

**KANATA LAKES**  
**NEA BOUNDARY DEFINITION,**  
**SHIRLEYS BROOK and**  
**TREE CUTTING MITIGATION**

*A report prepared for the City of Ottawa*

*by ESG International Inc.*

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**Important notice**

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10<sup>th</sup> September 2003.*

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## ***1.0 INTRODUCTION***

This report is the technical environmental study carried out to determine the Natural Environment Area (NEA) boundaries and the aquatic habitat associated with Shirley's Brook in the vicinity of the lands owned by KNL Developments Inc. on the west and east sides of the Goulbourn Forced Road, between the Beaver Pond to the east and the First Line Road allowance (the existing wooden hydro pole line) to the west. Lands on the east side of the Goulbourn Forced Road south of the Beaver Pond are already developed and are not included in the scope of this report. The study area for the report is depicted on Figure 1.

The NEA boundaries within the study area were originally addressed at a conceptual level in the 1980s, as described in the planning study completed by D. W. Kennedy Consulting Ltd. A primary objective of this study is to evaluate the original concept NEA lines utilizing the natural environment and social criteria described in this report.

This report was expanded to include identification of areas impacted by the unauthorized tree cutting in the early spring of 2002 between Goulbourn Forced Road and the First Line Road allowance. The tree cutting involved removal of approximately 2,200 stems of deciduous and coniferous trees ranging in average size for each species from 33cm to 97cm diameter at breast height. White ash, red maple, bur oak, white spruce, white elm, basswood and white cedar were the most frequently cut species. The majority of trees were removed in three general locations, as shown on Figure 2, among upland coniferous habitat south of the Kizell Pond and upland deciduous habitat north of the Kizell Pond to the west of the Goulbourn Forced Road, and among deciduous swamp habitat to the east of the First Line Road allowance. In addition to the actual removal of trees, damage of small tree stems and other vegetation was extensive as a result of the search for trees to be cut and the skidding of the harvested trees. Note that the delineation of the NEA boundaries did *not* consider the tree removal that occurred in March and April of 2002.

For the purpose of boundary delineation, the trees and associated habitat were considered to be intact. Mitigation measures are also presented to address this tree cutting.

This report does not represent an Environmental Impact Statement (EIS) for the proposed development. An EIS, including a monitoring plan, will be required for the proposed residential development utilizing the concepts in the Environmental Impact Statement Draft Guidelines (RMOC, 1998a) and the *Natural Heritage Reference Manual* (OMNR, 1999).

Specifically this report describes:

- the existing environmental conditions of the site, including the terrestrial, wetland and aquatic features;
- the evaluation of the Natural Environment Area (NEA) boundaries;
- the impact associated with the tree removal that occurred in March and April;
- mitigation measures for the tree removal, including restoration of the landscape; and,
- mitigation measures for the realignment of Shirley's Brook.

**Figure 1 Study Area, Vegetation Communities and NEA Lines**



The Kanata Lakes North Neighbourhood Park Facilities Program Update prepared by Corush Sunderland Wright Limited describes the recreational trail system, interpretative opportunities and other social components of the Kanata Lakes North evaluation. Information on stormwater management is described in the Kanata Lakes North Serviceability Study completed by Gumming Cockburn Limited.

## **2.0 METHODOLOGY**

### **2.1 Terrestrial Environment**

Many existing studies described the features and functions of the terrestrial environment. The principal documents are:

- Kanata Lakes Study Area Natural Environment Assessment (Brunton, 1992);
- Shirley's Brook and Watts Creek Sub-Watershed Study (Dillon, 1999);
- Environmental and Servicing Reviewing of the West Kanata Lakes Area (DRAFT, CH2MHILL, 2001 ); and,
- a Review of Campeau Lands within the South March Highlands Conservation Lands (F.F. Slaney & Company Ltd., 1978).

The vegetation communities, significant plant and wildlife species and ecological functions were reviewed and verified under 2002 conditions with detailed spring fieldwork in 2002. Observations of breeding birds were completed on May 29<sup>th</sup>, May 30<sup>th</sup>, and June 18<sup>th</sup>, 2002. The breeding bird work was conducted between 05:30 and 08:30 each morning. Weather conditions were ideal for the breeding surveys as winds were light and skies were clear. Additional vegetation and casual wildlife observations were undertaken later in the morning for each of the dates listed above, and on June 26<sup>th</sup>, 2002. Casual vegetation and wildlife observations were also noted as part of the many field visits completed with the study team and agency staff in August and September, 2002. As part of the surveys, potential habitat for amphibians and reptiles was examined, including the underside of logs and other woody debris. The Natural Heritage Information Centre database was reviewed to identify other potential species of interest in the vicinity of the site.

In addition to the background documentation, colour aerial photography (1999, 1:15,000) was used to assess the natural environment features in the general vicinity of the study area described above. The Natural Heritage Information Centre (NHIC) database was utilised to provide characteristics of the vegetation species identified with respect to wetland affinity, weediness, introduced plants, potential impact on native flora, and level of disturbance (Oldham et al., 1995). The system provides an assessment of the sensitivity and character of the vegetation through the application of the *Floristic Quality Index* (FQI), *Wetness Index* and *Weediness Index*. The FQI provides an index to measure the presence of conservative (sensitive) plants and for comparing different natural areas. The *Weediness Index* quantifies the potential invasiveness of non-native plants, and, in combination with the percentage of non-native plants can be used as an indicator of disturbance. The *Wetness Index* provides levels of probability that a particular species will occur in wetland or upland habitats. Detailed explanations of these systems and species lists are presented in Appendix B.

