather sampling be carried out at points within the system to locate specific sewer pipe reaches where contamination is originating. The possibility of contamination from animal droppings (eg. raccoons) was also cited and further investigation is required.

Station 3 (Dead Creek at Wooler Road) tends to have the highest bacteria counts. The mean value for E. Coli is 832 counts/100 ml; for faecal streptococci, 282 counts per 100 ml. Unrestricted cattle access to the stream in this areas contributes to the high counts. A trailer park, located just upstream, has been identified as having poor well water quality, possibly due to the condition of the septic systems (MacLelland Water Technology, 1995). The septic systems from this trailer park could also be affecting water quality in the stream at Station 3. However, the mean Pseudomonas aeruginosa count at Station 3 is only 4 counts per 100 ml, indicating that human sewage is not a major concern, by the time the flow reaches Station 3.

At station 4, the mouth of the marsh, bacteria counts are below the critical level. This indicates that the marsh is having a die-off or dilution effect on the bacterial levels in the water and underscores the importance of protecting the marsh because of its ability to act as a natural filter and "purify" the water.

The samples collected from York Creek (Station 5) indicate that bacteriological results are within the acceptable range.

#### Phosphorus Concentrations:

The Bay of Quinte Remedial Action Plan has identified the need to decrease phosphorus concentrations to reduce the occurrence of algal blooms in the Bay. The mean concentrations of total phosphorus in samples collected from Dead Creek and York Creek exceed the guidelines at all five stations and the goal of .030 mg/l for the average total phosphorus concentration in the Bay. Sources of phosphorus include animal wastes and fertilizers. Phosphorus is often adsorbed onto soil particles, and concentrations can be extremely high where there is bank or stream bed erosion.

The highest phosphorus concentrations occur at Station 3 (5.74 mg/l) where there is unrestricted cattle access to the creek. The City of Trenton Pollution Control Study (Phase 1) included total phosphorus data (for the storm sewer at Parkside Drive) for two runoff

events in the summer of 1997. During event 1, the total phosphorus concentration in a mid-event grab samples was 0.25 mg/l; for event 2 it was 0.08 mg/l (XCG Consultants Ltd., 1997). These values both exceed the 0.03 mg/l criteria. This indicates that both urban and rural areas are contributing to the excessive phosphorus loadings. The phosphorus concentrations at Station 4, where Dead Creek empties into the Bay are lower than upstream, but still exceed the acceptable values.

#### Nitrogen Concentrations:

Total Kjeldahl nitrogen and ammonia concentrations exceed the guidelines at all five stations. Sources of nitrogen can be attributed to fertilizers and animal wastes. Nitrogen inputs have not been identified as a concern by the QRAP.

In general, the water quality data for this watershed are similar to the data collected for small watersheds in nearby Sidney Township (Totten Sims Hubicki Associates, 1995). Total phosphorus concentrations, Kjekdahl nitrogen concentration and bacteria counts exceed the evaluation criteria, and can be attributed to animal wastes, detergents, and fertilizer application to residential and agricultural lands.

#### Benthic Invertebrate Data

Water sampling indicates stream conditions at the time of sampling. In contrast, benthic invertebrate sampling can provide a record of long term changes in the aquatic ecosystem. Invertebrates vary in their sensitivities to chemical and physical conditions of the aquatic environment and, consequently, the analyses of these communities can provide significant information on habitat conditions and ecosystem health (Totten Sims Hubicki Associates, 1995).

Benthic invertebrates were collected at four stations along Dead Creek using the "kick method" (Frost *et al*, 1971). The results are presented in Table 3. The creek was found to have a low diversity of benthic invertebrates. Low flow conditions exist for much of the year in Dead Creek. Reduced habitat space, low current velocity and reduced transport of organic material (Totten Sims Hubicki Associates, 1995) associated with low flow conditions, may explain the limited diversity of organisms collected. Freshwater snails and clams were the most abundant groups collected at all stations. Ephemeroptera and trichoptera, organisms that indicate good water quality (Totten Sims Hubicki Associates, 1995), were collected in small numbers at the two stations west of 2nd Dug Hill Road and were more numerous at one of the upstream stations.

Invertebrates provide an important food source for fish (Totten Sims Hubicki Associates, 1995). The limited diversity of animals collected suggests that Dead Creek has limited

Table 3         Dead Creek: Benthic Invertebrate Survey							
Order	Family		Number at				
		Stn.1	Stn.2	Stn.3	Stn.4		
	Planorbidae	270	11	33	26		
Amphipoda	Gammaridae	5		10	2		
Basommatophora (gastropod)	Lymnaeidae	71	59	19	27		
Coleoptera	Elmidae	1		1			
Diptera	Chironomidae			1	10		
Diptera	Tipulidae	1	15				
Ephemeroptera	Siphlonuridae			1			
Heterodonta (bivalve)	Sphaeriidae	27	15	35	7		
Hirudinea		1	1		1		
lsopoda	Ascellidae	1	10	8			
Mesogastropoda (gastropod)		8	28	73	130		
Nematoda		5	2	8	2		
Odonta					1		
Oligochaeta	Lumbriculidae		4	1	5		
Trichoptera	Phryganeidae		17	2	2		
TOTALS		390	162	192	213		

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\*Sampling occurred October 18 and 25, 1995

## Station Descriptions

Station 1:	Located in the swampy headwaters. The channel is poorly defined with a thick layer of decomposing organic matter (eg. grasses, leaves).								
	Water velocity: 0.06 m/s	Temperature: 9°C	Dissolved oxygen: 5.6 mg/l						
Station 2:	Located in a wooded area east of Second	nd Dug Hill Road.							
	Substrate consists of fine gravel and sar	nd.							
	Water velocity: 0.10 m/s	Temperature: 10°C	Dissolved oxygen: 8.7 mg/l						
Station 3:	Located west of Second Dug Hill Road Substrate consists of sand and gravel.	in a hardwood forest.							
	Water velocity: 0.10 m/s	Temperature: 9°C	Dissolved oxygen: 7.3 mg/l						
Station 4:	Located east of Wooler Road.								
	Passes through open pasture land.								
	Water velocity: N/A	Temperature: 9°C	Dissolved oxygen: 0.34 mg/l						

habitat value for fish. However, more data would be required to confirm this. No benthic invertebrate data is available for York Creek.

# **3.5 NATURAL COMMUNITIES**

The natural communities in the Dead and York Creek Subwatersheds have developed in response to the physical characteristics of the watershed and the climate. Moisture and soil depth, appear to be particularly important in determining the distribution of various vegetation communities. These communities have in turn been affected by human activities on the land.

Prior to European settlement, this area was forested in mixed stands of pine, oak and hemlock (Bourdo, 1956), but by the late 1800's much of it had been cleared for timber or agriculture. It appears that over 95% of the land base within the watershed was in agricultural use at some period in the historic past (Appendix C). As a result of this considerable human impact, none of the present plant communities are unaffected by human disturbance. Cultivation has prevented forest regeneration on good quality farmland, and has been inhibited by erosion and livestock grazing on marginal farmland. Those communities that appear to be least affected are the wetlands, but they too have been impacted by drainage works, including the construction of the Murray Canal through Dead Creek Marsh, road and railway culverts, shoreline development, deforestation, and storm sewers that drain from the City of Trenton into Dead Creek.

Despite historic human disturbance, the larger areas of naturally occurring vegetation in the watershed remain reasonably healthy and have the potential to support biological communities of high quality.

Natural areas can present a constraint to development, depending upon their significance, and the type of development that might be proposed for an area. But a healthy, diverse natural area within a community can also translate into social and economic gains, and attract new growth to an area.

The benefits of natural areas include:

- improved groundwater and surface water quality
- flood attenuation
- enhanced stormwater management
- improved air quality
- healthy, diverse wildlife communities (habitat for rare species, biodiversity, linkages, protection of significant vegetation communities—wetlands, woodlands, alvars)

- tourism (scenery, clean water for fishing, swimming, boating)
- special place to live (scenic, diverse, healthy ecosystem)
- traditional natural resource products (timber harvesting, fishing, trapping, hunting)

Described below is the current state of the natural communities within the watershed. These woodlands and wetlands contribute to the rural character and lifestyles within the watershed and to the overall health of the local ecosystem.

## 3.5.1 Significant Natural Areas

Four natural areas within the watershed have been inventoried (Figure 12):

- 1) Wooler Road Woods
- 2) Dead Creek Escarpment Woods and Alvar
- 3) Dead Creek Marsh
- 4) Dead Creek Headwater Woods and Wetland

Brownell (1993b) identified the Dead Creek Marsh, the Dead Creek Escarpment Woods and Alvar and Wooler Road Woods as significant waterfront natural areas in a report for the Waterfront Regeneration Trust. In addition, the Dead Creek Marsh was evaluated as a provincially significant wetland (Mosquin & Wilson, 1986; Boxall and Poropat, 1993). The Dead Creek Headwater Woods and Wetland was evaluated as part of the Subwatershed Plan (Appendix C) and found to be significant, using the same criteria adopted by Brownell. These natural areas form large nodes in the green net that has been cast across the watershed.

## Dead Creek Marsh

The Dead Creek Marsh is a 326 ha provincially significant wetland, bisected by the Murray Canal. It was originally evaluated as a Class 3 Wetland by Mosquin & Wilson (1986). In 1993 it was re-evaluated using the current wetland evaluation methodology and was again found to be Provincially Significant. Brownell (1993b) treated the areas north and south of the Murray Canal as separate units during her work on significant natural areas along the Lake Ontario Waterfront (Newcastle to Trenton). She considered the wetland north of the Murray Canal, an 83 ha area named the Dead Creek Marsh, to be significant in the context of the "Waterfront", on the basis of its fulfilment of 7 of the 10 evaluation criteria. Since Brownell includes upland vegetation in addition to wetland communities and the boundaries of the two "Dead Creek Marsh's" differ, to eliminate confusion the two will be identified as follows: Dead Creek Marsh (PSW) for the larger Provincially Significant Wetland and Dead Creek Marsh (SNA) for the significant natural area identified by



#### Brownell.

The Dead Creek Marsh (SNA) includes marsh, swamp, and forest. The marsh consists of a central open water channel dominated by floating and submergent vegetation such as Pond Lity (Nuphar variegata), Water Milfoil (Myriophyllum sp.) and waterweed (Elodea sp.) (Boxall and Poropat, 1993; Brownell, 1993b). Brownell (1993b) also noted Northern Wild Rice (Zizania palustris) growing in the open water, a regionally rare plant along the Lake Ontario Waterfront (Newcastle to Trenton). An expanse of emergents, primarily cattail (Tuphg sp.) and sedge (Carex sp.) (Boxall and Poropat, 1993) grow around the open water. Swamp thicket exists in the north corner and along the east side of the wetland. These areas are characterized by scattered dense shrubbery. Some of the shrub species include Willow (Salix sp.), Speckled Alder (Alnus rugosa) and Red Osier Dogwood (Cornus stolonifera). Hardwood swamp occurs in the west corner and along the east side of the Dead Creek Marsh. Tree species associated with the swamp include Red and Black Ash, Red Maple, and Sugar Maple. Lowland deciduous woods grow adjacent to the wooded and thicket swamp areas. Tree species that prefer these moist soils include Sugar Maple, Black Cherry, Red Oak and White Birch. Although not included in the provincially significant wetland, Brownell (1993b) identified a Black Maple limestone forest along the escarpment. This is the only example found along the Waterfront.

Brownell (1993b) notes that the provincially rare Beggarstick (Bidens discoidea) occurs at the edge of the marsh. She also identifies three regionally rare plant species and 13 species that are rare along the Waterfront (Brownell, 1993b) in this portion of the marsh. Brownell noted that the Dead Creek Marsh SNA was excellent habitat for the provincially significant Least Bittern (but none were noted). According to the wetland evaluation (Boxall and Poropat, 1993) for the entire Provincially Significant Marsh, several provincially significant animal species are found in the marsh, including the Least Bittern, Black Tern, Caspian Tern, Great Black-Backed Gull, and Black Crowned Night Heron (Boxall and Poropat, 1993).

Disturbances to the marsh include the Murray Canal and its service roads that effectively bisect the marsh, channelling for boat access, and cattle grazing at the north end (Brownell, 1993b). The culverts under the railroad and County Rd. 33 have also had an impact on the marsh. Blockage of the culverts with cattail/debris mats has at times affected the hydrological connection with Bay, raising the level of the marsh.

#### Dead Creek Escarpment Woods and Alvar

The Dead Creek Escarpment Woods and Alvar is 128.8 hectares in area. It is located along English Settlement Road, west of McMaster Road. The natural area extends westward to

Hutchinson Creek, beyond the limits of this Subwatershed Plan.

The Dead Creek Escarpment Woods and Alvar was identified as significant as it met three of the ten criteria: landform representation and rarity, vegetation community rarity and significant species. Vegetation communities within this natural area include swamp thicket (willow, meadowsweet and red ash), deciduous forest swamp (silver maple), mixed forest (hemlock, white pine, white cedar, red ash, white birch, trembling aspen, and balsam fir) and limestone alvar (Canada bluegrass, spikes and rushes). Alvars are naturally open areas with a sparse growth of shrubs and herbs that are adapted to the shallow, calcareous soils overlying limestone bedrock. The alvars along the southern side of the Dead Creek Escarpment Woods are the only example of alvar habitat found along the Lake Ontario Waterfront. However, these alvars are not well developed and have been degraded by cattle grazing (Brownell, 1993b).

A provincially rare sedge (*Carex formosa*) is found in this natural area along with several other plant species that are regarded as regionally rare along the Lake Ontario Waterfront or in MNR, Eastern Region (Brownell, 1993b).

It appears that over the past half a century, this natural area has been expanding. A comparison of aerial photographs from 1953 to present day, show that much of the southern portion of the existing natural area was agricultural fields. In the past few decades, these fields have been abandoned and are currently undergoing natural regeneration. Human disturbances of the natural area include logging and cattle grazing.

#### Wooler Road Woods

The Wooler Road Woods is a 39.1 hectares natural area, located to the west of Wooler Road. It is comprised of two vegetation communities: mixed forest swamp and deciduous forest. The swamp is comprised of red ash, trembling aspen, silver maple, white cedar and balsam fir. The forest includes a mature sugar maple/beech complex, which is rare along the Waterfront. A provincially rare sedge (*Carex formosa*) as well as shagbark hickory (*Carya ovata*), a regionally rare tree species along the Waterfront, also occur within this natural area.

Wooler Road Woods was deemed to be "significant" as it met 5 of the 10 evaluation criteria. These include landform representation & rarity, community representation and diversity, vegetation community rarity, quality of habitats and communities and significant species.

Human disturbances include a hydro corridor, which bisects the woods, and has largely been overtaken by Purple Loosestrife (*Lythrum salicaria*). Heavy cattle grazing, tapping for maple syrup, garbage disposal/littering and logging occur within the area (Brownell, 1993b). A portion of this natural area is designated for industrial purposes (*Murray*)

Township Official Plan)--this type of development could adversely impact the natural area.

