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Impact Assessments

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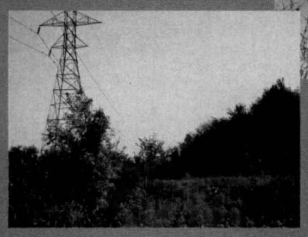
ENVIRONMENTAL IMPACT STATEMENT

KANATA LAKES NORTH
KANATA WARD,
CITY of OTTAWA



A report prepared for:

KNL Developments Inc.

April, 2003

KANATA LAKES NORTH

ENVIRONMENTAL IMPACT STATEMENT

A report prepared for KNL Developments Inc.

by Muncaster Environmental Planning.

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Important notice

This Web Edition of the Report was prepared by the Kanata Lakes Community Association as a service to the general Ottawa Community. The Report was originally submitted by KNL Development Inc. to the City of Ottawa in June of 2003 in support of an Official Plan Amendment Proposal, Plan of Subdivision Proposal, and Zoning By-law Amendment Proposal for a new major development.

The aim of publishing this Report on the web is to help residents and interest groups assess the development proposals submitted to the City of Ottawa by KNL Development Inc. For technical reasons, maps and diagrams (where included) had to be resized, and therefore should be used to gain a conceptual impression only. While every effort was made to maintain accuracy of the content, no responsibility can be assumed for any errors that may have arisen during the translation process from printed copy to electronic form. By reading this electronic version of the Report you accept the full responsibility for your use of its content. For a printed original of the Report, please contact the City of Ottawa. The kind permission of the City of Ottawa to prepare this electronic version is gratefully acknowledged.

Mik Svilans,
VP Environment,
Kanata Lakes Community Association
10th September 2003.

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1.0 INTRODUCTION

1.1 Report Purpose and Definition of the Study Area

The site consists of an area of approximately 225 hectares on the west and east sides of 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 (Figure 1). The lands west of Goulbourn Forced Road extend to the south to abut the Richcraft lands currently under review by the City. This application also includes a former school block south of the Beaver Pond, east of Goulbourn Forced Road. The latter two areas are in the Marchwood Community.

The proposal is for 1180 single residences and 2000 townhouse or apartment units (Figure 2). The site will be filly serviced with municipal sewer and water.

Surrounding land uses to the site include:

- Expanding residential portions of the Kanata Ward to the south and east of the site;
- Agricultural land to the west of the site, which has recently been purchased for the purpose of residential development; and,
- The core of the South March Highlands to the north of the site, including City of Ottawa owned land.

This EIS provides detail on the potential impacts and recommended mitigation measures associated with the proposed residential development. The report draws on many findings and conclusions detailed in the report titled *Kanata Lakes, NEA Boundary Definition, Shirley's Brook And Tree Cutting Mitigation* (November, 1992) by ESG International Inc. (referred to as the `NEA Report'). The field work completed as part of the NEA Report was utilized as the basis for biological inventory component of this EIS. The NEA Report defined the lands that contain the more important natural features and functions of the site. Any land use changes within and immediately adjacent to these lands will be restricted to passive recreational activities.

Several other studies were reviewed and cross-referenced during the production of this EIS. This resulted in an integrated and iterative approach to development of the concept plan, protection of natural environment features and recommended mitigation measures. These studies included the Kanata Lakes North Needs Assessment and Neighbourhood Park Facilities Program Update, and the Kizell Pond Trail and Woodland Restoration Concept, prepared by Corush Sunderland Wright Limited which describe the recreational trail system, interpretative opportunities and other social components of the Kanata Lakes North evaluation (CSW, 2002; CSW, 2003), and the Kanata Lakes North Servicing Study, Stormwater Site Management Plan and Erosion and Sediment Control Plan, all completed by Cumming Cockburn Limited (CCL, 2003a; CCL, 2003b). These latter studies provide information on stormwater management, grading requirements and other important servicing requirements that need to be addressed in this EIS.