Ecological units were defined based on species present, the wetness index of the species, dominant species, locations of standing water and other drainage observations; health, age, topography and soil conditions. The ecological units are described using the terminology recommended by the Ecological Land Classification system (Lee et al., 1998).

Other aspects of the surveys included photographs of site representative features and observations on the level of disturbance from human activities and non-native flora and fauna.

Brownell and Larson (1995), RMOC (1998b) and NHIC (2001) were used to identify nationally, provincially and regionally rare vascular plants, birds and other wildlife.

## **2.2 Shirley's Brook**

The aquatic habitat associated with Shirley's Brook west of the Goulbourn Forced Road was investigated in November 2001 and April 2002. This provided examination of the habitat under relatively dry conditions (November survey) and wetter conditions after snowmelt and frequent rain events (April survey).

Following Ministry of Natural Resources protocols, the aquatic habitat was surveyed by examining watercourse form, riparian corridor characteristics and in-stream structure. Watercourse form addresses the meandering of the channel and the riffle/pool/run/glide ratios. The riparian corridor characteristics include extent of stream cover and other riparian vegetation attributes, stream bank stability and any associated erosion and linkages to other features. Instream structure examines the exposed substrate, extent of in-stream cover such as aquatic vegetation, submerged shelters, undercut banks and boulders, the wetted and channel widths and the water depth.

## **3.0 DESCRIPTION of the EXISTING ENVIRONMENT**

### **3.1 Natural Environment Area**

As part of the larger Carp Ridge and South March Highlands Area, the Kanata Lakes study area provides a complex series of habitats that are unusual for the Region of Ottawa-Carleton (Brunton, 1992). The majority of the general area has been impacted to some extent by human disturbances such as logging since the 1800s, cattle grazing (primarily north of the Nepean - Arnprior Railway line), and agriculture (cropland west of the Goulbourn Forced Road). In 1870 much of the area was also impacted by what is known as the "Great Fire" (Brunton, 1992).

The Kanata Lakes area is characterised by upland vegetation that transitions abruptly to wetlands in depression areas. The flora and fauna are dominated by a high number of southern species with a slight northern influence (Brunton, 1992). The majority of the 500 flora species found within the Kanata Lakes area are typical or common in the Region (Brunton, 1992). The exceptions are those species that are considered to be northern species and a few uncommon or rare southern flora (Brunton, 1992). Furthermore, 108 of the 500 species are considered to be non-native and are associated with the railroad and the Goulbourn Forced Road (Brunton, 1992).

The most common vegetation types are the early and late successional upland deciduous forest. The early successional community has a long history of disturbance due to fires, logging, and agricultural development (Brunton, 1992). Marshes are common in the vicinity of the Beaver Pond and along inputs to the pond, especially from the west. The vegetation communities of particular natural history interest in our study area include late succession deciduous forest, late succession mixed forest, bedrock outcrops and wetlands.

The forested areas well to the west of the Goulbourn Forced Road represent the West Block Natural Environment Area proposed by Brunton (1992), while the forests east of the Goulbourn Forced Road represent the south portion of the Trillium Woods Natural Environment Area described by Brunton (1992). The forested portions of the study area east of the Goulbourn Forced Road and further to the west of the Forced Road are part of the 425 hectare candidate Provincially-significant South March Highlands life science Area of Natural and Scientific Interest (Brunton, 1992b). The entire study area is part of the South March Highlands Natural Area as defined in the former Region of Ottawa-Carleton's Natural Environment System Strategy (Brunton, 1997).

### **3.1.1 Wetlands**

The marshes to the east and west of Goulbourn Forced Road are dominated by broad-leaved cattail, with reed-canary grass, purple loosestrife and narrow-leaved cattail common (Figure 1, Photo 3, Appendix A). Slender willow and red-osier dogwood shrubs are scattered throughout the marshes. Rice cut grass, joe-pye-weed and spotted jewelweed are other common vegetation. Species of note identified by Brunton (1992) included green bur-reed and water-pepper, the latter is still considered regionally significant (RMOC, 1998). Eggs belonging to the Blanding's turtle, the only regionally significant non-avian fauna reported by Brunton (1992) in the general study area, were reported by Slaney (1978). Blanding's turtle was observed in Kizell Pond during the 2002 field surveys and was reported by Brunton (2001) in the ponds along the First Line Road allowance. The open water portions of the Beaver and Kizell Ponds and adjacent marsh areas also provide habitat for waterfowl. Several black ducks and mallards were observed, along with adult and immature wood ducks in the Kizell Pond.

### **3.1.2 Upland Habitat**

Sugar maple forests, with good representation of American beech and yellow birch forest are the most common forest communities along the north side of both the Beaver and Kizell Ponds (Photo 1, Appendix A). This forest is younger further north of Kizell Pond and closer to the Goulbourn Forced Road. The ironwood and black cherry associations are generally located north of the Nepean-Arnprior Railway line, however common associate tree species in our study area included white ash, red oak and basswood. Sugar maple trees (diameter at breast height (dbh) in the range of 70 cm) are representative of the larger trees in the more mature forest.



Good regeneration of balsam fir and white cedar was noted in some areas, and portions of the forest west of Goulbourn Forced Road are reflected of mixed forest conditions rather than deciduous forest (Figure 1). The forests are representative of a relatively high overall floristic quality of the vegetation with a slightly degraded to intact landscape prior to tree removal in March and April of 2002. A typical percentage of non-native plant species (21 percent in 2002) for a natural area in Southern Ontario were observed.