## Dead Creek Headwater Woods and Wetland

The Dead Creek Headwater Woods is the easterly end of the woodland linkage along the escarpment crest. It is a mosaic of hardwoods, mixed woods and conifer stands surrounding a wetland--the headwater of Dead Creek. The Headwater Woods occupies 53 ha, the wetland, 6.75 ha. The combined woodlands and wetland met three of the ten evaluation criteria and, therefore, has been identified as a significant natural area.

The Dead Creek Escarpment runs through the northwest side of this forest block and along most of its length, early mature hardwood forest is present on its buried slope. Sugar maple is the most dominant species, followed by white ash and beech and a mix of other species--bitternut hickory, hop-hornbeam and red oak. A mixed woods stand of white pine and sugar maple can be found within Hanna Park on the east side of the Natural Area. Some of this area has been affected by understorey cleaning to create a park-like lawn. Other stands of mixed woods occur on the west side of the Headwater Woods, where sugar maple, basswood and trembling aspen are present with white cedar. The southeastern third of the Headwater Woods is occupied by a relatively dense, but young stand of red cedar. A narrow strip of grassland (just over 1 ha) is located between the red cedar stand and the wetland.

The wetland can be divided into three units. The uppermost is a shallow, seasonally flooded, linear basin occupied by mixed wood swamp. The swamp is dominated by hardwoods, such as silver maple in the wet-mesic portion and black ash in the wet section, with a sizable presence of young white cedar. The middle section of the wetland is a permanently flooded cattail marsh that has developed on a drowned silver maple - black ash swamp. The lower section of the wetland includes a marshy flood plain including an in-stream farm pond. The wetland, was inventoried as part of this study using the MNR wetland evaluation and was found to be "not provincially significant". A total of 95 species of vascular plants were identified, with the greatest diversity occurring in the upper portion of the wetland. The mid and lower sections were found to provide important permanent and open water habitat for amphibians, waterfowl and aquatic mammals. The wetland greatly enhances the diversity of species in the adjacent woodland. The wetland also is important hydrologically as the headwaters of the creek. It currently receives drainage from adjacent residential development and has important functions in maintaining/improving water quality of the watercourse draining into the Bay.

## 3.5.2 Natural Corridor

The lands along the limestone escarpment are largely unsuitable for development or agriculture. As a result, the lands have been largely left alone and the core natural areas described above have developed. With the enhancement of connecting corridors at McMaster Road and between the Wooler Road and 2nd Dug Hill Road, these four natural

areas would form a green band along the Escarpment, stretching across the Dead Creek and York Creek watersheds. This natural area is part of a larger corridor, comprised of forests, wetlands and early successional forests, and stretches from Trenton westward nearly to Colborne. It is the largest such habitat in Ontario, south of Hwy 401 (Appendix D).

The natural corridor at McMaster Road, comprised mostly of red cedar, is approximately 45 metres wide. Where such a corridor is bisected by a road, a corridor width of 60 metres is recommended (Appendix D). A wider band of mixed vegetation is already establishing itself between Wooler Road and 2nd Dug Hill Road. Connecting together natural areas increases their value as habitat for wildlife. A network of natural areas can support a greater variety of animals and plants as animals are able to move from one area to another to find food and shelter and to breed.

## 3.5.3 Connecting Links and Nodes

In addition to the major natural heritage corridor in the watershed (described above), there is a network of secondary natural corridors that link up with the larger system--the natural vegetation growth along the Bay of Quinte shoreline, the watercourses and fencerows. In some places, vegetation has been removed for development, landscaping or agriculture, and the linkages have been broken.

In the Dead and York Creek subwatersheds, woody fence rows have been maintained between many agricultural fields. Fence bottoms offer a barrier to slow the wind and reduce soil erosion. In addition, they provide food and cover for wildlife and insects, and diversify the landscape for recreation and viewing. Maintaining these fencerows and enhancing the vegetation growth along them will contribute to the natural heritage system.

Much of the Bay of Quinte shoreline is residential, with some agricultural lands. Black Willow (*Salix nigra*) along the shore and the cattail marsh along the northern portion of the shoreline adjacent to Roseland Acres represents the remnants of the natural shoreline vegetation (Cairns and Noble, 1985). Re-establishing a natural vegetation buffer along the shoreline will help connect the other natural areas with the Bay and also contribute to improved water quality in the Bay.

The watercourses--Dead Creek and York Creek--connect the larger natural areas. Establishing and enhancing buffers along these watercourses will enhance wildlife habitat and water quality.

In addition to linear linkages are several small habitat nodes--wetlands, woodlands and old fields. Wetlands are scattered throughout the watershed. In addition to those wetlands within the four evaluated natural areas are a few, unevaluated wetlands, identified through aerial photography and field observations.

- A hardwood swamp, approximately 9.5 hectares in size, exists south of York Subdivision (Lot 10, Concession A) (Totten Sims Hubicki Associates, 1983; pers. obs., 1995). Vegetation consists of Red and Silver Maple, White Elm and Black Ash (pers. obs., 1995).
- A small swamp thicket (approximately 2.8 hectares) directly east of Wooler Road (Concession A, Lot 8) consists of a willow thicket interdispersed with patches of emergents (pers. obs. 1995). Aerial photographs from 1953 show this land as agricultural. The wetland may have formed following the construction of Wooler Road.
- Over the years, much of the marsh shoreline adjacent to the southern portion of Roseland Acres has been filled in and the shoreline hardened. A small cattail marsh which extends inland, is a remnant of this natural shoreline vegetation.

Within the study area, most of the remaining woodlands are in the four natural areas and follow along the escarpment. Not included within the inventoried natural areas is the pure, mature stands of Eastern Red Cedar (*Juniperus virginiana*) on the shallow soils along the limestone escarpment to the west of Wooler Road.

Old field and meadow communities have developed in the watershed on previously cultivated fields. These have been abandoned and have undergone natural succession. Land south of York Subdivision and Lot 6, Concession 1 (pers. obs., 1995) have developed into field communities. Typical vegetation includes native grasses, goldenrod (*Solidago sp.*), aster (*Aster sp.*), red osier dogwood and eastern red cedar. These old fields and meadows also have a role to play in the larger natural heritage system.

## 3.5.4 Animal Species

The upland and lowland vegetation communities within the watershed provide habitat for a variety of animal species. Many of the species reported in the watershed are characteristic of the agricultural/urban fringe across southern Ontario.

Several studies of the animal species within the watershed have been made, mainly in the vicinity of the Dead Creek Marsh (Brownell, 1993b; Boxall and Poropat, 1993). The principal large mammal is the whitetail deer, an animal that has adapted to the mandominated landscape of southern Ontario. The animals feed on agricultural lands and in parks and shelter in remnant woodlots and natural areas during the day. Natural food sources such as red osier dogwood, white cedar, maple, and beech (Brandon, 1983) are common in the watershed. Agricultural crops such as corn and soya beans supplement the natural diet. Coyote and fox have been sighted within the watershed; both are successful predators of rural and suburban lands in southern Ontario. During the inventory of the Dead Creek Headwater Wetland, numerous racoon tracks were observed and what appeared to be an old beaver lodge was seen in the middle of the cattail marsh. A variety of other small mammals are likely to be present including field mice, moles and voles.

The Dead Creek Marsh creates habitat for a number of wildlife species (see discussion above re: Dead Creek Marsh). The open water and vegetation cover provide nesting and feeding areas for a variety of wading and colonial birds as well as for waterfowl (Environment Canada, 1993; Boxall and Poropat, 1993). In the winter, the areas also provides cover for animals such as fox, coyote and winter birds (Boxall and Poropat, 1993).

Quinte RAP and the Canadian Wildlife Service have been involved with a Black Tern Breeding Enhancement Study. In the past, Black Terns have been observed nesting within the wetland and at the mouth of the Murray Canal (Richardson, 1994). However, nesting evidence was not found in a 1994 survey (Richardson, 1994). Platform and vocalization stations have been placed in the marsh to attract these birds to the area (Hartley, 1995).

In conjunction with Brownell's (1993b) work on significant natural areas along the Lake Ontario Waterfront, preliminary bird surveys were conducted in the Dead Creek Marsh and Dead Creek Escarpment Woods. Forty-eight species of birds were recorded including the red-tailed hawk, ruffed grouse, American woodcock, common flicker, downy and hairy woodpeckers, eastern king bird, eastern wood pewee, tree, bank and barn swallows, blue jay, common crow, black-capped chickadee, white breasted and red-breasted nuthatches, American robin, European starling, red-winged blackbird, etc. Pileated woodpeckers were observed during the examination of the Dead Creek Headwater Wetland. While no observations of confirmed breeding were observed, these birds are likely breeding in the watershed (Appendix C).

Information collected during the most recent wetland evaluation for the Dead Creek Marsh (Boxall and Poropat, 1993) indicates that several species of frogs, turtles, and snakes occur (Table 4). Midland painted turtles and a large population of green frogs were noted in the Dead Creek Headwater Wetland. These and other reptile/amphibian species are likely to occur in suitable habitat throughout the watershed.

Амр	HIBIANS	REPTILES		
Salamanders	Frogs & Toads	Turtles	Snakes	
Blue-spotted Salamander	American Toad Bull Frog Green Frog Leopard Frog Wood Frog	Blanding's Turtle Map Turtle Painted Turtle Snapping Turtle	Garter Snake Milk Snake Water Snake	

## 3.5.6 Fisheries

The Bay of Quinte littoral zone adjacent to the Dead Creek watershed was included in a nearshore habitat inventory of the Bay (QRAP Coordinating Committee, 1993). Nearshore habitat was mapped and several sites along the shoreline were seined netted by the MNR in 1992. The results of the inventory indicated several shoreline areas with submergent and emergent vegetation which support nurseries. Young-of-the-year Yellow Perch, Largemouth Bass, Bluegill and Pumpkinseed Sunfish, and Walleye were collected (QRAP Coordinating Committee, 1993). Figure 13 shows the location of this nearshore habitat.

Shallow water with submergent and emergent vegetation such as the Dead Creek Marsh and the mouth of the marsh, provide spawning habitat for warm water fish such as Northern Pike, Brown Bullhead, Yellow Perch and Largemouth Bass (Environment Canada, 1993; Boxall and Poropat, 1993; Hartley, 1998). Local concern has been expressed with regards to the two culverts under the abandoned CNR line and County Rd. 33 that connect Dead Creek Marsh with the Bay of Quinte. The culverts tend to get clogged with cattails which may impede the passage of fish into the marsh to spawn.

Several years ago, a local landowner observed Northern Pike travelling up Dead Creek in the spring. There are no recent reports of fish in Dead Creek. High stream flows that occur during spring melt and heavy rainfall, dwindle to minimal levels for most of the year. Potential for fish habitat remains, but is limited.

York Creek is considered to have very limited potential to provide habitat for fish. Downstream of the study area, York Creek has undergone extensive channelization. Ditching



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has also occurred along other reaches of the watercourse within the watershed to improve drainage. These channel alterations, along with the intermittent nature of York Creek and its receiving waters (Hutchinson Creek), severely limit its ability to support fish habitat.

## 3.5.7 Habitat Losses

Development in Southern Ontario has caused total habitat losses, but more significant has been the small cumulative losses that have resulted in a fragmented landscape. The lack of forest cover in Southern Ontario and the fragmentation of remaining forest patches is one of the most significant environmental impacts in this province (Riley and Mohr, 1994).

Fragmentation and habitat losses will be a threat in Murray Township as development expands westward from the City of Trenton. The immediate pressures will be felt adjacent to the City limit in the urbanizing area, but incremental development may gradually impact the natural features in rural areas. Protection of existing natural areas, re-establishment of vegetation corridors along waterways and fencerows, and allowing natural regeneration to take place will help maintain wildlife diversity, landscape diversity and help improve water quality.

# 3.6 LAND USE

Logging and agriculture were the first human activities in the area to significantly alter the landscape (LTRCA, 1970). Agriculture and residential development are now the primary land uses within the watershed (see Figure 14). Such development can impact surface water runoff characteristics, water quality and the extent and quality of natural habitat (QRAP Coordinating Committee, 1993).

## 3.6.1 Agriculture

Land in the northern portion of the watershed has been classified as either Class 1 or Class 2 in terms of agricultural land capability (OMAF, 1962). Apple orchards and row crops such as corn dominate the landscape in this area of the Lake Iroquois Plain.

The shallow soils associated with the escarpment provide poor growing conditions for crops (OMAF, 1962). Some cattle grazing occurs along the limestone plateau and directly south of the escarpment. Cattle have access to portions of Dead Creek (pers. obs., 1995).

Since 1953, the amount of cultivated land has decreased in the watershed (aerial photographs). Urbanization, notably at Roseland/Princess Acres, York Subdivision, along County Rd. 33 and west of Trenton, occurred on land that was previously in agricultural use. In addition, fields that existed along the escarpment and English Settlement Road



have since naturally regenerated.

## 3.6.2 Residential

There are several types of residential land use within the Dead and York Creek subwatersheds. Residential development can be described as concentrated residential lots with urban services; areas with concentrated, privately serviced lots; or low density, privately serviced lots.

## Concentrated residential development with urban services

The residential area within Trenton consists of concentrated lots with urban services. Surface water that runs off roofs, roads and parking areas is conveyed to natural watercourses.

## Privately serviced, concentrated residential development

Shoreline development which includes two subdivisions (Princess and Roseland Acres), a trailer park and York Subdivision located along County Rd. 2, consists of privately serviced, concentrated development. This type of residential development can have serious impacts on water quality where soils are unsuitable for private waste disposal systems and/or when such systems are too close together (Driscoll, 1986).

## Privately serviced, low density residential development

This type of development is associated with agricultural areas and scattered development along roads. Scattered rural development can fragment natural areas and increase the cost of services for a municipality.

## 3.6.3 Commercial

Commercial development within the watershed occurs primarily in Trenton along Dundas Street and Dufferin Avenue. Increased surface runoff volume and parking lot contaminants may be associated with parking lots (Totten Sims Hubicki Associates, 1995).

## 3.6.4 Industrial

Several light industries, including food and beverage, textiles and warehouse storage, exist in the southwest portion of the watershed, along Dufferin Street and County Rd. 33. Property zoned industrial on the City of Trenton Official Plan extends from County Rd. 33 northward to the Trenton Escarpment Natural Habitat Area. Currently the northern portion of this property has not been developed. A network of recreational trails that extend through Hanna Park and the Natural Habitat Area also connect to this portion of industrially zoned land.

## 3.6.5 Closed Landfill Site

The closed Carrying Place Landfill Site is located on the north edge of the limestone escarpment overlooking the Dead Creek Marsh (Lot 11, Concession B). Limited information is available on the site as landfill operating records do not exist (Dillon, 1991). The site was operated by the Township of Murray; however, the County of Northumberland has since assumed responsibility for the site.