Fig. 1 Study Area and Vegetation Communities

1.2 Scoping the Environmental Impact Statement

This EIS was prepared in accordance with Policy 5.4.3.2 of the Regional Official Plan with guidance from the Natural Heritage Reference Manual and Appendix J of the Shirley's Brook and Watts Creek Subwatershed Study (Dillon, 1999). The major objective of this Environmental Impact Statement is to demonstrate that the proposed change in land use will not negatively affect the significant features and functions of the study area, or will be able to rninimize such impacts through mitigation measures. To attain this objective, the original concept Site Plan was reviewed and recommendations made for revisions based on field observations of the features and functions of the natural environment.

The Environmental Impact Statement Draft Guidelines (BMOC, 1998a) and the *Natural Heritage Reference Manual* (an update to the *Natural Heritage Training Manual)* (OMNR, 1999) were reviewed to identify potential items that the EIS should address.

The following items were identified for particular attention, recognizing that many of these issues are interrelated:

· what are the anticipated direct and indirect potential impacts on the NEA lands, including the special features representative of the general South March Highlands area such as wetland, upland forests, associated wildlife habitat and other features?;

· how will a recreational trail within the NEA lands affect the ecological features and functions?

· what are the features of the wooded areas that are proposed for development?; how are the features and functions of the natural area such as linkages and unique habitats influenced or supported by the site?;

· will a new forest edge be created as a result of the development or will forest interior conditions be impacted?;

· will increases in impermeable surfaces result in impacts on infiltration and groundwater?;

· what are the potential impacts associated with the construction and operation of the municipal services and stormwater management facilities?;

· what is the quality of aquatic habitat within Shirley's Brook and how will this habitat be impacted by a proposed relocation of the watercourse?; and,

· how will changes in the baseflow entering Shirley's Brook affect downstream aquatic habitat.

1.3 Planning and Servicing History

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. This report has been previously submitted but an overview follows.

Campeau Corporation submitted a concept plan for the Marchwood Lakeside Communities in 1980. As a part of the approval process (OPA) the lands to be set aside for open space purposes (the golf course, NEA lands, parks and trail systems) were established by registering on title a document which has become commonly referred to as the 40 % Agreement. This document, as revised over the years, is the guide to the amount of open space (including all categories identified above) that is required.

The Marchwood Community is now almost fully developed with the exception of the Richcraft and School sites referred to in the Introduction. This development started in the mid-1980's on Knudsen Drive and has been undertaken by three owners including Campeau Corporation, Genstar Development Company and now KNL Developments Inc.

Fig. 2 Concept Plan

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 29th, May 30th, and June 18th, 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 26th, 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 utilized 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 of the NEA Report.

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 snow-melt 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, streambank 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 Terrestrial Habitat

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).

Bedrock outcroppings are common throughout the area. The major soil associations are

Rockland and Anstruther (Schut and Wilson, 1987). The Anstruther soils are characterized by 10 – 50 cm of acidic stony sandy loam, over bedrock with excessive to good drainage, while the Rockland association is represented by Precambrian bedrock comprising 25 percent or more of the area. The topography is moderately sloping (10 to 15 percent) with many irregular slopes, particularly in proximity to the Kizell Pond. Small areas of poorly drained Dalhousie silty clay foams are located south of the Kizell Pond and west of the Goulbourn Forced Road, while much of Shirley's Brook, including the proposed realigned area, is located within poorly drained North Gower silty foams. Finally Huntley organic soils are within the Kizell and Beaver pond areas.

The Kanata Lakes area is characterized by upland vegetation that transitions abruptly to wetlands in depressional 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; Brunton, 2001). 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, in the north-east portion of the study area, represent 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 (BMOC, 1998). Small swamp and marsh areas are also located north of the Nepean-Arnprior Railway line along Shirley's Brook and in the north portion of Trillium Woods.

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 and in Trillium Woods (Photo 1, Appendix A). This forest is younger further north of Kizell Pond and closer to the Goulbourn Forced Road, as well as in the south-west corner of the study area, south of the Kizell Pond, and north of the former cattle grazing land to the north of the Nepean-Arnprior Railway line. Common associate tree species in the central portion of the site on both sides of Goulbourn Force Road include white ash, red oak, white elm, red maple, white pine, bur oak and basswood. Ironwood and black cherry associations are common in some portions of the forests in the north and east portions of the study area. 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. Similar size white pines are adjacent to Shirley's Brook west of Goulbourn Forced Road.