This natural area provides high forest coverage, with several area-sensitive breeding birds reported by Brunton (1992) including scarlet tanager, ovenbird, American redstart, black-and-white warbler, veery, pileated woodpecker, barred owl and ruffed grouse. With the exception of the barred owl, all of these area sensitive bird species were observed during the 2002 field surveys. Additional area sensitive breeding bird species noted in 2002 included blue-headed vireo, scarlet tanager, pine warbler and winter wren. The blue-headed vireo is considered a regionally-rare breeding bird (Brownell and Larson, 1995). The high quantity of snags and dying elms in the area provide nesting and perching sites for such species as the pileated woodpecker and red-headed woodpecker (Slaney, 1978) (Photo 5, Appendix A). The latter woodpecker is considered 'possibly rare' on a regional basis by Brownell and Larson (1995), and has not been reported recently in the study area.

Several rare flora species were reported in the mature forests by Brunton (1992). Plants still considered regionally significant (RMOC, 1998) included maidenhair spleenwort, hairy woodrush, downy rattlesnake-plantain, white vervain, burreed sedge, showy orchis, virginia spring beauty and long-spurred violet.

Younger mixed forests are located east of the First Line Road allowance and south of the cattail marsh (Figure 1).

Small areas of bedrock outcrops are scattered throughout the forested areas, especially to the west of the Goulbourn Forced Road (Photo 2, Appendix A). The number of bedrock outcrops increases closer to the First Line Road allowance. The largest of these areas is approximately two hectares in size. Regionally significant plant species reported in this community by Brunton (1992) included rusty woodsia and maidenhair spleenwort.

### **3.1.3 Linkages and Other Functions**

The forests in the study area are linked to the adjacent natural areas via remnant woody vegetation and wetlands and Trillium Woods in the east portion of the study area. These natural areas provide a wildlife corridor which enable birds and other wildlife to penetrate away from the core South March Highlands and Carp Hills natural areas, and inland from the Ottawa River via smaller natural areas to the north-east (Dillon, 1999).

The forested portions of the study area have had little site fragmentation. These pristine forested areas have high aesthetic qualities and provide a variety of wildlife habitat. Cattle grazing and other agricultural activity have had little impact on the more mature forests. However, there are a large number of trails, especially to the north of Kizell Pond, on the west side of the Goulbourn Forced Road. Erosion was observed along many of these trails, apparently in association with mountain bike activity. Several mountain bike structures have been erected.

### 3.1.4 Definition of NEA Boundaries

As stated in the introduction to this report, the NEA boundaries were conceptually defined, without the benefit of detailed field assessments, in the 1980s through the 40 percent agreement. This concept definition was the starting point for the definition of the NEA boundaries completed in this study. The Official Plans of both the City of Kanata and the Regional Municipality of Ottawa-Carleton state that the boundaries are approximate and can be altered without an amendment to the Official Plan (s.5.4.1.2 and s.5.4.2.2, RMOC Official Plan; s.6.4.2. 1, City of Kanata Official Plan).

The following environmental factors were used in evaluating the detailed location of the NEA boundaries:

- Representation of diverse natural features
  - marsh and swamp wetlands
  - coniferous, mixed and deciduous forests
  - bedrock knolls
- Protection of the sensitive natural features
  - suitable setback from the wetland habitat and edges of the forests
- Topography
  - locate boundaries beyond greater slopes
- Recreation
  - ensure lines provide enough space for trails and vistas of the interesting features

Note that the delineation of the NEA boundaries did *not* consider the tree removal that occurred in March and April of 2002. For the purpose of boundary delineation, the trees and associated habitat were considered to be intact.

The proposed NEA boundaries include wetlands and open water associated with the Kizell Pond and the Beaver Pond and suitable adjacent lands to protect the wetlands. The wetland habitat is generally cattail marsh along with deciduous swamp habitat in the west portion of the study area, east of the First Line Road allowance. The wetlands were included as they represent a different habitat relative to the adjacent upland forests and they are contiguous with wetland habitat to the west (Photos 3 and 4, Appendix A). The extent of adjacent lands required to protect the wetlands was a function of the slope stability, which was generally very good throughout the study area, a reflection of the minimal overburden in many areas, the topography, and the establishment of the riparian vegetation. In addition to the marshes and open water associated with the Kizell and Beaver Ponds, additional wetlands and woodlands pools have been included within the NEA boundaries on the north side of both the Kizell and Beaver Ponds (Photo 4, Appendix A). These areas provide habitat for amphibians, breeding birds and other wildlife.

Having retained the existing wetlands within the NEA boundaries, large tracts of deciduous and mixed forests were incorporated within the NEA boundaries north of the Kizell Pond, and smaller cedar and deciduous forests were included on the south side of Kizell Pond. In addition to the *core* area of upland forest on the north side of Kizell Pond, major bedrock knolls were incorporated into the NEA boundary (Photos 1 and 2, Appendix A). This provided retention of a variety of upland habitat benefiting both wildlife and the nature appreciation experience of the area. The NEA boundary on the north side of the Kizell Pond was designed to be large enough to include a core protected forested area of a minimum of 10 hectares for area sensitive breeding birds (Photo 1, Appendix A).

The NEA boundaries include existing trails, or the space required for new trail alignments, on both sides of Kizell Pond and the north side of Beaver Pond. These are discussed in more detail in the recreational report produced by Corush Sunderland Wright Limited. To ensure that a recreational trail alignment that protected the more sensitive environmental features while providing the desired experiences could be achieved within the NEA boundaries, a corridor for the trail alignment was selected in the field with staff from Corush Sunderland Wright and the City. In some areas on the north side of the Kizell Pond, east of the major outcroppings, the NEA boundary was extended five to ten metres to the north to accommodate the preferred location of a new trail alignment.