Waste such as appliances, car parts and other large items have been observed at the toe of the landfill (Dillon, 1991). Two studies were conducted to determine if landfill leachate is contaminating groundwater (Dillon, 1991; Proctor and Redfern, 1995). Both studies concluded that the environmental impact would not pose a constraint for future development in the vicinity. However, Dillon (1991) mentions the possibility of buried drums existing in the fill area and suggests that long-term monitoring of shallow water is the most practical and cost effective method of monitoring potential impacts.

## 3.6.6 Aggregate Extraction

Extraction of gravel and sand for asphalt and concrete occurs at the northern boundary of the watershed.

## 3.6.7 Parkland and Trails

Several small parks in Trenton (OW Larry Park, an abandoned quarry in a residential area north of Dundas Street) and in Princess Acres (Cec Irwin Memorial Park) provide open space and playground areas. A playground and tennis courts also exist at Hanna Park.

A network of recreational trails have been developed in Hanna Park and the Trenton Escarpment Natural Habitat Area. These trails link up to a portion of the abandoned Old Trunk Railway, which is currently under private ownership. Elsewhere in the watershed, private fencing blocks passage along the railway bed and portions are privately owned.

A small greenbelt area, with several picnic tables, borders the eastern section of the Murray Canal, beginning at the entrance of the Twelve O'Clock Point Road. This area is operated by Trent-Severn Waterway.

## 3.6.8 Natural Areas

The natural areas have been described above. Human use of these areas includes various traditional resource activities including selective logging, maple syrup tapping, and hunting.

# 4. Planning Considerations

Land use planning involves making decisions about how people should use, (or leave unused), part of the earth's surface, having regard to known and expected circumstances and to given aims and/or criteria. Planning is particularly important because all land use changes are either permanent or extremely costly to revert. Collectively, provincial legislation and policies as well as local policies and by-laws set forth the basic framework for land use planning in Ontario. In this chapter, planning policies that affect this region are discussed.

# 4.1 PROVINCIAL POLICY STATEMENT

On May 22, 1996, the Ontario government issued the Provincial Policy Statement under the Planning Act. The Statement provides policy direction on matters of provincial interest related to land use planning and development. The policies focus on the key provincial interest related to land use planning and are to be complemented by locally-generated policies regarding matters of local interest. The Provincial Policy Statement replaces the Comprehensive Set of Policy Statements and the earlier Flood Plain Planning and Wetlands Policy Statements. Excerpts of the Policy Statement, applicable to this Subwatershed Plan, are provided in Table 5.

Section 3 of the <u>Planning Act</u> requires that, in exercising any authority that affects planning matters, planning authorities "shall have regard to" policy statements issued under the Planning Act. The recommendations provided in this Subwatershed Plan are meant to assist the Municipality with its responsibility in implementing the Provincial Policy Statement.

The Natural Heritage (2.3), Water Quality and Quantity (2.4) and Natural Hazard (3.1) policies have been reviewed. A brief discussion on these policies is provided.

## 4.1.1 Natural Heritage (Policy 2.3)

## Policy Overview

Policy 2.3.1 states "Natural heritage features and areas will be protected from incompatible development." Implementation of this policy is critical to protecting the watershed ecosystem. The watercourse and adjacent riparian buffer, the wetlands and wooded uplands are the backbone of a healthy, functioning system. Protecting natural heritage features, is a first step in protecting water quality and quantity and in avoiding hazards associated with flooding and erosion.

Table 5         Excerpts from the Provincial Policy Statement           Issued under Section 3 of the Planning Act (May 22, 1996)						
2.3 Natural Heritage	<ul> <li>2.3.1 Natural heritage features and areas will be protected from incompatible development.</li> <li>a) Development and site alteration will not be permitted in: <ul> <li>significant wetlands south and east of the Canadian Shield; and</li> <li>significant portions of the habitat of endangered and threatened species.</li> </ul> </li> <li>b) Development and site alteration may be permitted In: <ul> <li>fish habitat;</li> <li>significant wetlands in the Canadian Shield;</li> <li>significant wetlands in the Canadian Shield;</li> <li>significant wetlands in the Canadian Shield;</li> <li>significant woodlands south and east of the Canadian Shield;</li> <li>significant woodlands south and east of the Canadian Shield;</li> <li>significant woodlands south and east of the Canadian Shield;</li> <li>significant willigh habitat; and</li> <li>significant areas of natural and scientific interest if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area is identified</li> </ul> </li> <li>2.3.2 Development and site alteration may be permitted on adjacent lands to a) and b) if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified.</li> </ul> <li>2.3.3 The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible.</li> <li>2.3.4 Nothing in policy 2.3 is intended to limit the ability of agricultural uses to continue.</li>					
2.4 Water Quality and Quantity	2.4.1 The quality and quantity of ground water and surface water and the function of sensitive ground water recharge/discharge areas, aquifers and headwaters will be protected or enhanced.					
3.1 Natural Hazards	<ul> <li>3.1.1 Development will generally be directed to areas outside of: <ul> <li>a) hazardous lands adjacent to the shoreline of the Great Lakes - St. Lawrence River System and large inland lakes which are impacted by flooding, erosion, and/or dynamic beach hazards;</li> <li>b) hazardous lands adjacent to river and stream systems which are impacted by flooding and/or erosion hazards; and</li> <li>c) hazardous sites.</li> </ul> </li> <li>3.1.2 Development and site alteration will not be permitted within: <ul> <li>a) defined portions of the dynamic beach;</li> <li>b) defined portions of the dynamic beach;</li> <li>b) defined portions of the one hundred year flood level along connecting channels (the St. Mary's, St. Clair, Detroit, Niegara and St. Lawrence Rivers); and</li> <li>c) a floodway (except in those exceptional situations where a Special Policy Area has been approved).</li> </ul> </li> <li>3.1.3 Except as provided in polity 3.1.2, development and site alteration may be permitted in hazardous lands and hazardous sites, provided that all of the following can be achieved: <ul> <li>a) the hazards can be safely addressed, and the development and site alteration is carried out in accordance with established standards and procedures;</li> <li>b) new hazards are not created and existing hazards are not aggravated;</li> <li>c) no adverse environmental impacts will result;</li> <li>d) vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies; and</li> <li>e) the development does not include institutional uses or essential emergency services or the disposal, manufacture, treatment or storage of hazardous substances.</li> </ul> </li> </ul>					

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The Policy's direction with regards to significant wetlands (south and east of the Canadian Shield) and with regards to significant portions of the habitat of endangered and threatened species is clear: development and site alteration is not permitted in these areas.

The Policy is more permissive with regards to development and site alteration in other natural heritage features and areas. Development and site alteration may be permitted in fish habitat, significant woodlands, significant valleylands, significant wildlife habitat and significant areas of natural and scientific interest, and on adjacent lands to these areas, significant wetlands and significant portions of the habitat of endangered and threatened species, if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area is identified.

The Policy also provides direction to maintain and improve the diversity of natural features in an area and the natural connections between them, where possible.

A qualifier is provided, which states "Nothing in policy 2.3 is intended to limit the ability of agricultural uses to continue."

## Watershed Context

Provincially Significant Wetlands: The Dead Creek Marsh is the only Provincially Significant Wetland in the watershed. The most recent evaluation was completed by Boxall and Poropat in 1993.

Habitat for endangered or threatened species: There is no data to support any such habitat in the Dead & York Creek subwatersheds.

Fish Habitat: Field studies to address this issue were not completed as part of this study. The Bay of Quinte, Dead Creek, York Creek, Dead Creek Marsh and the Murray Canal are all considered to be Fish Habitat, unless site specific studies are undertaken which may indicate otherwise.

Significant Woodlands: Application of this policy requires a larger study area. Most of the woodlands in this watershed are to be considered for protection under significant wildlife habitat.

Significant Valleylands: These include the lands adjacent to Dead Creek and York Creek. Protection of the valleylands in this watershed is adequately provided for by the Fish Habitat and Natural Hazards policies. Significant Wildlife Habitat: The Wooler Road Woods, Dead Creek Escarpment and Alvar, and the Dead Creek Marsh (SNA) have been identified as Significant Natural Areas by Brownell (1993b), using accepted evaluation criteria in a study completed for the Waterfront Regeneration Trust. Dead Creek Headwater Woods and Wetland has also been identified as significant using this same criteria (Appendix C).

Significant Areas of Natural and Scientific Interest (ANSI): There are no ANSIs in the study area. However, it is recommended that the escarpment in the vicinity of Wooler Road be recommended to the Ministry of Natural Resources as a candidate Earth Science ANSI (Appendix C).

Diversity of Natural Features and Natural Connections: This policy provides further justification for protecting the significant wildlife habitat areas in the watershed, buffers along streams, and other natural linkages.

## 4.1.2 Water Quality and Quantity (Policy 2.4)

## Policy Overview

Policy 2.4 states "The quality and quantity of groundwater and surface water and the function of sensitive ground water/discharge areas, aquifers and headwaters be protected or enhanced."

## Watershed Context

This Policy can be applied to all development in the watershed. Stormwater management for large developments, sediment control and implementation of on-site best management practices for small developments, maintenance and establishment of natural buffers around waterways, and restrictions on development in sensitive areas will help to protect water quality and quantity.

## 4.1.3 Natural Hazards (Policy 3.1)

## Policy Overview

Section 3.1 of the Provincial Policy Statement replaces the Flood Plain Planning Policy Statement and addresses other hazards. The Statement provides direction for keeping development outside of lands that may be impacted by flooding, erosion or dynamic beach hazards along the Great Lakes System, outside of flooding and erosion prone lands adjacent to streams and rivers, and away from other hazardous sites. The Policy makes some allowance for development to occur in these areas provided that the hazards can be overcome and there are no adverse environmental impacts, among other conditions. The Policy however is firm with regards to floodways: Policy 3.1.2 states that: "development

and site alteration will not be permitted in a floodway."

#### Watershed Context

Great Lakes System/Large inland lakes: Flooding, Erosion, Dynamic Beach Hazards These policies are to be applied to the Bay of Quinte. There are no dynamic beaches in the watershed; therefore, the greater of the flooding and erosion limits should be applied to define the hazard lands along the Bay. As outlined in Chapter 2, the flooding and erosion limits have been determined for the study area based on recommendations for inland lakes. In some areas along the Bay the erosion hazard is greater; in other areas the flooding hazard is the larger of the two.

## **Riverine Flooding and Erosion Hazards:**

The regional storm (Timmins Storm) is the regulatory flood for this area. A hydraulic model has been run to calculate the regional flood for Dead Creek and York Creek. These have been plotted as pencil flood lines, for use in guiding development away from the flood plain.

#### Hazardous Sites

Areas within the watershed that have organic soils (such as those found in the wetlands) can be considered as hazardous sites. Guiding development away from wetlands addresses this policy for this watershed.

## 4.1.4 Provision for Site Specific Studies

By their nature and intent, the policies overlap and intertwine, to provide direction to protect a connected natural system. With the exception of a few areas where the policy is more strict, it does allow development within natural areas and flooding/erosion prone lands, provided that the hazards can be overcome and there are no adverse environmental impacts.

The recommendations developed as part of this Subwatershed Plan are aimed at protecting the natural environment and protecting development from natural hazards. Should a developer propose to develop within the recommended sensitive area or setbacks, the onus should be placed on the developer to show that there will be no adverse impacts and that the hazards can be overcome.

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DEAD & YORK CREEK SUBWATERSHED PLAN

# 4.2 CANADIAN FORCES BASE RESTRICTIONS

## 4.2.1 Zoning Regulations

In order to minimize bird hazards to aviation, regulations are in place to restrict the size of ponds within a defined area proximate to the base. These regulations apply to most of the Dead and York Creek subwatersheds. Figure 15 shows the area affected. Open water storage reservoirs may be permitted by the zoning regulations if the total surface area of the reservoir (permanent pool) does not exceed 1 ha or the reservoir is not used for water storage for a period in excess of 48 hours. This has implications in terms of developing a stormwater management strategy for the area. Exemptions to these rules are sometimes granted.

## 4.2.2 Noise Exposure Forecast (NEF)

The Provincial Policy Statement, as revised February 1, 1997, includes policies relating to long term economic prosperity that apply to airports. To ensure that airports and "sensitive land uses" are appropriately designed, buffered and/or separated from each other, the policy (1.1.3g) states:

To protect airports from incompatible development:

- 1. New residential development and other sensitive land uses will not be permitted in areas near airports above 30 NEF/NEP, as set out on maps (As revised from time to time) approved by Transport Canada; but
- 2. Redevelopment of existing residential uses and other sensitive land uses or infilling of residential and other sensitive land uses may be considered above 30 NEF/NEP if it has been demonstrated that there will be no negative impacts on the long-term function of the airport.

This applies to all Ontario airports, including designated lands for future airports, with Noise Exposure Forecast (NEF)/Noise Exposure Projection (NEP) mapping.

NEF mapping has been prepared for CFB Trenton (see Figure 16). It shows that a wide band cuts through the undeveloped portions of the Dead and York Creek subwatersheds. This "restricted area" includes a large portion of the natural corridor along Dead Creek including portions of the Wooler Road Woods, Dead Creek Escarpment Woods and Alvar, and Dead Creek Headwater Woods and Wetland.

# 4.3 BAY OF QUINTE REMEDIAL ACTION PLAN

The Bay of Quinte has been identified by the International Joint Commission (IJC) as one




of 43 "Areas of Concern" for water quality impairment around the Great Lakes Basin. For each of these areas, plans have been developed that identify remedial actions to overcome the environmental problems and restore the area's beneficial uses. These plans are called remedial action plans (RAPs).

In 1986, a two stage planning process was initiated in the Bay of Quinte region. The Bay of Quinte Remedial Action Plan (QRAP) Coordinating Committee submitted the Stage 1 Report, entitled *Environmental Setting & Problem Definition* to the IJC in 1990. The committee completed the Stage 2 Report, *Time to Act* in 1993. This second report represents the product of many years of intensive ecosystem investigation. It concludes the planning phase and outlines the recommended cleanup programs. *Time to Act* was developed with full public consultation and is a comprehensive plan integrating economic, social and environmental factors. It makes 80 recommendations to guide growth and development in an environmentally sustainable manner and restore the Bay of Quinte.