Good regeneration of balsam fir and white cedar was noted in many areas, and portions of the forest west of Goulbourn Forced Road, both north of Kizell Pond and south of the Terry Fox Extension, are reflected of mixed forest conditions rather than deciduous forest (Figure 1), with white cedar, white pine and white spruce well represented. 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 mammals are well represented in the study area including white-tailed deer, porcupine and woodchuck.

Several rare flora species were reported in the mature forests by Brunton (1992). Plants still considered regionally significant (BMOC, 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

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.

3.2 2002 Tree Cutting

Tree cutting occurred 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 3, 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.

3.3 Shirley's Brook and Other Aquatic Habitat

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 low-flow 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 bean 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 subwatershed study. Ms. Jennifer Harker at Dillon Consulting, the author of the subwatershed 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.

3.4 Definition of NEA Boundaries

As detailed in the NEA Report, the NEA boundaries were conceptually defined, without the benefit of detailed field assessments, in the 1980s and included as part of the 40 % Agreement. This concept definition was the starting point for the definition of the NEA boundaries completed in the NEA Report.

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.

The NEA boundaries identified in the NEA Report, and included on Figure 1, 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).

Note that the NEA lands are identified on Figure 2 as 'Urban Natural Feature' to reflect the term used in the draft 2003 City of Ottawa Official Plan.

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, an extensive 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. However, the concept plan was reworked to include to two linkages in the range of 40 and 30 metres wide to provide some wildlife and pedestrian linkage. Efforts should be concentrated on connecting Trillium Woods to South March Highlands to the north-west. The need for any extensive linkage from Trillium Woods to the south has been lost due to the extensive development surrounding the Beaver Pond.

4. 0 PROJECT DESCRIPTION

4.1 The Concept Plan and Land Uses

The proposed residential development is for 1180 single residences and 2000 townhouse or apartment units (Figure 2). In addition to the NEA lands and Trillium Woods described in Section 3, park open space areas are located in the north-west corner of the site, west and east of Goulbourn Forced Road in the central portion of the site, and at the east edge of the study area. Small linkages have been provided between the Beaver Pond and Trillium Woods, as well as several access points from the development areas to the NEA lands. An open space area north of the Nepean-Arnprior Railway line, in the north-west corner of the site, will be used mostly for a stormwater management pond to service the Terry Fox Drive extension. Blocks of land to the west of the future Goulbourn Forced Road alignment north of the railway have been reserved for three schools sites. To the south of this is an open space block that will be primarily dedicated to active recreational land use (soccer pitches).

The development contains a broad range of residential, open space and institutional areas. Densities are in keeping with Official Plan policies although some amendments will be required. In addition the Concept meets the objectives of the 1980 and 1987 concepts as well as the intent of the 40 % Agreement. This report along with other environmental, engineering , archaeological, recreational and transportation reviews are being submitted in support of Official Plan Amendment, Draft Plan of Subdivision and Zoning applications. These applications can be referenced for precise details on the proposed land uses.

4.2 Stormwater Management

All minor system (storm sewers) for the study area drain into the Kizell and Beaver Ponds, as outlined in the recent servicing studies and 1984 Master Drainage Plan completed by Cumming Cockburn Limited. To minimize potential impacts on the wetland habitat features of these areas, a minimum of three storm outlets are proposed (Figure 3). As the Kizell and Beaver Ponds represent quantity and quality facilities, it is not necessary to construct full sediment bays for each outlet.

To reduce the impact of the stormwater outflows it is proposed to construct energy dissipators at the outlets that will prevent erosion damage during peak flows. The energy dissipators will also separate coarse sediments that can be removed without disturbing the natural pond areas.