The NEA boundaries proposed in this report and the conceptual boundaries developed in the 1980s are generally similar. There was an increase in protected area of approximately two hectares (five acres) on the east side of the Goulbourn Forced Road, north of the Beaver Pond, to add ephemeral ponds and more forested and swamp habitat. The NEA boundary on the south side of the Kizell Pond is similar to the original boundary. On the north side of the Kizell Pond, west of the Goulbourn Forced Road, the NEA boundary has been decreased closer to the Forced Road relative to the concept NEA boundaries to delete upland meadow and early successional forest habitat. In addition, a portion of the upland forest habitat to the north of the bedrock knolls, west of the First Line road allowance, was not retained as this habitat is very common in the Kanata Lakes/South March area, and the habitat did not add to the diversity of the area. The total NEA lands, as designated in this study, on the west side of the Goulbourn Forced Road are in the order of 35 hectares (87.6 acres).

The eastern most pocket of land, north-east of the Beaver Pond, has been identified as "Open Space". This area was not included in the NEA boundaries due to a relatively high level of disturbance from a wooden pole hydro line, trails and extensive areas without a closed canopy of woody vegetation. However the lands are valuable as a recreational linkage to the lands to the north. Given the extent of existing and proposed development in the vicinity of the Beaver Pond, a natural linkage between the NEA lands along the Beaver Pond and Trillium Woods to the north was not considered beneficial from a biological sink perspective. Efforts should be concentrated on connecting Trillium Woods to South March Highlands to the north-west.

### 3.2 Shirley's Brook

At the time of a November, 2001 survey, there was no flow in the channel of Shirley's Brook west of the Goulbourn Forced Road, although there was a defined stream channel and some pools of standing water. The defined stream channel and woody debris suggested that flows are present for a portion of a typical year, and flow was observed on April 10, 2002, after a period of recent rains and snowmelt. On April 10, the channel contained water that varied in depth from 37 to 70cm. The wetted width of the watercourse varied between 1 and 4 metres.

The habitat of Shirley's Brook west of the Goulbourn Forced Road can be divided into two reaches. The reach within the first 100 metres upstream, west, of the Goulbourn Forced Road has an extensive amount of stream cover from woody vegetation in the riparian corridor. The substrate consists of bedrock outcrops and coarse material, such as rubble and cobble, which also provides some instream structure and the woody vegetation affords good stream cover. The lowflow channel is well defined among the bedrock.

The majority of the study area, that is the reach of Shirley's Brook from 100 metres upstream of the Goulbourn Forced Road to the First Line Road allowance, has very limited overhanging vegetation. The sediment was composed of fines (clay, sand and silt). The majority of the watercourse was vegetated throughout with terrestrial plants and in the upstream locations with some shrubs, indicating that this portion of Shirley's Brook is an ephemeral, or intermittent, watercourse.

A small flooded area of reed canary grass was located approximately 125 metres upstream of the Goulbourn Forced Road. Although this area appears to provide some potential spawning habitat for fish such as Northern pike, fish as large as pike could not move through the many culverts and narrow sets of runs and cascades associated with Shirley's Brook downstream. Further west, Shirley's Brook flows between two cultivated fields and the channel appears to have been historically straightened. There was generally at least a one-metre width of reed canary grass between the edge of the agricultural fields and the channel, however in some areas there was no buffer. A small wooden bridge, providing access to the south agricultural field, did not appear to inhibit flow.

Approximately 750 metres upstream, west, of the Goulbourn Forced Road, Shirley's Brook branches in two, with both branches channelized. One branch continues to the north towards the Nepean-Arnprior Railway line, while the other branch continues in an east-west orientation towards the First Line Road allowance. Immediately downstream of the First Line Road allowance, most of the flow in the channel of Shirley's Brook was contained behind a berm that appeared to be a historical beaver dam.

Approaching the Nepean-Arnprior Railway line, the branch runs along the south side of the rail line towards the First Line Road allowance. The upstream side of a culvert under an agricultural access trail appears to block water during periods of flow. A culvert has been removed south of the rail line, and ponding may also occur upstream of this area.

The area to the west of the branching of Shirley's Brook between the Goulbourn Forced Road and the unopened First Line Road allowance (hydro line) coincides approximately with the reach described as Type 1, or critical, habitat in the Shirley's Brook and Watts Creek sub-watershed study. Ms. Jennifer Harker at Dillon Consulting, the author of the sub-watershed study, was contacted to determine the source of this designation, as the 2001/2002 field review gave no indication that the habitat would be considered Type 1. Ms. Harker was unable to provide any supporting field notes or other information for the Type 1 designation. She suggested that the area be re-examined, which is what we have done. Similarly City of Ottawa staff indicated that they do not have any background information on the reach classification.

No fish were observed in the study area in either the autumn or spring field visits. The channelized nature of the watercourse, lack of spring fish observations, limited stream cover and absence of instream structure greatly limits the fish habitat potential of this reach. The most important function that this reach provides is the contribution of base flow to the downstream reaches of Shirley's Brook. Although the fish habitat on-site is very limited beyond the first 100 metres west of the Goulbourn Forced Road, given the downstream contributions, defined channel and presence of spring flow, it is recommended that the reach beyond the forested area west of the Goulbourn Forced Road be considered intermittent degraded, or Type 3, fish habitat. The fish habitat within the forest adjacent to the Forced Road would be considered Type 2, or important, fish habitat.

The edges of the Beaver Pond were electrofished for the Terry Fox Drive Environmental Assessment Study (Dillon, 2001). Central mudminnows dominated this catch, although pumpkinseed, brook stickleback, fathead minnow and goldfish were also captured.