Among the 80 recommendations are several that can be applied to municipal planning and ecosystem protection within the Dead and York Creek watersheds. Recommendations are provided regarding alternative agricultural practices, reducing the use of chemicals and discharge of toxic contaminants, storage of hazardous wastes, street and catch-basin cleaning, etc. A complete list of the recommendations along with the schedule, proposed implementing agency, proposed partners and estimated costs are included in the *Time to Act* report on file at the Conservation Authority office. The following recommendations are important from a land use planning perspective:

- 1. The Quinte basin community should give priority to developing, promoting and implementing a code of ecosystem ethics to (1) guide and influence the actions of its residents and commercial enterprises, and (2) protect environmental quality and human health in the area.
- 2. The ecosystem approach, which includes concepts such as sustainable development, should be integrated into future land use and economic planning processes within the Bay of Quinte.
- 8. Official Plans in the Bay of Quinte drainage basin should be amended at the time of their next cyclic review to include a strategy to prevent increased phosphorus loading to the bay associated with each jurisdiction's planned growth and development
- 33. Stormwater quality control must be provided for new urban development in

municipalities with frontage on the Bay of Quinte.

- 34. The Province of Ontario's Subwatershed Planning Process should be adopted and employed by Quinte area municipalities to provide direction for the preparation of Secondary Official Plans for areas slated for new urban development.
- 64. The Ontario Ministry of Natural Resources, the Ontario Ministry of Municipal Affairs, the Mohawks of the Bay of Quinte, the local Conservation Authorities, Quinte municipalities, local industries, Non Government Organizations, the private sector and individual should cooperatively prevent any further loss of the integrity of the basin's remaining wetland ecosystems.
- 67. Quinte watershed municipalities should provide protection of the shoreline and streambanks within their jursidiction by designating in their Official Plans a buffer strip setback of 15 metres or greater to be maintained undisturbed as a natural protection zone.
- 68. Municipalities in the Quinte basin, the Ontario Ministry of Natural Resources and the Ontario Ministry of Municipal Affairs should work cooperatively to maintain existing natural wildlife corridors and explore opportunities to create additional corridors, especially those that would link to coastal wetlands and public shorelines.

Implementation of the recommendations in this Subwatershed Plan will help to implement these recommendations and contribute towards the QRAP cleanup efforts. Opportunities for ecosystem enhancement should also be considered through QRAP programs such as the Rural Water Quality Program (administered by Lower Trent Conservation) and the Habitat Protection and Restoration Program (administered by Quinte Conservation).

# 4.4 MUNICIPAL AMALGAMATION

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At the onset of this study, the Dead and York Creek watersheds were described as being located primarily within the Township of Murray, with the upper portions of the drainage basins in the City of Trenton. With very little room left within the City of Trenton, development pressure was being felt along the Murray side of the municipal boundary. Municipal servicing needed to be addressed, a stormwater management strategy developed, and upstream-downstream impacts considered for the proposed developments. Now, with municipal amalgamation scheduled for January 1, 1998, the political issues will be easier to address, as will implementation and monitoring strategies associated with the

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#### **DEAD & YORK CREEK SUBWATERSHED PLAN**

Subwatershed Plan.

The new City of Quinte West, will include all of the Township of Murray and City of Trenton, as well as the Township of Sidney and Village of Frankford. Like the other departments in the new City, the Planning Department will be faced with a challenge: setting up a new department and developing a consistent approach to planning across the Municipality. With the political boundaries gone, there will be new development opportunities. At the same time, there will be an opportunity to identify the natural features that add to the character and richness of the new City and those that present a hazard to development. The completion of this Subwatershed Plan is quite timely in that it provides recommendations for implementing the natural heritage, water quality and quantity, and natural hazard portions of the Provincial Policy Statement for the watershed area. Such will be useful to the Municipality as it revises and updates its planning documents.

# 4.5 MUNICIPAL PLANNING POLICIES

The land use planning documents of a municipality are intended to guide the physical development of a community with proper regard for the natural, social and economic environments. Although the time horizon of these documents varies among communities, it is generally between 10 to 25 years.

The Township of Murray Official Plan was approved by the Minister of Municipal Affairs on April 6, 1993. Murray's Comprehensive Zoning By-law was passed by Council on June 29th, 1978. The need to update Zoning By-Law has been recognized by the Township in recent years.

The City of Trenton Official Plan was approved by the Minister of Municipal Affairs on August 8th, 1972. A number of major updates and comprehensive amendments have been undertaken since that time, with the most recent major amendment occurring in 1994. In terms of land use policies, in addition to general policies, this Official Plan divides the City into a number of planning districts and each district has more distinct policies applicable to that area.

That portion of the Dead and York Creek watershed that is located within the City of Trenton is located within Planning District Nos. 4 and 5. The City of Trenton Comprehensive Zoning By-law was passed by Council in 1977. Since that time, there have been a number of updates and consolidations.

Figure 17 shows the Official Plan designations within the watershed. Listed below is a brief summary of the designations and zones within the watershed and what is permitted in each.

#### Murray's Official Plan:

The "Agricultural" designation is found south of County Rd. 2, north of Powerline Road, east of Hendricks Road and west of 2nd Dug Hill Road. This designation predominantly permits agricultural uses.

The "Rural" designation is found predominantly in the southern half of the watershed. The predominant land use permitted by this designation is agriculture. However, other uses permitted by this designation include limited residential, recreation, conservation and rural commercial and industrial uses.

The "Special Urban" designation is found south of County Rd. 2 and east of 2nd Dug Hill Road. This designation identifies areas where significant concentrations of urban uses have developed in the past and/or where future concentrated urban development is proposed during the period of the Official Plan.

There is an area on the east and west sides of Wooler Road, at its intersection with English Settlement Road, which is designated as "General Industrial." The types of industrial uses envisaged by this designation are those which are not considered to be offensive because of heat, smoke, noise, dust and transportation facilities.

Roseland/Princess Acres and the Old Carrying Place Road area are designated as "Hamlet". The predominant land use permitted by this designation is single detached dwellings. A limited amount of commercial and industrial uses and community facilities are also permitted.

The Dead Creek Marsh area is currently designated as "Environmental Protection". This designation does not permit development and is intended for conservation and preservation uses.

The closed Carrying Place Landfill Site has been designated as "Waste Disposal". In accordance with the Environmental Protection Act, subsequent land use on the site will not be permitted until approval is provided by the Ministry of the Environment.

# Murray's Zoning By-law:

The predominant zones in the watershed are the "General Rural (A2)" and "Restricted



Rural (A1)" Zones. These Zones permit a number of rural type uses such as farms, conservation and public uses.

York Subdivision, Roseland/Princess Acres and the Old Carrying Place Road area are currently zoned "Special General Residential (R3)." This Zone permits single family detached dwellings.

The only area with "Environmental Protection (EP)" zoning is the Bay of Quinte and its immediate shoreline. The Subwatershed Plan presents an opportunity to identify other areas that should be placed in this zone.

#### Trenton's Official Plan:

The Official Plan intends that the predominant land use within District No. 4 is low density residential with some commercial uses located along County Rd. 2. The predominant land use intended in District 5, Subdistrict B is industrial type uses, except for Hanna Park and the Trenton Escarpment Natural Habitat Area.

#### Trenton's Zoning By-law:

Those portions of land located within Planning District No. 4 are predominantly zoned "Residential" of varying densities. The lands located within Planning District No.5 are predominantly zoned "Industrial". The Hanna Park area is zoned "Open Space", which permits park uses. The Trenton Escarpment Natural Habitat Area is zoned "Environmental Protection". This zone does not permit development.

The current designations and zoning for the watershed area were set out prior to the issuance of the Provincial Policy Statement. Some of the natural hazards and natural heritage features have not been identified in these planning documents. With the formation of the new City of Quinte West, it is expected that an Official Plan and Comprehensive Zoning By-Law review will take place, providing an opportunity to implement the recommendations put forth in this Subwatershed Plan.

# 4.6 FUTURE LAND USE

The existing land use within the study area has been described previously in this report. For most of the watershed, agriculture and rural residential development have been the primary land uses. However, the rural area (Murray Township) immediately to the west of the City is expected to undergo considerable urban growth in the next few years. The area within the Dead Creek and York Creek watershed, east of 2nd Dug Hill Road and north of the escarpment, will be able to accommodate a population of 1,833 (based on low density

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residential housing) (Murphy, 1995). Other potential development areas include the commercial development site in the northwest quadrant of County Rd. 2 and 2nd Dug Hill Road, the industrially-zoned land in the south west corner of the City of Trenton, the rural land below the escarpment and east of 2nd Dug Hill Road, and the land designated industrial along Wooler Road.

Based on land use designations and preliminary development concepts that have been put forth for the developing portions of the watershed, a future development scenario was identified. This development scenario is shown in Figure 18 and described in Table 6.

This scale of development and the increased population could put a significant amount of stress on the natural environment--available green space, surface and ground water quality, and natural diversity. For this reason, a stormwater management strategy is needed along with sound recommendations to guide land use development. As part of developing a healthy community, recommendations were also put forth regarding recreational opportunities in the watershed, and these too, should be considered in the planning process.

# 4.7 LOCAL VIEWS

Through discussions with the Watershed Interest Group, public meetings and questionnaire responses, local perspectives were considered in developing this Subwatershed Plan (Appendix A).

Landowners' (with large land holdings) views differed from those who own small parcels or live, work, or have a general interest in the watershed. Based on the questionnaire responses, the people in the latter group supported environmental protection through planning and stewardship. However, according to the questionnaire responses from individuals owning large tracts of rural land in the subwatershed, environmental protection is seen as an infringement on property rights.

Most of the Dead and York Creek subwatersheds are not undergoing rapid urbanization like some areas of the Province. With unemployment rates high in the area, development and economic growth are a priority. Natural areas are abundant in the rural areas, and for the most part, remain healthy. Therefore, planning restrictions to protect the environment are seen as unnecessary road-blocks to growth, jobs and personal economic gains.

At the same time, people within the watershed are starting to recognize the link between a healthy environment and healthy economy. In the Quinte area, tourism is a major



Table 6 Future Development Scenario				
Developing Area				
• east of 2nd Dug Hill Rd., north of the escarpment	<ul> <li>commercial development proposed along north side of Hwy 2</li> <li>residential development proposed to the north of the commercial development</li> <li>commercial development proposed along south side of Hwy 2 (approx. 5.25 ha)</li> <li>residential development of varying densities proposed south of the commercial development along 2nd Dug Hill Road (approx. 20 ha)</li> </ul>			
• northwest quadrant of 2nd Dug Hill Rd. and Hwy 2	<ul> <li>large commercial development proposed (approx. 8.4 ha)</li> </ul>			
Potential Development Areas				
<ul> <li>south of York Subdivision</li> </ul>	<ul> <li>rural residential subdivision proposed (approx 8.5 ha)</li> </ul>			
• east 2nd Dug Hill Rd, south of the escarpment	<ul> <li>no development plans, but may have potential for non-residential uses</li> </ul>			
<ul> <li>both sides of Wooler Road, near English Settlement Rd.</li> </ul>	<ul> <li>no development plans, but designated/zoned industrial (east side: approx. 12 ha &amp; west side: approx. 16 ha)</li> </ul>			
Rural Development				
• rural area, west of 2nd Dug Hill Road	<ul> <li>scattered rural development is likely to continue throughout the rural area (eg. severances)</li> </ul>			

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economic draw. In 1996, a team of professionals visited the area as part of the International Countryside Stewardship Exchange Program. In the International Countryside Stewardship Exchange's (1996) report the value of the natural features of "The Bay of Quinte Country" are recognized with regards to the tourism industry and a number of recommendations made to help make this area a tourist destination.

The challenge with this Subwatershed Plan, is to develop recommendations that address these issues. How can the Municipality have regard to the Provincial Policy Statement and at the same time respect landowner concerns?

In the developing area, a sound stormwater strategy and planning recommendations are needed. For the rest of the watershed, rather than applying an Environmental Protection designation and zone to all of the identified natural heritage areas, a softer approach may be more acceptable. With development pressure low for most of the natural areas, stewardship and public education may be more beneficial than restrictive zoning. In the Official Plan an "overlay" approach could be employed to flag the need for site specific assessments for major development.

# 5. Watershed Management Strategy

# 5.1 MANAGEMENT FRAMEWORK

Watershed planning calls for an integration of issues—environmental, social and economicto map out a framework to guide future development and land use practices. It calls for an understanding of the natural features and functions in the watershed, an understanding of the planning framework and regulations that guide development, and an understanding of what is important and acceptable to the community.

From an ecological point a view, the first step in developing a watershed management strategy is to map out the natural system or "green network" within the watershed. The green network consists of the watercourses, shorelines, wetlands, significant natural areas and connecting ecological links between them. The key areas are listed below, and have been described in an earlier section of this plan:

- Dead Creek and a natural buffer
- York Creek and a natural buffer
- Dead Creek Marsh Provincial Significant Wetland and Significant Natural Area
- Bay of Quinte shoreline
- Wooler Road Woods Significant Natural Area
- Dead Creek Escarpment Woods and Alvar
- Dead Creek Headwater Woods and Wetland

Protection and enhancement of these natural areas, natural buffers, and the connections between the areas will help keep the watershed healthy and attractive. Specific benefits include maintained and improved surface and ground water quality, wildlife habitat and biodiversity, and landscape diversity, which in turn can improve economic opportunities. A healthy environment and "place to live", attractive countryside and improved recreation opportunities could be a draw for people, businesses and industries looking to relocate to this area.

The next step in watershed planning is to map out the future land use scenario and overlay it with the natural systems map to identify development opportunities and constraints (see Figure 19). Opportunities are sought to integrate flood plain and stormwater management with the natural system.

The final step, and most challenging, is to develop recommendations that will help facilitate development while protecting the natural features and functions. The management framework has to address federal and provincial regulations and policies in a manner acceptable to the local community.



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Recommendations for the Dead and York Creek subwatersheds have been developed, in consultation with the municipalities, agencies and community, to help guide development and protect and enhance the natural heritage of the watersheds. These recommendations fall into four areas: Municipal Land Use Planning, Stormwater Management, Land Stewardship, and Community Enhancement.

Political and community will are key to the protection and enhancement of the green network within the watershed. Recommendations put forth in this plan fall chiefly into the hands of the Municipality and watershed residents. Agencies and interest groups will have an interest in the recommendations and outcomes, but the decisions relating to protection through planning rest with the Municipality and private land stewardship rests with landowners. Agencies and interest groups can only work with these "decision-makers," providing advice, encouragement and assistance, wherever possible.

# 5.2 Municipal Land Use Planning

The municipal planning documents--the Official Plan and the Comprehensive Zoning By-Law--are valuable tools for protecting natural systems. The Official Plan sets out general policies and provides direction for a community's planning decisions. The Comprehensive Zoning By-Law is a legal document used by the Municipality to regulate the use of land. It states exactly what land uses are currently permitted in the community and identifies detailed information such as types of uses and buildings that are permitted, lot sizes and setbacks.

With the formation of the new City of Quinte West, it is expected that a new Official Plan and Comprehensive Zoning By-Law will be developed in the next few years. This provides for an excellent opportunity to incorporate the recommendations of this Subwatershed Plan.