4.3 Site Preparation

Due to the large rock outcropping and rugged topography of the site, construction of municipal services, roadways and housing will require massive rock blasting and grading operations on all street right of ways and residential lots. However these operations will be confined to the residential lots and streets with few exceptions and should not impact open space blocks and the NEA lands, providing the mitigation measures detailed below are properly implemented.

Construction impact adjacent to the Kizell and Beaver Ponds will be minimized as the development consists primary of single-family lots backing onto the ponds. With the elevation of the ponds lower than the adjacent development retaining walls and slope terracing will be carried out on the lots to match the existing grade that will result in minimal blasting required adjacent to the natural areas.

4.4 Shirley's Brook Realignment

As indicated in Section 3.3, the aquatic habitat associated with Shirley's Brook in the west portion of the study area has been severely impacted through channelization, loss of natural features within the riparian corridor and adjacent agricultural activity. To minimize additional impacts to the watercourse and to improve the aquatic habitat over existing conditions using natural channel design, it is proposed to realign Shirley's Brook from approximately 100 metres west of Goulbourn Forced Road from the centre of the current agricultural field to south of the Nepean-Arnprior Railway line. This will also greatly reduce the potential impacts on the watercourse as the required crossings will be much less than if the brook was left in its existing location. By realigning the watercourse away from the core of urban activities, base flow can be collected from upstream undisturbed areas, carried through a natural channel enhanced with aquatic habitat features and flow into the existing Shirley's Brook west of Goulbourn Forced Road. Co-ordination is being taken with the design of the Terry Fox Drive extension to ensure the maximum amount of existing natural flow is directed to the Shirley's Brook realignment in order to provide the maximum amount of uncontaminated base flow.

4.5 Woodland Trail

A woodland trail has been roughed out throughout the fringes of the NEA lands north and south of the Kizell Pond (Figures 2 and 3; Photo 8, Appendix A). The woodland trail, to be used for passive recreational activity, will have a naturalized character with a 1.2 -1.5 metres width of cedar chip surfa6e, following a varied terrain. This trail design is of a smaller magnitude than the existing stone-dust pathway east of Goulbourn Forced Road and north of the Beaver Pond. Its alignment has been designed to provide a reasonable gradient, minimize tree removal and

provide lookout opportunities, and make connections to the future subdivision through block accesses. Construction of the trail will generally only require localized grading, such as locations of the trail with excessive cross-slope conditions, will require a modest fill of crushed stone, with a cedar log curb on the down-slope side of the trail to retain the fill. In a few locations where there are dips in the surface, the trail will require enhanced drainage measures of weeping tile covered with granular fill to allow for consistent surface drainage and trail continuity. Small footbridges or boardwalks of cedar decking will be required in three locations where the trail traverses wet meadow regions, to allow for proper surface drainage that would be impeded by a granular path. Small rubber tired equipment will be used to minimize the impact and clearing width constructing the trail.

In addition to the lookouts and provision of access the trail passes through a variety of plant associations in its relatively short (.6 km.) length. This makes for an interesting walk in terms of the changing terrain, woodland character and vistas, and offers interpretive opportunities that will be explained on a trail map. This map will be posted in the "hummel gate" signboard at each departure point adjacent to Goulbourn Forced Road and will be made available as a sheet map. Provision of safe crossing points of Goulbourn Forced Road and pedestrian connections within the right-of way particularly to the path on the south side of the Beaver Pond need to be resolved through the functional design of the road realignment.

Soccer pitches will be located on the west side of Goulbourn Forced Road and passive parks will be located in the west, central and east portions of the development, along with a linear park associated with the realignment of Shirley’s Brook.

Fig. 3 Trail and Woodland Reinstatement Concept

5.0 DESCRIPTION of ENVIRONMENTAL IMPACTS

The impacts associated with the tree cutting in March and April, 2003 were discussed in the NEA Report. The total amount of area within the NEA lands damaged by the tree removal was approximately four hectares (ten acres) (Figure 3).