#### ***4.0 DESCRIPTION of ENVIRONMENTAL IMPACTS***

##### **4.1 Natural Environment Area Level of Impact Analysis**

The total amount of area within the NEA boundaries defined in Section 3.1.4 damaged by the tree removal in March and April of 2002 was approximately four hectares (ten acres) (Figure 2). Within the NEA boundary major tree removal occurred in the cedar upland forest south of the Kizell Pond, immediately west of the Goulbourn Forced Road, and the ash and maple swamp to the west of the Kizell Pond, east of the First Line Road allowance (Photos 7 and 8, Appendix A). Tree removal also occurred at the edge of the wetland habitat west of the Goulbourn Forced Road, on the south side of the pond

The vegetation communities within the NEA boundary on the north side of Kizell Pond, west of the Goulbourn Forced Road were not impacted except for a portion of the upland deciduous forest contiguous with the impacted swamp in the west portion of the study area.

Major tree removal occurred outside of the NEA boundary in the upland deciduous forest north of the Kizell Pond, immediately west of the Goulbourn Forced Road. Some tree removal also occurred among upland deciduous forests on the south side of Kizell Pond, to the south of the NEA boundary.

There was no damage to the deciduous forests on the north side of Beaver Pond, east of the Goulbourn Forced Road.

Protection of trees and other vegetation not removed as logs was poor. There was significant indiscriminate damage to the vegetation by logging equipment. Many smaller trees appeared to be cut or damaged only for access to larger trees. In addition, several swaths of run-over trees and shrubs indicate that much damage was done to the woody vegetation as a result of surveying with heavy machinery for potential trees to be removed.

The potential impacts associated with the proposed residential development will be reviewed in detail as part of the Environmental Impact Statement. Potential impacts of development of the adjacent lands on the NEA features and functions could be direct or indirect. The direct impacts could include intrusions into the NEA boundaries by construction equipment and stormwater management infrastructure, or during the operational component, by the adjacent residents, their pets and a greater presence of associated urban wildlife. Indirect impacts that could occur during construction include release of untreated surface flow towards the NEA boundaries, which could contain contaminants from improper maintenance of machinery and from accidents and malfunctions such as spills during refuelling of equipment. Adjacent residents could also create indirect impacts through the introduction of non-native and invasive species and removal of woody vegetation adjacent to the NEA boundaries. Such impacts could stress the native species within the NEA lands.

#### **4.2 Shirley's Brook Realignment**

The more sensitive aquatic habitat in the study area is within the initial 100 metres of Shirley's Brook upstream, or west, of the Goulbourn Forced Road. This habitat should either be left in the current conditions with a minimum fifteen metre naturalized buffer from any adjacent development, or relocated to the north where there will be less potential for disturbances from adjacent activity. If the latter solution is selected, additional details will be added to the fish habitat compensation package described in Section 5.2.

Given the extremely limited on-site aquatic habitat, as described in Section 3.2, further upstream of Goulbourn Forced Road, it is recommended that the watercourse to south of the Nepean - Arnprior Railway line be realigned to permit a natural channel design of the reach outside of the core portion of the development. This will ultimately provide greater aquatic habitat and less impact on the watercourse as it will be contained within a naturalized open space area as described in Section 5.2. Placement of proper functioning culverts and removal of existing berms will improve the on-site habitat relative to existing conditions and should increase the downstream contribution to baseflow.

As long as existing baseflow is maintained and proper sediment and erosion control measures are undertaken during construction, no notable impact on downstream fish habitat is anticipated.

## **5.0 MITIGATION of IMPACTS**

### **5.1 Natural Environment Area**

#### **5.1.1 Remediation and Restoration Principles**

The following site remediation and restoration principles will be incorporated into the site work to be completed as a result of the tree removal that occurred in March and April of 2002. These principles are summarized in Figure 3. This site work should be completed as soon as possible to minimize further disturbance, and ideally before the spring thaw in 2003.

##### **Plantings:**

- planting of native tree and shrub species such as white cedar, white spruce, red maple, sugar maple and black ash. Seedlings will be required for reforestation due to shallow growing conditions in the area;
- planting of ground cover native species such as bunchberry, asters, wild sarsaparilla, starflower and wild lily-of-the-valley;
- selective pruning of trees that were damaged during the removal of adjacent trees to reduce susceptibility to disease and promote new growth; and,
- opportunities to transplant young saplings into disturbed areas and buffers from land that will be developed in the future or saplings that may be damaged during restoration activities.

##### **Wildlife Habitat:**

- retain dead trees (snags) in the terrestrial habitat to provide wildlife habitat; 0 other wildlife habitat should be encouraged with retention of brushes and rockpiles;
- bird platforms, purple martin houses and bat boxes are other examples of measures to enhance wildlife habitat;
- within the wetland habitat submerged and emergent plants should be planted; and, o rock slabs and logs could be positioned for sunning and improving aquatic habitat.

##### **Removal of Woody Debris:**

- avoid additional damage to regenerating deciduous and coniferous stems and ground cover vegetation during removal of debris by avoiding use of heavy equipment and minimizing the extent of debris removal;
- avoid removal of woody debris from sensitive areas, including wetlands, but remove debris where it will improve conditions for stems to regenerated;
- remove stems over 8cm diameter. Unless in proximity to a recreational trail, other debris should remain as wildlife habitat;
- retain existing woody debris that occurred as natural deadfall prior to the tree removal in 2002. Exceptions may be made in areas where pre-existing woody debris compromise the aesthetics associated with the recreational trail system;
- woody debris should be removed before spring 2003 to avoid destruction of newly created habitat in the debris;
- stumps in proximity to the recreational trail should be ground down to the existing surface elevation to improve the aesthetics viewed from the trail. Care will be required to ensure the stump removal does not aggravate existing damage to the surface conditions; and,
- selective stumps should be designated for alternative uses such as bird feeders, benches or bases for interpretative displays.