The recommendations provided below are based on the Natural Heritage, Natural Hazard and Water Quality and Quantity policies of the Provincial Policy Statement. By their nature and intent, the policies overlap and intertwine, to provide direction to protect a connected natural system. With the exception of a few areas where the policy is more strict, it does allow development within natural areas and flooding/erosion prone lands, provided that the hazards can be overcome and there are no adverse environmental impacts. Table 7 summarizes the recommendations.

The recommendations are intended to provide direction to the Municipality with its responsibility to "have regard to" the Provincial Policy Statement and at the same time provide flexibility to help address community concerns with development restrictions. The

Table 7 Planning Recommendations			
	Recommended Planning Approach*	Recommended "no development" areas	Recommended buffer strip*** width
Dead Creek Marsh Provincially Significant Wetland	30 m development setback** for single lot rural residential development Impact Assessment for other development proposals within 120 m	within Provincially Significant Wetland	20 metre
Bay of Quinte	Development setback** greater of: 30 m, erosion limit (15 m), or 100 year flood limit		20 metre
Dead Creek	Development setback** greater of: 30 m or regional flood plain	within 100 year flood plain	20 metre
York Creek	Development setback** greater of: 15 m or regional flood plain	within 100 year flood plain	10 metre
Dead Creek Marsh Significant Natural Area	No restrictions on single lot rural residential Impact Assessment required for other development		20 metre
Dead Creek Escarpment Woods & Alvar	No restrictions on single lot rural residential Impact Assessment required for other development		20m adjacent to forested areas 30m adjacent to alvars
Dead Creek Headwater Woods & Wetland	No restrictions on single lot rural residential Impact Assessment required for other development		20 metre
Wooler Road Woods	No restrictions on single lot rural residential Impact Assessment required for other development		20 metre

\* recommended planning approach: impact assessment may reduce recommended setback

\*\* development setback: applies to buildings, structures, septic systems, hardened surfaces

\*\*\* buffer strip: consists of non-manicured natural vegetation--grasses, shrubs, trees

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Municipality will consider the recommendations in consultation with the community when it prepares/amends its planning documents. Only a small portion of the watershed, adjacent to the old municipal boundary, is expected to undergo major growth in the foreseeable future. In this area, it is recommended that a proactive planning approach be taken. In the rural areas, where development pressure is minimal, a permissive approach may be more acceptable to local landowners.

# 5.2.1 RECOMMENDATIONS

# 5.2.1.1 Dead Creek Marsh

The Dead Creek Marsh is a Provincially Significant Wetland. The Provincial Policy Statement provides no flexibility with regards to development in the marsh. However, it is more flexible regarding development on adjacent lands. In order to provide direction in this regard, a Comprehensive Impact Assessment was completed. The recommendations provided below are based on this study. It should be noted that in addition to the wetlands policies, other components of the Provincial Policy Statement apply, including fish habitat, significant wildlife habitat, water quality and quantity, and the natural hazards policies (Figure 20).

- #1 The wetland boundary should be defined as the largest outer edge of the flood line and wetland evaluation mapping.
- #2 Based on the Comprehensive Impact Assessment, rural residential development may be permitted within the "adjacent lands" to the wetland provided that: No building, structure, septic system or hardened surface is allowed within 30 metres of the wetland edge.

A 20 metre natural buffer strip is retained along the wetland's edge where no site alteration is permitted.

- #3 Lot grading plans should be completed for all new development adjacent to the wetland
- #4 A site specific impact assessment should be completed by the applicant for: Any development that will encroach upon the recommended setbacks and buffers.

Non residential uses (eg. Commercial and Industrial) that are proposed within 120 metres of the wetland, other than agricultural activities.

Higher density residential development (other than single lot rural residential)



that are proposed within 120 metres of the wetland.

- #5 The wetland and 30 metre construction setback should be recognized in the municipal planning documents.
- #6 The "adjacent lands" should be defined as any lands within 120 metres of the wetland edge and recognized in the planning documents. (It should be clearly noted that this is not a setback, but an area of influence that must be examined before development, other than single lot rural residential and agricultural activities, can occur.)

# 5.2.1.2 Bay of Quinte

The Water Quality and Quantity, Fish Habitat, and Natural Hazard policies apply to the Bay. The erosion hazard and flooding hazard limits are based on the recommended setbacks for inland lakes (Figure 21).

#7 Development (buildings, structures, septic systems or hardened surfaces) should generally be directed outside of:

--a 30 metre setback from the shoreline (measured from the seasonal high water mark)

--the erosion hazard limit

--the flooding hazard limit

- #8 A 20 metre natural buffer strip should be retained along the shoreline for new development.
- #9 Lot grading plans should be completed for all new development along the shoreline.
- #10 If development is proposed within the recommended setback, the developer should be required to complete a site specific Impact Assessment which addresses flooding and erosion concerns, impacts on water quality and fish habitat concerns, in addition to the other criteria set out in section 3.13 of the Provincial Policy Statement.
- #11 The recommended construction setback should be recognized in the municipal planning documents.

# 5.2.1.3 Dead Creek

The Water Quality and Quantity, Fish Habitat, Significant Valleylands, and Natural Hazard policies apply. The regional flood plain is very wide in areas and therefore the municipality may wish to consider a two zone approach, whereby some development is permitted



between the regional and 100 year flood line. However, the value of protecting the stream corridor as part of the natural heritage system should also be considered when developing construction setbacks or considering development within the floodplain (Figure 22).

- #12 Development (buildings, structures, septic systems or hardened surfaces) should generally be directed outside of:
   --a 30 metre setback from the creek (measured from the seasonal high water mark)
   --the regional flood plain
- #13 Development may be permitted:
  -- within the 30 metre setback from the creek (where it is not exceeded by the 100 year flood line)
  --between the 100-year flood plain and regional flood plain following completion of technical studies that indicate there will be no adverse impacts
- #14 A 20 metre natural buffer strip should be retained along the watercourse for new development.
- #15 Lot grading plans should be completed for all new development along the watercourse.
- #16 If development is proposed within the recommended setback, the developer should be required to complete a site specific Impact Assessment, which addresses flooding and erosion concerns, impacts on water quality and fish habitat concerns, in addition to the other criteria set out in section 3.13 of the Provincial Policy Statement.
- #17 The recommended construction setback should be recognized in the municipal planning documents.
- #18 A two-zone flood plain analysis should be completed to assess the impacts of applying this approach to development within the Dead Creek flood plain.

# 5.2.1.4 York Creek

The Water Quality and Quantity, Significant Valleylands and Natural Hazard policies apply. As with Dead Creek, the regional flood plain is very wide in some areas along York Creek. The municipality may wish to consider a two zone approach, permitting some development between the regional and 100 year flood line. As mentioned above, the value of protecting the stream corridor as part of the natural heritage system should be considered when developing construction setbacks or considering development within the floodplain (Figure 22).



- #19 Development (buildings, structures, septic systems or hardened surfaces) should generally be directed outside of
   --a 15 metre setback from the creek (measured from the seasonal high water mark)
   --the regional flood plain
- #20 Development may be permitted:
  --within the 15 metre setback from the creek (where it is not exceeded by the 100 year flood line)
  --between the 100-year flood plain and regional flood plain following completion of technical studies that indicate there will be no adverse impacts
- #21 A 10 metre natural buffer strip should be retained along the watercourse for new development.
- #22 Lot grading plans should be completed for all new development along the watercourse.
- #23 If development is proposed within the recommended setback, the developer should be required to complete a site specific Impact Assessment, which addresses flooding and erosion concerns, impacts on water quality and fish habitat concerns, in addition to the other criteria set out in section 3.13 of the Provincial Policy Statement.
- #24 The recommended construction setback should be recognized in the municipal planning documents.
- #25 A two-zone flood plain analysis should be completed to assess the impacts of applying this approach to development within the York Creek flood plain.

#### 5.2.1.5 Significant Natural Areas: Dead Creek Marsh, Dead Creek Escarpment and Alvar, Dead Creek Headwater Woods, Wooler Road Woods

The Significant Wildlife Habitat and Diversity of Natural Features policies can be applied to these areas. The Dead Creek Marsh, in terms of these recommendations, is the Significant Natural Area identified by Vivian Brownell. It is important to note that Provincial Policy restricts residential development in large portions of the Dead Creek Escarpment and Alvar, Dead Creek Headwater Woods and Wetland, and Wooler Road Woods because of noise within the flight line of the airport (NEF contours). Adherence to this policy will also help to protect the natural areas (Figure 23).

#26 When making planning related decisions, the Municipality should recognize the significance of these areas and their function as core areas within a larger diverse



natural system.

- #27 A 20 metre buffer should be identified around the "forest components" of the Significant Natural Areas in the planning documents.
- #28 A 30 metre buffer should be identified around the "alvar components" of the Significant Natural Areas in the planning documents.
- #29 In the rural areas, agriculture and rural residential development may be permitted within the natural areas and buffer. Large scale developments and uses other than commercial or industrial may be permitted in a natural area or buffer if the applicant completes a site specific Impact Assessment, demonstrating that there will be no negative impacts on the natural features or the ecological functions associated with the area.
- #30 In the urban development areas, the natural areas and buffers should generally be protected through planning. Development may be permitted if the applicant completes a site specific Impact Assessment, demonstrating that there will be no negative impacts on the natural features or the ecological functions associated with the area.
- #31 These "Significant Natural Areas" areas should be recognized in the Municipal Planning documents.

#### 5.2.1.6 General Recommendations

The following recommendations apply to other areas within the watershed and will help with implementation of the Water Quality and Quantity (2.4) and the Diversity of Natural Features (2.3.3) policies.

- #32 All wetlands (marshes and swamps) within the watershed, regardless of size or status, should be protected in the planning documents to help maintain predevelopment wetland hydrologic function, provide water storage, wildlife habitat, and landscape diversity.
- #33 No new development (buildings, structures, septic systems or hardened surfaces) should be permitted within 15 metres of wetlands in the watershed.
- #34 A 10 metre natural buffer strip should be retained along the wetlands for new development.
- #35 Lot grading plans should be completed for all new development adjacent to wetlands.

- #36 Vegetation corridors that link Significant Natural Areas should be identified and, at the time of major development proposals, protected and enhanced through development design (Figure 23).
- #37 Reference should be made in the Municipality's planning documents to the need for stormwater management for all developments greater than 1 ha.
- #38 Should a developer propose to develop within an area that is restricted from development because of the area's sensitivity or potential hazards, the onus should be placed on the developer to show that there will be no adverse impacts and that the hazards can be overcome.
- #39 Development should be restricted on the escarpment, because of its near vertical face. It is also a prominent landform feature and should be protected.

#### 5.2.2 **IMPLEMENTATION**

The following "actions" have been identified to implement the planning recommendations:

• An amendment should be made to the Official Plan in the "developing area" to establish development policies to implement the recommendations in this Subwatershed Plan.

• The new Official Plan for the City of Quinte West should recognize the natural hazards and natural heritage features within the watershed, and include policies to protect water quality and quantity. Approaches include:

**Environmental Protection designations:** This regulatory approach should be applied to the Dead Creek Marsh Provincially Significant Wetland, the floodway of Dead Creek and York Creek, and areas of potential flooding/erosion along the Bay of Quinte. Specific policies should be set out in the Official Plan that would give the developer an opportunity to carry out an Impact Assessment for proposed development in an EP designation.

**Environmentally Sensitive Area Overlay:** This more flexible approach can be used to implement provincial policies in areas where natural hazard and potential environmental impacts are less severe. It could be applied in Significant Natural Areas, buffers around environmental features, and on lands between the 100 year and regional flood plain. Specific policies would need to be set out in the Official Plan to identify what type of development can occur in an area, when an Impact Assessment is required and what issues will need to be addressed.

• The Official Plan should designate the entire Municipality as a Site Plan Control Area and include policies that will allow site plan control to be used as a mechanism for protecting the natural ecosystem.

• Following completion of the Official Plan, a Comprehensive Zoning By-Law should be completed to implement the Official Plan policies. Use of "Environmental Protection" zones, setbacks, and general provisions should be considered.

• Impact Assessment guidelines should be developed based on the criteria provided in the Natural Heritage Training Manual (MNR, 1997) to determine when and what degree of effort is required.

• The escarpment, in the vicinity of the Wooler Road, should be recommended to the Ministry of Natural Resources as a candidate Earth Science Area of Natural and/or Scientific Interest.

• The natural heritage and natural hazard features and buffers identified in this Subwatershed Plan should be used to form a "plan review" screening map.

# 5.3 STORMWATER MANAGEMENT

It is well accepted that urbanization can have adverse impacts on streams and other receiving water bodies. The resulting change in hydrologic regime from increased stormwater runoff may cause flooding, streambank erosion and water quality problems such as pollutant loadings, temperature effects, baseflow reduction, habitat changes and groundwater impacts.

Stormwater management has been identified as a critical component of the clean up and maintenance efforts for the Bay of Quinte, and a Stormwater Strategy has been developed to help implement the Bay of Quinte Remedial Action Plan. The Dead and York Creek watersheds lie within the implementation area for the Stormwater Strategy. As such, stormwater management for development within these areas must meet the water quantity and water quality criteria set out in this Strategy.

Rather than dealing with stormwater management on a site by site basis, the preferred approach is to develop a strategy for the entire developing area that considers development pressure, natural systems and land ownership. By setting out the framework up front, it reduces the amount of work required by each individual developer, results in optimizing facilities from the Municipality's perspective, and allows for a better designed and functioning system that fits with the natural process and landscape. In all, it is a costeffective approach. Developing a stormwater strategy was a key component of this project.

# 5.3.1 TECHNICAL REPORTS

The firm of Totten Sims Hubicki and Associates were contracted as part of this study to undertake a hydrology and stormwater management analysis of the Dead Creek/York

Creek Subwatershed Plan. This report, entitled "Hydrology/Stormwater Management Strategy--Dead Creek/York Creek Watershed Plan" forms Appendix B to the Subwatershed Plan. The technical study provides insight on the following topics:

• delineation of drainage basins and critical nodes (hydrologic reference points) for confluence of runoff

- assessment of post-development water quality characteristics
- review of soil characteristics within the urbanizing areas to assess potential for infiltration to reduce size of end-of-pipe facilities
- comparison of pre-development flow regime with post development scenario within York and Dead Creek to assess changes to flood risks or erosion potential

• overview of groundwater regime to identify potential impacts to groundwater quantity and quality

- screening of potential stormwater management techniques for application
- assessment of performance of stormwater management practices

Other technical considerations which were screened while developing the stormwater management strategy include assessment of habitat sensitivity to stormwater discharges, bird hazard zone restrictions for CFB Trenton, and consideration of the total watercourse in conjunction with specific stormwater facilities as an integrated, functioning water management system.

These technical considerations need to be combined with other factors relating to land use policies, property value, land ownership, the timing of future development, municipal ownership/maintenance of stormwater facilities, public perception, and integration with other constraints such as the natural system.

# 5.3.2 STORMWATER MANAGEMENT GUIDELINES

Based on the above considerations, the following guidelines or criteria were developed:

Lands along major streets and roadways will have more value for development and are, therefore, less desirable locations for stormwater facilities.

The Municipality is interested in optimizing the number of facilities to reduce their ownership and maintenance costs. Municipal representatives participating on the Steering Committee stated that 'end-of-pipe' stormwater management facilities are preferred over conveyance controls (vegetated swales) in this regard.

The stormwater management strategy may combine lot level controls with 'end-of-pipe' stormwater management facilities.

Mechanical water quality treatment is not required (eg UV), based on the water quality simulation model combined with the 'up-front' planning effort and resultant designation

and protection of the existing natural system.

Opportunities for integrating the hydrologic component of the stormwater management works with the natural system should be examined. Existing wetlands can contribute significantly to mitigate negative effects of urban development. In addition to wetlands' natural filtering ability, they further enhance/treat stormwater by storing flood waters, dampening peak flows and recharging groundwater levels. Natural buffers and wetlands should be maintained to assist with stormwater management. Also, stormwater facilities should be designed to fit with the natural system and add to the diversity and attractiveness of the green or open space network.

A preferred stormwater management strategy is needed for the developing areas in the upper portions of the Dead and York Creek Subwatersheds.

General stormwater management recommendations are required for other identified "potential development" areas.

General recommendations for lot grading and buffers are needed for rural development.

Commitment to implementation and monitoring is needed to ensure the stormwater management strategy is carried out and that the facilities are functioning properly.

# 5.3.3 RECOMMENDATIONS

The stormwater management recommendations can be divided into 3 areas: the developing area, potential development areas, and rural development (see Figure 24).

# 5.3.3.1 Developing Area

The "developing area" can be further divided into two areas--the headwaters of York Creek and the headwaters of Dead Creek, north of the escarpment.

# York Creek Developing Area

The headwaters of York Creek include three drainage basins (Appendix B)--YC8, YC9, YC10 (see Figure 24). These areas are located on the northwest, northeast and southeast quadrants of the County Rd. 2 (Dundas Street West) and 2nd Dug Hill Rd. intersection. A combination of residential and commercial development is proposed. There are no significant natural features on these lands; the upper reach of York Creek emerges in the southwest corner of this intersection. However, of interest to the stormwater management plan is the high infiltration capacity of the soils in parts of this area (see Figure 9). Specifically, the northern portion (north of 2nd Dug Hill Road) is located on the southern slope of the Trenton Moraine (Chapman and Putman, 1973). Evidence in the adjacent aggregate extraction operations indicate a well drained condition with a considerable depth to groundwater.



Lot level controls are considered as important and worthy measures for stormwater management. In commercial areas, where large roof areas and parking lots are typical, control measures may be incorporated which provide temporary storage for extreme runoff. Storage is provided within the rooftop area and on the parking lot by utilizing appropriate flow restrictors. These controls serve to reduce the size of centralized or endof-pipe facilities. Runoff from rooftops is considered to be clean, with the only potential contamination originating from atmospheric deposits or roofing materials, which are considered minimal. Roof runoff also has the potential to be infiltrated if the opportunity exists.

Implementation of lot level controls within urban residential areas has not reached a high degree of public and municipal acceptance. There is potential in YC10 for infiltration of yard and roof runoff, but rear yard ponding or low slope swales are generally regarded as a nuisance on urban lots. Also, existing topography in this area may limit some types of controls. Nevertheless, some general practices may be incorporated which can be accepted. These include alternate lot grading to maximize the amount of lot area which drains to rear yard areas. Also, roof runoff should be directed to grassed areas or soakaway pits.

To address runoff quality targets, centralized runoff collection/treatment facilities will be required to provide treatment prior to discharge to York Creek. Similarly, since on-site measures cannot be expected to provide the full amount of flow attenuation, some form of centralized runoff detention will be needed within the drainage system to control peak flows resulting from urbanization. A review of potential options for centralized treatment suggests that a pond/wetland could address quality control issues and also include significant detention storage for the purpose of downstream flow control. In a watershed such as York Creek in which there are open space opportunities along the drainage system, any centralized stormwater management facility would be ideally integrated within potential open space areas. Other relevant factors which are screened for facility type and location include minimizing the number of facilities, locations which facilitate phasing as contributing areas develop, and areas which will serve within the existing contours and drain developing areas without complex conveyance systems.

Two options were considered based on these criteria. The first option envisioned facilities located within each quadrant of developing area, i.e. YC 8, 9, and 10. This option minimized infrastructure disruption and upgrades required at the intersection, and would allow development to proceed with less complications around cost-sharing and phasing. Negative aspects include the number of facilities (3), and the location of the facilities (utilizing valuable road frontage on development lands and remoteness from any connections to green space or natural corridors).

Option 2 proposed a centralized location within the southwest quadrant of the intersection. This location is physically low enough to accept drainage from the general development area surrounding the site, and is ideally located at the initial section of defined channel for York Creek. Drainage conduits traversing County Rd. 2 and 2nd Dug Hill Road would be undersized to convey stormwater from developed areas, but it is very likely that intersection improvements will be necessary to accommodate development. Implementation will require up front involvement from the municipality and a cost sharing agreement between benefitting landowners. Ultimately, maintenance and operation could be restricted to one facility for this development area (approximately 40 hectares). This water quality facility would require approximately 3500 cubic metres of permanent pool and 2000 cubic metres of dynamic storage for quality purposes. For quantity control, an additional 5000 cubic metres of dynamic storage would be required in addition to the permanent pool volume, resulting in a total volume of 8500 cubic metres. At an average depth of 1m the permanent pool would require a maximum of 0.5 hectares, which is within the guidelines for bird control as stipulated by CFB Trenton. Land area requirements for dynamic storage, access, landscaping, and inlet and outlet works would make the total land area estimate at 1.0 hectare.

Based on this discussion, the following recommendations are given.

- #40 Commercial development should incorporate source controls to control the rate of runoff from YC8, 9, and 10. These controls include catch-basin inlet controls that result in temporary ponding in parking lots, or grassed areas, and rooftop storage with gradual release to the drainage system.
- #41 Geo-technical investigations should be undertaken to evaluate the feasibility of infiltration of runoff from rooftop areas. If site characteristics are favourable, the use of infiltration trenches or perforated pipe systems are recommended as a secondary control of the volume of direct runoff. If soil and groundwater characteristics do not favour engineered infiltration, then roof drainage should be directed to pervious areas or swales.
- #42 Maintenance and operation of on-site measures should be the responsibility of the landowner and conditions for responsibility should be incorporated into the site plan agreement. Further, the landowner should report annually that appropriate measures are in place and working as designed.
- #43 Rear lot overland drainage and length of swales in residential areas of YC10 and YC8 should be maximized. Geo-technical investigations should be undertaken to evaluate the feasibility of infiltration of runoff from rooftop areas. If deemed feasible, roof runoff should be infiltrated. Alternatively, and at a minimum, all roof runoff should be discharged to grassed areas in the rear of houses.
- #44 The preferred option for centralized runoff control, as reviewed and discussed with the Project Steering Committee, is Option 2. This facility proposed for Option 2

provides the necessary quality and quantity control while minimizing land area for stormwater management and optimizing future operating efficiencies for the municipality.

#### Dead Creek Developing Area

DC10 includes lands east of 2nd Dug Hill Road to the existing urban limit and south from the drainage divide between York and Dead Creek, and north of the Dead Creek escarpment (Figure 24). The total developable land area is approximately 30 hectares which is proposed for residential uses of varying densities. No development plans have yet been brought forward for the southwest corner. Most of the developing area is open field, with the south end of this area extending into the Dead Creek Headwater Woods. Some of the DC10 basin is located south of the Escarpment, but is not suitable for development because of the wetland. The 30 NEF also restricts residential development in the DC10 basin, south of the escarpment.

There are no existing defined drainage routes over the land, with most surface water being captured by depression storage and subsequently infiltrating. There is evidence of groundwater seeping from the escarpment and discharging to Dead Creek. Natural heritage features for the site include the Dead Creek Headwaters Woods and Wetland east of 2nd Dug Hill Road and the adjacent escarpment. These lands exhibit mixed forest cover combined with areas of poor drainage on the table lands above (see Natural Areas component). The existing conditions reveal that there is limited surface water retention on the top of the escarpment. The stormwater strategy objective for this area would be to integrate required stormwater controls with natural features and utilize and augment existing low areas for storage and treatment of runoff.

Due to the fact that the land is basically retained by two major landowners who may have differing development agendas, the stormwater strategy should attempt to facilitate phasing, if possible, based on the respective property boundaries. This appears to be feasible as the existing depression, which receives excess runoff and acts as a storage area, straddles the property boundary. The stormwater management strategy should also take opportunity from the detention and attenuation potential of Dead Creek upstream of 2nd Dug Hill Road. In this regard, this wetland could serve to dampen intensified peak flows associated with urban development and further 'polish' stormwater. Utilizing the existing wetland will also serve to reduce stormwater management facility sizing on the table lands.

Options analyzed for stormwater runoff control included the use of engineered conveyance systems to treat and store runoff, or the use of centralized ponds or 'end of pipe' facilities. As stated previously, municipal representatives stated their preference of end of pipe facilities over conveyance systems. The option of centralized control was further evaluated in terms of a combined quality/quantity facility located on table lands on the escarpment, or a combination of quality control prior to discharge to the wetland in combination with utilizing the existing wetland for attenuation of peak flows. Based on the existing status of

the wetland, and the existing area of reservoir within Dead Creek upstream of 2nd Dug Hill Road, it was considered acceptable from a technical standpoint to utilize the wetland for quantity control and additional passive quality control. This would minimize the land area requirements and potential disruption of the table lands for stormwater management purposes. Issues which arise with the option of utilizing the existing wetland include riparian rights and land ownership of the Dead Creek Headwater Wetland as well as complications which may arise with scheduling and implementing the necessary works offsite of development lands.

Based on the foregoing, the following recommendations are presented for area DC10.

- #45 Stormwater quality control for this development area should be centralized, and located within an existing depression located on the table lands adjacent to the escarpment. The proposed facility would preferably be a wet pond with a wetland fringe. The total required volume for quality control is approximately 2500 cubic metres of which 1500 cubic metres would be permanent pool. The existing low depression has a volume of approximately 1600 cubic metres. Additional storage can be achieved through a combination of berming and excavation. All inlet locations should incorporate a sediment forebay to capture the majority of suspended solids within a confined area. This will facilitate periodic maintenance with minimum disturbance to the main facility.
- #46 Stormwater runoff in excess of the quality facility (major storms) should be routed to the wetland below the escarpment. This will require a spillway or other appropriate conveyance system, and a bypass for the quality control pond. The spillway for major flows could be incorporated with the outlet of the quality pond. Peak flows within Dead Creek should be controlled downstream of 2nd Dug Hill Road by utilizing the storage capacity of the existing wetland. In this regard, an outflow control structure should be incorporated within any upgrades required for the 2nd Dug Hill Road and Dead Creek crossing. The design of outlet works should include an assessment of the natural environment to ensure that fish habitat and wetland functions are not impaired. It is expected that this roadway will require improvements in conjunction with the proposed development. In this regard, the road crown will be raised to provide adequate cover over culverts. Also the abandoned rail bed to the south should also be raised appropriately where it meets 2nd Dug hill road such that spill does not occur. Storage required for 100 year return period is approximately 8000 cubic metres with a controlled outflow of 2.6 cubic metres per second.

# 5.3.3.2 Potential Development Areas

The potential development area are lands within the watersheds that are designated for development, have preliminary proposals but no immediate development plans, or are located on the urban fringe. These areas include one drainage basin in the York Creek

watershed (YC4) and three drainage basins in the Dead Creek watershed (DC9, DC4B, DC2B). All of these areas are less suitable for development, because of physical constraints such as flooding or locations within wetlands and natural areas. A brief discussion follows:

#### York Creek (YC4)

Drainage basin YC4 is located in York Subdivision southwest of the intersection of County Rd. 2 and the Wooler Road. A new residential development has been considered south of the existing York Subdivision. York Subdivision was built on, or within, the bed of the headwaters of a small stream and has experienced frequent flooding problems.

A previous study was completed for Lower Trent Conservation by Totten Sims Hubicki Associates (1983), which identified a potential method of alleviating the drainage problems within the subdivision. The cost-benefit analysis proved the project to be not feasible. The drainage works were never undertaken due to lack of landowner support and funding.

#### It is recommended that:

#47 Careful consideration should be given to the extension of the existing development. An Official Plan amendment would be needed to change the current "agricultural" designation. Much of the proposed development is within the 100-year flood plain of the small swale that drains through York Subdivision and empties into York Creek. Unless adequate drainage works are undertaken, development should be restricted in the flood plain lands.

Should development be permitted, the following stormwater management options exist:

Quantity control considerations would be based on providing safe and sufficient routing of major flows draining from the existing York Subdivision to the north. Detention of major flows is not considered appropriate due to timing of runoff within the main branch of the creek. Controls for quality would be based on the use of 'low tech' best management practices that could be incorporated within rural developments. These include the use of enhanced grassed swales, reduced lot grading, bio-retention areas for vegetative filtering and runoff retention, vegetative filter strips, and modified lot grading (maximize front to rear direction for overland flow).

#### Dead Creek -- DC9

DC9 lies just to the south of the Dead Creek Headwater Woods and Wetland--east of 2nd Dug Hill Road, south of the escarpment (see Figure 24). This area was considered as a potential development area because of its proximity to Trenton. There are no known development plans for this area. Its location within the 30 NEF for CFB Trenton presents a development constraint which restricts residential development and other sensitive land uses. Industrial and commercial development may be permitted.

#48 Stormwater management recommendations include provision of a centralized stormwater quality treatment. Existing depressions should be utilized where possible to develop water quality wet ponds/wetland combinations. Existing areas which may be suitable are located adjacent to the abandoned rail line for drainage flowing to Dead Creek and in the vicinity of the intersection of 2nd Dug Hill Road and County Rd. 33 where an existing depression is located. The Dead Creek Headwater Wetland upstream of 2nd Dug Hill Road should be utilized for quantity control and secondary treatment as prescribed for area DC10.

#### Dead Creek-DC2B

Development area DC2B is the lower catchment end of DC2A (DC2A has not been identified as having development potential). DC2B is located west of Wooler Road, north of English Settlement Road and is currently designated as "Industrial." This area is restricted from residential development because of its location within the 30 NEF. It is also located within a significant natural area--the Wooler Road Woods, and therefore would be best left undeveloped.

Should development be permitted at this location, stormwater management recommendations include:

- #49 On-site quantity control measures in the form of roof-top and parking lot detention. This will dampen peak flows to minimize the size of conveyance channels required for the escarpment.
- #50 Quality controls should be incorporated for parking areas, and loading and receiving areas. The use of oil/grit separators are recommended for these applications, although filter strips and bio-retention areas could be appropriate for treating sheet flow from parking lots.