**Figure 3 Restoration recommendations**



### 5.1.2 Area by Area Remediation Plans

In consultation with the project landscape architects, an on-site remediation plan will be developed for each impacted area. The remediation plan will incorporate the principles listed in Section 5.1.1 and will include site specific application of the principles based on the extent of impact for an area, the growing conditions, access to the area, and the proximity to the recreational trail system. For example in portions of the impacted deciduous forest south of the Kizell Pond and east of the First Line Road allowance that are not near the recreational trail, it is recommended that the tree stumps and smaller woody debris remain. In closer proximity to the recreational trail, such as in the coniferous forest immediately west of the Goulbourn Forced Road, the tree stumps should be ground down to the surface level and a greater proportion of woody debris removed (Photo 6, Appendix A).

In the deciduous swamp to the east of the First Line Road allowance, due to access concerns in the soft substrate, it is recommended that the stumps and woody debris remain. More disturbances to the wetland habitat are anticipated than any benefit associated with the removal.

Figure 2 identifies the location of low, medium and high areas of impact. Low areas were identified as those in which very few trees were cut and there was limited woody debris left in place or the debris can be relatively easily removed. Approximately 0.46 hectares (1.1 acres) of low impacted area was designated within the NEA boundaries. Many regenerating stems appeared to still be viable and there was minimal disturbance to ground cover vegetation or the ground itself. Medium areas contained more removed trees but there were still many trees left or there were few trees, and no large trees, in the area prior to the tree cutting. The medium areas contained no large areas of brush piles that cannot be relatively easily removed and a good representation of healthy regenerating stems and ground cover was still available with limited damage to the surface integrity. Approximately 0.52 hectares (1.3 acres) of medium impacted area was designated within the NEA boundaries. High impact areas had many trees removed and/or large trees removed. There was often extensive woody debris and notable damage had occurred to the ground cover, regenerating stems and/or surface integrity. The majority of the impacted area was designated high, approximately three hectares (7.6 acres) (Figure 2).

The levels of impact will assist in delineation of the on-site restoration plans for each area. For example, in areas of low impact, more woody debris is likely to remain in place providing it does not compromise the success of regenerating stems or the aesthetic appeal of the recreational trail system. The requirements for plantings in these areas will be minimal. More removal of woody debris, treatment of stumps and plantings will be required in the medium and high levels of impact. The woody debris to be removed should generally be chipped and the product removed off site unless it can be utilized for recreational trails or as part of the mitigation measures such as a protection area adjacent to the construction fencing, as described below.

It is imperative that the restoration and rehabilitation plans be completed under the supervision of a qualified professional who will identify the prescribed treatments not only on an area by area basis but also individual stumps and limbs. All work should be undertaken with a minimal amount of heavy equipment and should be completed outside of the growing season, ideally when the ground is frozen but minimal snow cover is present.

### 5.1.3 Development Guidelines for Adjacent Lands

This section will be fleshed out in detail as part of the Environmental Impact Statement. The Environmental Impact Statement will address additional items such as human intrusions into the NEA lands, impacts and mitigation associated with the stormwater management plan and phasing of the development. At this stage, the Serviceability Study for the Kanata Lakes North prepared by Cumming Cockburn Limited and the Kanata Lakes North Neighbourhood Park Facilities Program Update prepared by Corush Sunderland Wright Limited have been reviewed. The concepts and solutions presented in these documents are consistent with the objective of preservation of the important features and functions of the NEA lands. For example, the phasing of development within the Serviceability Study recommends development of the lands south of the Kizell Pond first. These lands are adjacent to existing residences east of the Goulbourn Forced Road and development under construction to the south. This phasing will not 'land-lock' natural environment features by first developing lands that are furthest from existing development. Detailed analysis at the subdivision application stage should focus on fine-tuning the location of the storm sewer outlets to avoid sensitive features, control of sedimentation and other protection measures during construction of the outlets, and ensuring the outlets and associated infrastructure do not conflict with the recreational trails. Detailed mitigation measures need to be developed for the construction of the recreational trails to ensure disruptions to adjacent sensitive features are avoided. The potential impacts of the trail operations on the surrounding environment need to be fleshed out and appropriate mitigation measures developed.

To protect the edge of the NEA lands, as defined in Section 3.1.4, a buffer of 10 or 15 metres is recommended adjacent to the NEA boundaries. The extent of this buffer is a function of the vegetation communities and topography adjacent to the NEA boundary. For example, on the south side of the Kizell Pond, west of Goulbourn Forced Road, the recommended buffer could be only ten metres as the woody vegetation adjacent to the NEA lands is limited and the topography is gently sloping. On the north side of the Kizell Pond, approximately 300 metres west of Goulbourn Forced Road, the lands adjacent to the NEA boundary are generally forested and the topography is more undulating. In this location a 15 metre buffer will be recommended. The buffers will be further delineated as part of the EIS.

From a natural environment perspective, the function of the buffer is primarily to protect the edges of the NEA lands. The boundaries of the NEA lands have already taken into account a buffer to protect the more sensitive features such as the wetland habitats and steep slopes. Thus the buffer does not represent a setback from top-of bank for example, but is an additional buffer from a boundary that already includes typical setbacks from the sensitive features.

Where the recommended buffer is currently void of woody vegetation, native tree and shrub plantings are desirable to increase the naturalization of the buffer and add to its protective function.

If the recommended buffer is insufficient to protect an existing treed edge along the NEA boundary during construction, then the width of the setback should be increased. For example if blasting requirements dictate that a ten metre buffer will not adequately protect the root structure of the trees representing the existing forest edge then the setback must be increased. The extent of blasting in proximity to the buffer will be a function of the specific development plans for each lot (i.e. the location of the building footprint) and the associated servicing requirements. In areas adjacent to the buffers where blasting is required, consideration should be given to pre-shearing the rock to create a crack between the trees' critical root zone perimeter (approximately 15 times the dbh of the trees) and the blasting work, and the ground around the trees adjacent to blast areas should be moistened to increase soil adhesion and assist in retaining root-soil contacts during blasting.

The outside edge of the buffer must be clearly delineated with construction fencing to ensure no entry of machinery into the buffer area and adjacent NEA lands and to prevent grading, soil compaction and other potential impacts on the core of the root system of trees within at the edge of the NEA lands. Wood chips should be placed on the development side of the construction fencing to help prevent the compaction of soil surrounding fine feeding roots and further discourage entry into the buffer areas.

Due to the extent of bedrock near the surface and associated blasting requirements for installation of services, retention of individual trees outside of the NEA lands and buffers is difficult. The following mitigation measures are recommended for general tree retention and protection of wildlife habitat.

- where retention of regenerating stems will not be feasible due to their location in a lot, the stems should be considered for transplanting to provide a source of native trees where blasting, grading or construction access will require planting after development;
- planting of native trees should be encouraged on a lot by lot basis to assist in replacing the trees removed;
- in all areas the extent of vegetation removal should be limited as much as the blasting and grading requirements will permit; and,
- to protect breeding birds, tree removal should not occur between May 15~' and July 7~', unless a breeding bird survey is conducted and trees removed within five days of the survey.

## 5.2 Shirley's Brook

As discussed in Section 3.2, with the exception of the first 100 metres upstream of the Goulbourn Forced Road, the fish habitat on-site is very limited. As indicated in Section 4.2, it is proposed to relocate the reach upstream of the Forced Road to a corridor adjacent to the Nepean-Arnprior Railway line. In this location the reach will be able to meander within a 30 metre naturalized corridor. This will improve the on-site aquatic habitat characteristics while maintaining the existing downstream contributions. The relocation of this reach of Shirley's Brook will result in a harmful alteration, disruption or destruction of fish habitat, as defined under the Federal *Fisheries Act*. This section will outline the benefits of relocating the reach. The enhancement measures recommended below will form the basis of a compensation agreement to be developed with the agencies as part of the *Fisheries Act* authorization. The measures must ensure that the aquatic habitat in the relocated reach will be improved over the existing conditions. If the relocation of Shirley's Brook includes the habitat immediately west of the Goulbourn Forced Road, then the extent of compensation will be increased to ensure an improvement in overall aquatic habitat.

### 5.2.1 Natural Channel Design

To provide the opportunity for an improvement in fish habitat over existing conditions the realigned reach must be maintained as an open channel rather than a piped, underground system. A major benefit of realigning this reach of Shirley's-Brook will be an improvement in the sinuosity or meandering of the watercourse. It is recommended that the reach be designed to permit meandering with the naturalized thirty metre wide swath. This will allow natural channel design while maintaining an appropriate buffer from the developed portion of the site.

Other aspects of natural channel design that will provide an improvement over existing conditions include riparian plantings to provide increased stream cover, greater instream structure through placement of logs (submerged shelters) and boulders, and an improvement in the extent of pool and riffle habitat. The natural features will be spaced to avoid large areas of uniform conditions, and be positioned in physically stable locations. The pool habitat will be dug to provide a typical water depth of one-half metre below the low flow depths. Pool habitat will also be ultimately created in the vicinity of the placed boulders. Riffle habitat will consist of individual sections of crush stone and rubble ranging in size from 5 to 10 em. All riffle coarse material will be washed before use. The riffle habitat will be created in sequence with the pool habitat. The riffle habitat is important for aquatic insect production and some fish spawning. The low flow water depth at the riffle habitat should be approximately 15 cm.

The number of culverts required along the reach will be much less than the culverts required if the reach was to be left in its existing location, where the number of residential street crossings would have been much greater.