#### Dead Creek-DC4B

Development area DC4B is located east of Wooler Road, north of the escarpment. This land has been designated as "Industrial." Again, because of its location within the NEF, residential development is restricted. While it is not located within a significant natural area, there is potential for natural regeneration of this land which could form a natural link between the Wooler Road Woods and the Dead Creek Headwater Woods and Wetland. Ideally, if there is landowner support, the Industrial designation should be removed.

Should development be permitted at this location, stormwater management recommendations include:

#51 On-site quantity control measures in the form of roof-top and parking lot detention. This will dampen peak flows to minimize the size of conveyance channels required for the escarpment.

#52 Quality controls should be incorporated for parking areas, and loading and receiving areas. The use of oil/grit separators are recommended applications for loading bays, while filter strips and bio-retention areas could be utilized for treating sheet flow from parking lots.

Bio-retention is a method to manage stormwater by using or retaining native plantings combined with soil conditioning. This method usually captures sheet flow from impervious surfaces, and is typically limited to drainage areas up to 0.5 hectares. Bioretention practices may be readily integrated with commercial or industrial sites by utilizing landscaped or graded green areas, such as parking islands, parking edge, and perimeter areas for water storage and uptake by vegetation. This stormwater management technique may be utilized for area DC2B or 4B.

# 5.3.3.3 Rural Development

While development should be focused around urban and rural settlement areas (PPS 1.1.1a), there will likely continue to be some rural development (severances and subdivisions). The following criteria should be employed for any rural development to not only ensure no negative impacts on the natural environment, but to help enhance the existing system.

- #53 no more than two lots and one retained lot (as per the Official Plan) should be permitted through the severance process
- #54 drainage and stormwater management plans should be required for all plans of subdivisions
- #55 drainage and stormwater management plans should be required for all site plan developments on lands that exceed one hectare
- #56 natural buffers of 20 metres should be maintained around all watercourses, wetlands and shorelines (10 metres for York Creek)
- #57 no construction should be permitted within 30 metres of all watercourses, wetlands and shorelines (15 metres for York Creek)
- #58 no construction should be permitted in the flood plain (unless approved through a 2-zone study)
- #59 lot level controls should be included in the lot drainage

# 5.3.4 IMPLEMENTATION

The following are perceived to be relevant general considerations for the implementation of a stormwater management strategy:

• The Municipality should ensure that the need for stormwater management, as set out in the recommendations in this plan, is identified in the Official Plan and Zoning By-law.

• All stormwater management plans should be reviewed by Lower Trent Conservation and Municipal Public Works staff to ensure that stormwater management criteria are met.
• All planning applications should be reviewed to ensure that the development does not create or aggravate existing drainage concerns and that "best management practices" are incorporated into lot grading and drainage.

• A "Site Specific Source Controls Manual" should be developed to describe typical scenarios that may occur when developing near a watercourse or wetland and how stormwater/drainage should be addressed for each.

# 5.4 LAND STEWARDSHIP

### 5.4.1 WHAT IS STEWARDSHIP?

Stewardship means caring for the land in ways that benefit or sustain the land while enhancing the rural quality of life of the landowner, family, friends and neighbours. Stewardship implies:

- Respect for natural ecosystems and the interconnectedness of land, water, plants, animals and humans.
- Responsibility as a custodian to pass the land on to the next generation undamaged or improved.
- Resourcefulness in assessing options and undertaking land stewardship activities.

Stewardship is recognized as a powerful tool for protecting and managing natural resources. In the recent past, habitat protection has been focused on formal and legal means, such as regulations and land use control. Now, with changing public attitudes towards the environment and with government cutbacks, private landowner stewardship will play an important role in environmental protection.

Public agencies have a role to play in encouraging the stewardship approach. Agencies develop policies and guidelines to try to ensure natural resource management, but the private landowner is free to make the best decision for his particular situation. A good landowner steward knows his land best, cares for it most, and understands the local context. He looks after it cheaply or at no cost to society.

The first step in getting people to take care of the land is public education. The values of protecting and enhancing natural areas must be promoted to the community, along with advice for good management practices. This can involve face-to-face meetings with individual landowners through a private land stewardship program or could be part of a broader public education program. Community groups--schools, youth groups, naturalists clubs, service groups--may want to take on conservation projects on public lands or, with the support of the landowner, on private lands.

As in any watershed, public education and stewardship will go a long way towards protecting the natural environment in the Dead & York Creek subwatersheds. However, the watershed area is small and a handful of people own most of the undeveloped land. Based on public input during development of the watershed plan, community interest in stewardship is low. Nevertheless, some present and future landowners may be looking for advice or assistance on how to protect and manage their property.

### 5.4.2 Recommendations

The following recommendations are provided for conservation-minded landowners within the local watersheds. Some of the recommendations are quite specific to certain areas, while others are more general and should be applied more broadly.

#### Specific Recommendations

- #60 Landowners should be informed of the natural attributes of their property and provided with stewardship advice.
- #61 To alleviate problems associated with culvert blockages in the Dead Creek Marsh, the vertical stakes recently put in place around the culvert entrance should be maintained. As well, all cattail growth around culvert entrances should be removed, and the wetland substrate should be excavated to a depth of at least 3 metres. This will remove sediments that are being deposited at this natural constriction site and allow a storage area for future sedimentation. It will also allow for critical water circulation, fish migration, and will minimize back flooding. While the deeper depths will not prevent floating cattail islands from stopping here, they will stop the cattails from establishing a permanent stand.
- #62 The drainage canal through the Dead Creek Escarpment Woods and Alvar should be altered so as to retain water within the forest, but not within the adjacent farm fields.
- #63 Landowners should be encouraged to allow a 30 metre natural buffer to establish itself along the alvars.
- #64 Farmers should be encouraged to limit cattle grazing in the alvars.
- #65 The greenway (corridor) currently joining the Dead Creek Escarpment Woods and Wooler Road Woods should be maintained (a minimum of 60 metres wide).
- #66 The wooded fringe between Wooler Road and 2nd Dug Hill Road should be maintained as a natural linkage between the Wooler Road Woods and the Dead Creek Headwater Woods.
- #67 Landowners should be encouraged to allow a 20 metre buffer strip to regenerate

with natural vegetation along watercourses, wetlands, and the Bay of Quinte.

- #68 Landowners should be encouraged to allow a 20 metre buffer strip to regenerate with natural vegetation around the edge of existing forests and woodlands.
- #69 Natural vegetation corridors should be encouraged to develop along fencerows, watercourses, and the top of the escarpment to form linkages between natural areas.
- #70 Farmers should be encouraged to restrict cattle access to watercourses (the Bay of Quinte, creeks and wetlands)
- #71 Farmers should be encouraged to keep livestock out of woodland areas to enhance the growth and value of woodlots.
- #72 Forest cutting should be done on a sustained yield basis.
- #73 Natural regeneration, the preferred approach for re-establishing natural areas, should be encouraged but active planting, where appropriate, is not discouraged.
- #74 Native species should be used for any naturalization projects. Some local nurseries stock native plants.
- #75 Minimizing grass cutting to allow meadows to develop should be promoted for its wildlife habitat benefits.
- #76 Local forest owners should be informed of the Managed Forest Tax Incentive Program. This program encourages landowners to manage their forests in a responsible manner, with the incentive that these lands are taxed at 25% the rate of residential land. Management information is provided free by the Ontario Foresters Association or the Ontario Woodlot Owners Association.

#### **General Recommendations**

- #77 Consider alternatives to the use of pesticides and chemical fertilizers for lawn care, gardening, and agriculture. When using chemicals, reduce the amounts applied and choose less toxic chemicals where possible. Buy only what you need and store any extra away from your living quarters in a well-ventilated area, out of children's reach.
- #78 Rural landowners should be encouraged to maintain their septic systems through regular sludge removal, by keeping trees and heavy equipment off the tile bed, conserving water use, being careful of what goes down the drain, and by watching for signs of septic system damage or failure.

- #79 Water conservation should be promoted to both urban and rural residents.
- #80 Minimize the use of hazardous chemicals for household cleaning and consider alternatives. Hazardous chemicals should be stored and disposed of properly.
- #81 Watershed residents should be encouraged to "reduce, re-use, recycle."

#### 5.4.3 Implementation

Land stewardship is an ongoing effort of landowners. The following steps have been identified to assist landowners with their stewardship efforts:

• A Stewardship Program should be initiated to provide information and assistance to landowners. This should be part of a stewardship program for a larger area (eg. the lower Trent region). The program may include newsletters, information packages, demonstration projects, and one-on-one landowner contact.

• Provide landowners with a copy of the recommendations in this Subwatershed Plan.

• Develop a monitoring and maintenance plan for the clean out of culverts at Dead Creek Marsh and County Rd. 33.

• Encourage volunteers to participate in watershed clean-up/restoration activities.

# **5.5 COMMUNITY ENHANCEMENT**

Protecting the natural features of the watershed while development occurs is the focus of this Subwatershed Plan. However, the human element also needs to be considered. How might development affect the community and how might the quality of life be maintained and improved? For the Dead & York Creek area, two means have been identified: *Countryside Preservation* and *Recreation*. These have been brought to the forefront because of the work of two recent initiatives: the Waterfront Regeneration Trust (its work in developing the Waterfront Trail and connecting the community with the waterfront) and the International Countryside Stewardship Exchange (the catalyst in getting municipalities and groups to work together to develop and promote the Bay of Quinte Country as a tourist destination.)

### 5.5.1 COUNTRYSIDE PRESERVATION

With the exception of the northeast corner, the Dead and York Creek watersheds are mostly rural: residential areas, farmland and natural areas are interspersed to create scenic rural landscape typical of southern Ontario. A few old homesteads and rail fence lines that represent remnants of early settlement patterns dot the landscape. As the new City of Quinte West emerges and urban growth expands outward from Trenton, the character of the rural area that many people value, will be threatened. Since people who live here and people who visit the area value the rural countryside, efforts should be made to protect it through community planning and private stewardship.

#### 5.5.1.1 Recommendations

The following recommendations have been put forth:

- **#82** Development along the top of the Dead Creek Escarpment, west of the Wooler Road should preserve the view of the escarpment from County Rd. 33 and the marsh.
- #83 Development should occur adjacent to existing built up areas (adjacent to Trenton). Strip development should be discouraged.
- #84 The use of locally appropriate development/construction designs should be encouraged.
- #85 An appreciation for elements of the rural countryside and continuance of traditional activities should be promoted--rail fences, orchards, mixed farming, maple syrup production, etc.

## 5.5.2 **RECREATION OPPORTUNITIES**

People living within the Dead and York Creek watersheds have access to recreational parks and facilities in nearby communities (Carrying Place and the City of Trenton). The Murray Canal and the Bay of Quinte are ideal locations for water-based activities. In reviewing the natural features of the area and gathering input from local residents, several suggestions have been made for developing recreational facilities within the watershed area. Some of the suggestions provide opportunities for outdoor activities that could help develop a well-balanced, healthy community. And some of the activities may have economic benefits, drawing people to the area and increasing spending in local stores.

Listed below are some suggestions that have been put forth for recreational development in the watershed.

<u>Grand Trunk Railway line</u>: The old Grand Trunk Railway line, which follows along the top of the Dead Creek escarpment west of Wooler Road, affords a view of the Dead Creek Marsh and Bay of Quinte and may be an ideal recreational trail.

Boat launch to Bay of Quinte: A boat launch in the Bay of Quinte may be desirable along County Rd. 33.

<u>Canoeing in the Dead Creek Marsh</u>: Canoeing in the Dead Creek Marsh could be promoted to encourage nature appreciation and attract outdoor enthusiasts to the area.

<u>Marsh Viewing</u>: The old landfill site along English Settlement Road, which overlooks the Dead Creek Marsh, could be developed into a roadside viewing area.

<u>Trenton Escarpment Natural Habitat Area</u>: Hiking/ski trails could be developed on this 19 acre natural area, owned by the Conservation Authority, and linked with the trails in adjacent Hanna Park.

<u>Stormwater Management Facilities</u>: Opportunities should be considered to integrate stormwater management facilities with the natural environment and to incorporate them into the park system. This will enhance the park system by creating landscape diversity and providing wildlife habitat.

#### 5.5.2.1 Recommendations

#86 The Community and Leisure Services Department of the new Municipality should investigate the merits of these recreation opportunities.

#### 5.5.3 Implementation

Implementation of the recreation and countryside preservation recommendations will require "buy-in" and the interest of the Municipality and community. Implementation of the recommendations can be achieved by the following actions:

• Develop planning policies that focus growth in the established urban and rural settlement areas and discourage scattered rural development.

• Encourage and promote development design that will add to the character of the area through planning and communications.

• Provide the Community and Leisure Services Department of Quinte West with a copy of the Subwatershed Plan and discuss the recreation opportunities.

• Identify recreational opportunities and potential linkages with other recreation opportunities in planning/development proposals.

• Complete a Master Plan for Trenton Escarpment Natural Habitat Area.

# 6. Implementing the Plan & Monitoring Change

## **6.1 IMPLEMENTING THE STORMWATER MANAGEMENT STRATEGY**

Implementation of the preferred stormwater management options will require cooperation between the individual developers and between the developers, the Municipality, and review agencies. As concluded in the preceding chapter, the preferred option for the Dead Creek and York Creek developing areas has been judged to be a combination of lot-level controls combined with a centralized facility and associated works for each major development catchment. The water management strategy incorporates two stormwater management ponds and an outflow control structure for Dead Creek upstream of 2nd Dug Hill Road, to provide flow control and stormwater treatment by natural settling and biological treatment.

Pond 1:

Located south of County Rd. 2 and west of 2nd Dug Hill Road. The pond is proposed to be an extended detention wet pond with a length to width ratio greater than 3:1. The pond will discharge to the existing channel of York Creek.

Pond 2:

Located on the top of the escarpment within an existing drainage depression. The pond will provide extended detention with appropriate geometry. This facility could potentially incorporate two inlets from the two major land holdings with a common outlet.

Outlet Structure for Dead Creek at 2nd Dug Hill Road:

Peak outflows should be contained to existing levels by incorporation of a control structure at this road crossing. This work could be integrated with future upgrades of this road, but should include an assessment of the natural environment to ensure minimal impacts.

The present study has provided planning level estimates of the stormwater storage volumes at three locations to provide adequate stormwater treatment as well as control peak flows up to the 100 year return period. These pond volumes are summarized in Table 8. Pond volumes are based on full implementation of source controls in all new residential and commercial development. Pond dimensions are also included in Table 8.

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Table 8         Summary of Storage Volume, Land Area Requirements         and Dimensions for Stormwater Facilities				
	YORK CREEK POND	Dead Creek Pond	Dead Creek Wetland Storage	
Permanent pool volume for adequate solids and bacteria control	3500 m <sup>3</sup>	1400 m <sup>3</sup>	N/A	
Peak live storage volume at 100-year return period	5000 m <sup>3</sup> below elevation 103.8 m	N/A	8000 m <sup>3</sup>	
Peak live storage for quality control	2000 m <sup>3</sup>	1100 m <sup>3</sup>	N/A	
Estimated land area requirement	1 hectare	1 hectare	N/A	
Bottom width	30 m	50 m	N/A	
Total length	120 m	200 m	N/A	
Side slopes	4:1 (h:v)	7:1 (h:v)	N/A	
Permanent pool depth	1 m	0.3 m	N/A	
Maximum depth	2 m	0.5 m	N/A	

Implementation of the stormwater strategy will require:

• final design analysis and detailed design of the recommended stormwater ponds, flow conveyance systems, and culvert improvements

• fulfilment of Environmental Assessment (if the municipality becomes the proponent) and regulatory approval requirements

- determination of phasing requirements (if applicable)
- definition of cost-sharing arrangements

Design of the two stormwater ponds will include:

- detailed site layout and grading plans to provide the required storage volumes
- detailed design of inlet and outlet control structures, including sediment forebays, that regulate storage levels and peak water levels within each facility
- preparation of landscaping plans and detailing of other design features such as access

roads, fencing, etc.

It must be emphasized that further hydrologic and hydraulic analyses are likely to be required at the final design stage, in order to optimize the size, operation, and layout of both facilities.

#### 6.1.1 Implementing Source Controls

The recommended Stormwater Management strategy calls for the following at-source or on-site controls within new development areas:

<u>Residential Source Controls</u>: ensuring that roof drainage is diverted onto grassed areas, as opposed to being drained onto paved areas or directly connected to the storm sewer.

<u>Commercial On-Site Controls</u>: consisting of roof top storage on flat-roofed buildings, along with catchbasin inlet controls in parking areas, to restrict peak outflow rates. Storage volumes have been based on representation of these distributed control measures. They must therefore be incorporated in all new development sites for the overall system to provide the required performance in terms of peak flow control and stormwater treatment.

Analysis of on-site measures has produced estimates of peak flow outflow rates that would result from the various types of urban development, as listed in Table 9.

Table 9           Target Peak Flows for Source Controls			
	Unit-area O (litres/second per ha	Unit-area Outflow Rates (litres/second per ha of catchment area)	
RETURN PERIOD	Industrial/Commercial Sites	Residential Areas	
2 years	15	15	
5 years	20	20	
10 years	25	25	
25 years	30	30	
100 years	40	40	

The unit-area values are the same for both residential and industrial/commercial development. This results from the fact that although industrial/commercial development will typically produce more runoff per unit area (due to higher imperviousness), more flow attenuation is possible on the industrial/commercial sites by way of rooftop and parking-lot

storage.

#### 6.1.2 Facility Phasing

Pond construction will be required as development proceeds in each respective drainage area. It is difficult to predict the timing for the proposed developments, but it would appear that the most immediate development priority would be within the vicinity of the 2nd Dug Hill Road and County Rd. 2 corridor. This development area includes lands from all existing development proposals for the northeast and northwest quadrants as well as a significant portion of the property in the southeast quadrant. Therefore, it would appear that this facility would be the top priority, as it would service a mixture of proposed land uses and serve all development minded landowners.

Phasing of the facility does not appear to be of any direct benefit, as the pond proposed will not be multi-celled. Opportunities for phasing could be introduced into the required conveyance channels and culvert improvements required to convey water across each intersection.

Pond 2 (which will accommodate development between 2nd Dug Hill Road and the City of Trenton in the Dead Creek watershed) may present opportunities for phasing. Utilizing the existing low area while regulating outflow into adjacent property would be the most obvious approach. This should be preceded by the final design such that economic efficiencies of any temporary measures can be maximized.

#### 6.1.3 Cost Sharing

Due to the fact that recommended facilities will service multiple landowners, cost sharing of stormwater infrastructure will be required. The fundamental principles on which cost sharing should be based are as follows:

• Costs for the proposed facilities should be shared equitably amongst those who benefit from them.

• The cost of the proposed works should be shared amongst only new land development within the contributing drainage area.

• Facility costs should be allocated in proportion to the volume of stormevent runoff generated by the proposed developments that drain to the facility.

In applying these principles, there are some specific considerations that come into play:

• The recommended stormwater strategy represents a centralized approach, in which flow control and treatment occur at centralized locations. This is in contrast to a piecemeal approach in which each individual development site would incorporate its own flow

control/treatment facility.

• This centralized approach is based on minimizing overall costs (initial capital costs and annual operation and maintenance costs) by minimizing the number of separate stormwater facilities.

• Because recommended facilities are located at central locations, they must receive drainage from the entire catchment area, not just proposed urban development that has brought about the need for stormwater management.

To implement cost-sharing on this basis, some measure or index of runoff volume is required. It is suggested that the most reasonable method is to use the 'runoff coefficient' method to characterize the runoff volume generated by the unit of development area. The runoff coefficient would therefore be based on the imperviousness of the development area. By multiplying the runoff coefficient with the land area, we arrive at an indicator of the relative contribution for each area or property.

This approach has been applied by:

• Identifying the individual development areas or properties within the catchment areas of the developing areas. These are indicated on Figure 24.

• Estimating the overall imperviousness of each parcel, by considering the expected type of development and any areas expected to remain undeveloped due to environmental constraints.

• Estimating a runoff coefficient for each parcel.

• Tabulating runoff coefficient times area for each parcel and computing totals for each catchment area. Each development area or property is then given a percentage of the total which would be transferred to applicable costs.

This rationale has been applied to the York Creek Pond and summarized in Table 10.

#### Cost Estimates

Cost estimates for pond construction are based on an analysis completed for the City of Belleville Pollution Control Planning Study. Although the analysis is not directly comparable to facilities recommended in this strategy, it provides a general guideline for construction costs. Based on this information, cost estimates for the three major stormwater works as recommended are as follows:

York Creek Pond42.5 hectares of development service area @ \$8000/ha= \$340,000Dead Creek Pond28 hectares of development service area @ \$4000/ha= \$112,000Dead Creek Wetland Outlet Works= \$15,000

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#### **DEAD & YORK CREEK SUBWATERSHED PLAN**

Prop No. Fig 18	Refer.	Type of Develop.	Area (Ha.)	Imperv. %	Est. Runoff Coeff.	Area times R.C.	% of Est. Cost
1	NW#2/DugH	Commercial	8.10	95	0.85	6.89	28.9
2	Klamp	Commercial	1.26	90	0.83	1.05	4.4
3	Klamp	Med. Res.	1.21	55	0.50	0.61	2.6
4	Klamp	Residential	7.41	25	0.33	2.45	10.2
5	MTF north	Commercial	1.85	90	0.83	1.54	6.4
6	MTF north	Med. Res.	1.46	55	0.50	0.73	3.1
7	MTF north	Residential	7.29	25	0.33	2.41	10.1
8	MTF south	Commercial	5.25	90	0.83	4.36	18.3
9	MTF south	Med. Res.	4.64	55	0.50	2.32	9.7
10	MTF south	Residential	3.61	25	0.33	1.19	5.0
11	West Hard.	Commercial	0.38	90	0.83	0.32	1.3
Totals	west mard.	Commercial	42.46	30	0.00	23.87	1.3

# 6.2 IMPLEMENTATION & MONITORING COMMITTEE

The recommendations provided in this Subwatershed Plan are aimed at protecting the health of the watershed ecosystem. Implementation of the planning and stormwater management recommendations will ensure that development proceeds in a manner that has respect for the natural environment. Individual landowner and community decisions to implement the stewardship, recreation, and countryside preservation recommendations will contribute to the overall watershed health and the social and economic well-being of the community.

Action items that will implement the individual recommendations are provided in the preceding chapter. These same actions are listed in Table 11 on the following pages, along with responsibilities and a time-frame. To ensure implementation of the recommendations, an Implementation and Monitoring Committee, comprised of representatives from the Municipality, Conservation Authority and Bay of Quinte Remedial Action Plan, should be established. Members from other agencies should be invited to meet with the Committee, as warranted, to deal with issues that relate to their mandate. One meeting a year should be sufficient to review overall progress and identify priorities, but on-going discussion and meetings should be encouraged as implementation of the plan proceeds.

In addition to moving the plan forward, the Implementation and Monitoring Committee should be responsible for monitoring the overall effectiveness of the watershed plan. The monitoring program needs to be practical and simple. Surface water quality sampling

Table 11a IMPLEMENTATION FRAMEWORK: Municipal Land Use Planning				
RECOMMENDATION NO.	IMPLEMENTING ACTION	RESPONSIBILITY	TIME-FRAME	
12 - 18 26 - 27 30 - 35 37 - 39	• An amendment should be made to the Official Plan in the "developing area" to establish development policies to implement the recommendations in this Subwatershed Plan.	Municipality in consultation with Lower Trent Conservation	1 year	
1 - 39 53, 54, 55	• The new Official Plan for the City of Quinte West should recognize the natural hazards and natural heritage features within the watershed, and include policies to protect water quality and quantity.	Municipality in consultation with Lower Trent Conservation	1 - 3 years	
2, 3, 8, 9, 14, 15, 21, 22, 27, 28, 34, 35, 36	• The Official Plan should designate the entire Municipality as a Site Plan Control Area and include policies that will allow site plan control to be used as a mechanism for protecting the natural ecosystem.	Municipality	1 - 3 years	
1 - 39	• Following completion of the Official Plan, a Comprehensive Zoning By-Law should be completed to implement the Official Plan policies. Use of "Environmental Protection" zones, setbacks, and general provisions should be considered.	Municipality in consultation with Lower Trent Conservation	3 - 5 years	
4, 6, 10, 16, 23, 29, 30, 38	• Impact Assessment guidelines should be developed based on the criteria provided in the Natural Heritage Training Manual (MNR, 1997) to determine when and what degree of effort is required.	Lower Trent Conservation	1 year	
39	• The escarpment, in the vicinity of the Wooler Road, should be recommended to the Ministry of Natural Resources as a candidate Earth Science Area of Natural and/or Scientific Interest.	Landowner, Municipality, Lower Trent Conservation	1 - 2 years	
1, 2, 6, 7, 12, 19, 26, 27, 28, 32, 33, 36, 39	• The natural heritage and natural hazard features and buffers identified in this Subwatershed Plan should be used to form a "plan review" screening map.	Municipality and Lower Trent Conservation	immediately	

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Table 11b         Implementation Framework:         Stormwater Management				
RECOMMENDATION NO.	IMPLEMENTING ACTION	RESPONSIBILITY	TIME-FRAME	
37, 53, 54, 55	The Municipality should ensure that the need for stormwater management, as set out in the recommendations in this plan, is identified in the Official Plan and Zoning By-Law.	Municipality in consultation with Lower Trent Conservation	1-3 years	
40 - 59	All stormwater management plans should be reviewed by Lower Trent Conservation and Municipal Public Works staff to ensure that stormwater management criteria are met.	Municipality Lower Trent Conservation	on-going	
40 - 59	All planning applications should be reviewed to ensure that the development does not create or aggravate existing drainage concerns and that "best management practices" are incorporated into lot grading and drainage.	Municipality, in consultation with Lower Trent Conservation as required	on-going	
54 - 59	A "Site Specific Source Controls Manual" should be developed to describe typical scenarios that may occur when developing near a watercourse or wetland and how stormwater/drainage should be addressed for each.	QRAP Lower Trent Conservation	1 year	

RECOMMENDATION NO.	IMPLEMENTING ACTION	RESPONSIBILITY	TIME-FRAME
60 - 81	• A Stewardship Program should be initiated to provide information and assistance to landowners. This should be part of a stewardship program for a larger area (eg. the lower Trent region). The program may include newsletters, information packages, demonstration projects, and one-on- one landowner contact.	Lower Trent Conservation	1 - 3 years
60 - 81 85	<ul> <li>Provide landowners with a copy of the recommendations in this Subwatershed Plan.</li> </ul>	Lower Trent Conservation	immediate
61	<ul> <li>Develop a monitoring and maintenance plan for the clean out of culverts at Dead Creek Marsh and Highway 33.</li> </ul>	Lower Trent Conservation	1 year
60 - 81	<ul> <li>Encourage volunteers to participate in watershed clean- up/restoration activities.</li> </ul>	community groups	on-going

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Table 11d IMPLEMENTATION FRAMEWORK: Community Enhancement				
RECOMMENDATION NO.	Implementing Action	RESPONSIBILITY	TIME-FRAME	
82, 83	<ul> <li>Develop planning policies that focus growth in the established urban and rural settlement areas and discourage scattered rural development.</li> </ul>	Municipality	1 - 3 years	
84	<ul> <li>Encourage and promote development design that will add to the character of the area through planning and communications.</li> </ul>	Municipality Developers	ongoing	
85, 86	• Provide the Community and Leisure Services Department of Quinte West with a copy of the Subwatershed Plan and discuss the recreation opportunities.	Lower Trent Conservation	immediately	
86	<ul> <li>Identify recreational opportunities and potential linkages with other recreation opportunities in planning/development proposals.</li> </ul>	Municipality	ongoing	
86	• Complete a Master Plan for Trenton Escarpment Natural Habitat Area.	Lower Trent Conservation	3 years	

could be considered, when an opportunity arises, to allow comparison with the baseline data. However, funding for collection and analysis would need to be identified if water quality monitoring were to continue. Similarly, digital mapping comparisons of the natural areas could be considered in the future when new aerial photography is produced, but again this would be costly and labour intensive. A more realistic approach for this watershed may involve a driving tour of the watershed by the Committee members followed by some discussion around a series of questions. Table 12 is a proposed checklist of questions that could be used for monitoring purposes. Depending upon the response to these questions, the committee should direct efforts towards the areas where improvements can be made.

Table 12 Monitoring Checklist for the Dead & York Creek Su	bwatersh	ned Plan
INDICATORS	YES	No
Have planning decisions been based on the recommendations in the Subwatershed Plan?		
Is development occurring within the natural areas or recommended buffers for natural areas and waterbodies?		
Are the stormwater ponds located at the preferred sites?		
Are the stormwater ponds being maintained properly?		· · <del>·</del>
Are the stormwater ponds functioning properly?		
Is the countryside in the rural areas being maintained?		
Are there any new recreation opportunities in the watershed?		
Has cattle access to the waterways been restricted?		
Is cattle grazing continuing in the woodlands?		
Is cattle grazing occurring in alvars?		
Are buffers being established adjacent to waterways and natural areas?		
Are there any significant changes to the natural areas?		
Are connecting links between natural areas being established?		
Are the culverts at County Rd. 33 and Dead Creek Marsh open?		
Action items: where is more work required?		
<b>Completed by:</b> Dead & York Creek Subwatershed Plan Implementation and Monitori	ng Comm	ittee

Date:

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