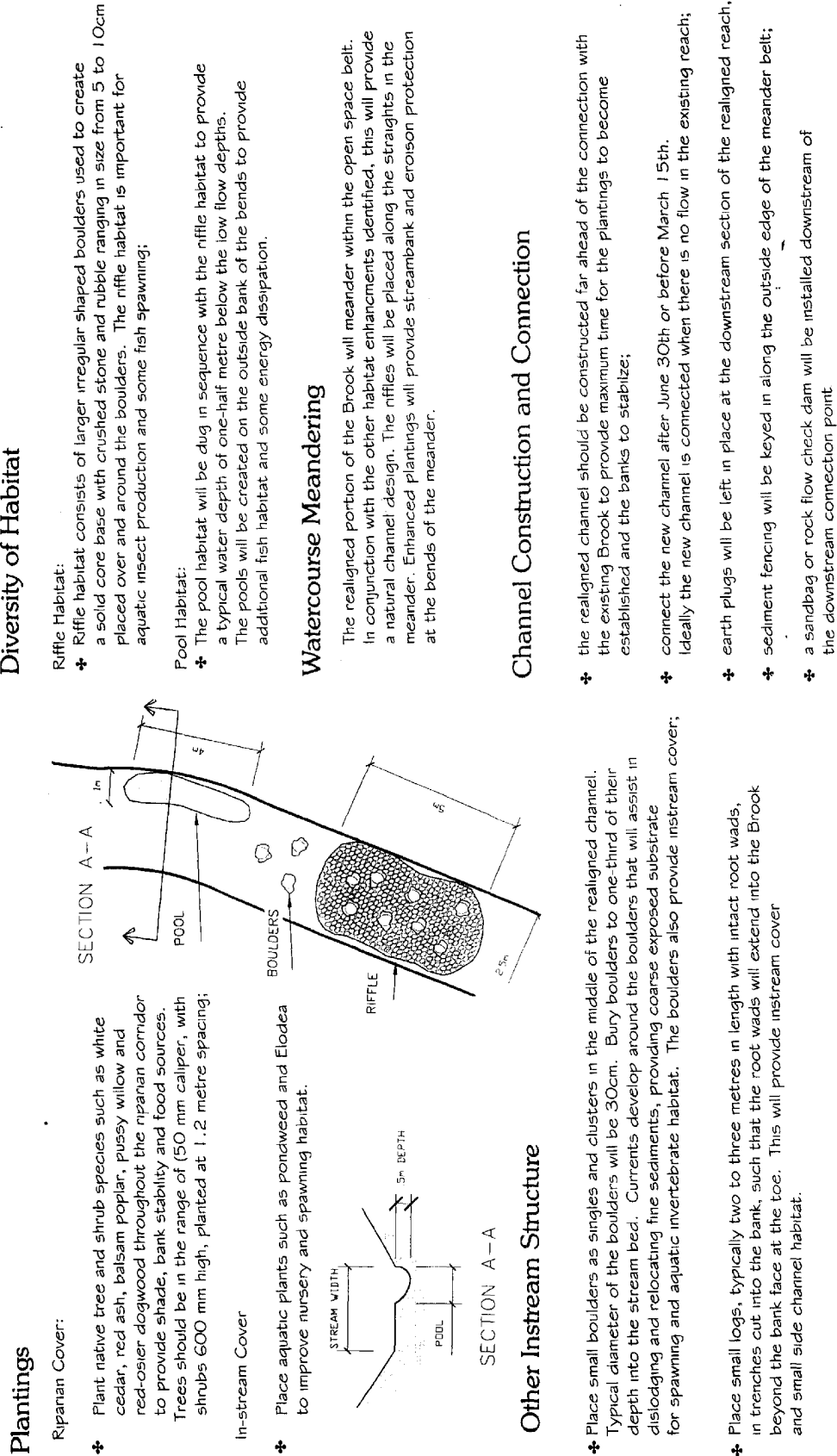
Figure 4 describes the concepts for the enhancement of aquatic habitat features and riparian corridor plantings. Detailed plans will be provided in the Environmental Impact Statement and the application to the Department of Fisheries and Oceans. Only native trees and shrubs will be planted as part of the riparian vegetation, including balsam poplar, red ash, pussy willow and black willow. In addition to the bank stability, instream habitat, energy dissipation and reduction of erosion potential, the natural riparian vegetation will improve groundwater regime, provide shade and detritus, increase vegetative diversity and enhance the terrestrial habitats.

The realigned channel should be dug well in advance of the actual flow relocation to give the maximum time for the natural vegetation to become established along the stream banks and to avoid the use of erosion control blankets where possible. Woody vegetation removal associated with the realigned channel preparation will be limited as the area is a combination of agricultural fields and cultural meadows. A native seed mix should be used in areas where the natural vegetation has not become established. To minimize potential impacts on downstream fish habitat, no in-stream work, including connection to the existing watercourse will occur between March 15<sup>th</sup> and June 30<sup>th</sup>.

### **5.2.2 Development Guidelines for Adjacent Lands**

The riparian corridor will be planted with native shrub and tree species to ensure an adequate buffer from the realigned reach within which there will be no development. Planting of the riparian corridor with native shrub and tree species is essential to provide maximum stream cover, treatment and corridor functions. A detailed planting plan will be developed. The required natural buffer from the channel is considered minimal due to the limited existing terrestrial features, stable soils, lack of sensitive on-site aquatic habitat and level topography of the area.

# Kanata Lakes West - Figure 4 SHIRLEY'S BROOK - NATURAL CHANNEL DESIGN



**Figure 4 Shirley's Brook channel design**

## **6. 0 CONCLUSIONS**

The forested portions of the study area are dominated by mature and early successional deciduous forests with mixed and coniferous forests also present. The majority of the flora species found within the Kanata Lakes area are typical or common in the Region. The forests are representative of a relatively high overall floristic quality of the vegetation with a slightly degraded to intact landscape prior to tree removal in March and April of 2002.

The NEA boundaries are similar to the initial NEA boundaries described in the 1980's. They provide for retention of a core forested area, providing habitat for area sensitive birds in the west portion of the study area, as well as wetland habitats and associated upland forests throughout the study area.

The tree removal impact in non-development lands was greatest on the south side of the Kizell Pond immediately west of the Goulbourn Forced Road, within the forests east of the First Line Road allowance and the deciduous swamp immediately to the east of the First Line Road allowance. Mitigation measures are provided to restore the areas of tree removal.

Measures are also provided to ensure that impacts on the NEA boundaries as a result of implementation of the Concept Plan will be minimal. This includes establishment of buffers beyond the NEA boundaries.

Beyond 100 metres west of the Goulbourn Forced Road, the aquatic habitat of Shirley's Brook is considered degraded. With natural channel design, it is believed that the habitat of this reach can be improved over existing conditions through realignment of the reach to south of the railway track, away from the core of the development area.

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**APPENDIX A**

**PHOTOS OF SITE REPRESENTATIVE FEATURES**

*(This has been prepared as a separate electronic document.)*

**APPENDIX B**

**PLANT and WILDLIFE SPECIES LISTS**

*(This has been prepared as a separate electronic document.)*