5.1 Terrestrial Habitat within the Development Area

Although much of the lands to be developed are former or current agricultural land and the NEA lands and Trillium Woods represent significant forested areas to be retained, major tree removal will occur in four general areas, north of the NEA lands north of the Kizell Pond (immediately to the east of the First Line Road allowance), north of the Beaver Pond, south of the Terry Fox Drive extension west of the Goulbourn Forced Road, and in the south-west corner of the site. The more mature of these forests to be impacted are the upland deciduous forests north of the NEA lands north of the Kizell Pond and the Beaver Pond and the mixed forests north of the Beaver Pond and south of the Terry Fox Drive extension (Figure 1). Less mature deciduous forests will be impacted in the south-west corner of the site and south of the Terry Fox Drive extension west of the Goulbourn Forced Road.

A new forest edge will be created along the north side of the Kizell Pond, east of the First Line Road allowance. This may increase the susceptibility of the trees along the new forest edge to impacts such as wind throw and sunscald.

In addition to the direct loss of woody vegetation, there will be a reduction in associated wildlife habitat. Forest interior will be impacted in two locations, south of the Terry Fox Drive extension west of the Goulbourn Forced Road, and north of the Kizell Pond. However the forest interior habitat in the north-west portion of the site by the Terry Fox Extension would be impacted regardless due to the extension of Terry Fox Drive. The forest removal on the north side of the Kizell Pond is currently not forest interior habitat as it is on the edge of the forest, however removal of this part of the forest will reduce the forest interior habitat to the south, closer to the Kizell Pond, as the edge of the forest is brought further south.

On the east side of the Goulbourn Forced Road, north of the Beaver Pond, there is currently insufficient area remaining from either the Beaver Pond, the Nepean-Arnprior Railway line or the breaks in forest cover on the west and east to permit suitable size for forest interior habitat. Due to the imminent Richcraft residential development north of Kanata Avenue and adjacent to the south boundary of the site, no forest interior habitat was considered to be present south of the Kizell Pond.

5.2 Adjacent Natural Environment Areas

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.

There is also the potential for impact on the NEA lands from construction and operation of a passive recreational trail. .

5.3 Servicing and Stormwater Requirements

As indicated in Section 4.2, three stormwater outlets (total) will be constructed at the outer edges of the wetland areas associated with the Beaver and Kizell Ponds. This could have a direct impact through vegetation removal, or an indirect impact through increase sedimentation or inputs of other contaminants, resulting in a reduction in water quality. By constructing the outlets solely as energy dissipators, the disturbance footprint and subsequent potential impacts on the wetland habitat are minimized. In addition, the wetland habitat where the stormwater outlets will be placed is dominated by cattail marshes, which are very tolerant of changes in water quality and will quickly re-establish after construction of the outlets. By directing the stormwater towards the cattail marshes, there will be no reduction in quantity of flow to the cattail marsh area which would be detrimental to the marsh.

The Beaver and Kizell Ponds are already approved for stormwater management and the Beaver Pond has a sanitary sewer through part of it. Brunton (2001) examined the potential impacts associated with this sanitary sewer east of Goulbourn Forced Road, along the periphery of the wetland habitat to the west of the Beaver Pond. Brunton (2001) concluded that potential direct and indirect impacts to the natural features are minimal given proper implementation of the mitigation measures.

Section 4.3 described the large extent of grading and blasting required to service the site. Because of the shallow root structure among trees growing in bedrock and vulnerability of any remaining trees to wind throw, this will in effect eliminate the potential for viable tree retention outside of blocks dedicated to open space and NEA lands. The blasting could also impact trees along the edge of the NEA lands and other open space areas if the root structures of these trees were significantly damaged.

5.4 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 will be left in the current conditions with a minimum fifteen metre naturalized buffer from any adjacent development. The fish habitat in the Kizell and Beaver Ponds will be retained as part of the NEA lands and protected by the buffer of adjacent upland NEA lands. However, some impact is possible in association with construction and operation of the stormwater outlets, as described in Sections 4.2 and 5.3.

Given the extremely limited on-site aquatic habitat, as described in Section 3.3, 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 (Figures 1 and 4). 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 4.4. 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. The drainage from the natural area upstream of the Terry Fox extension will also be captured.

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.

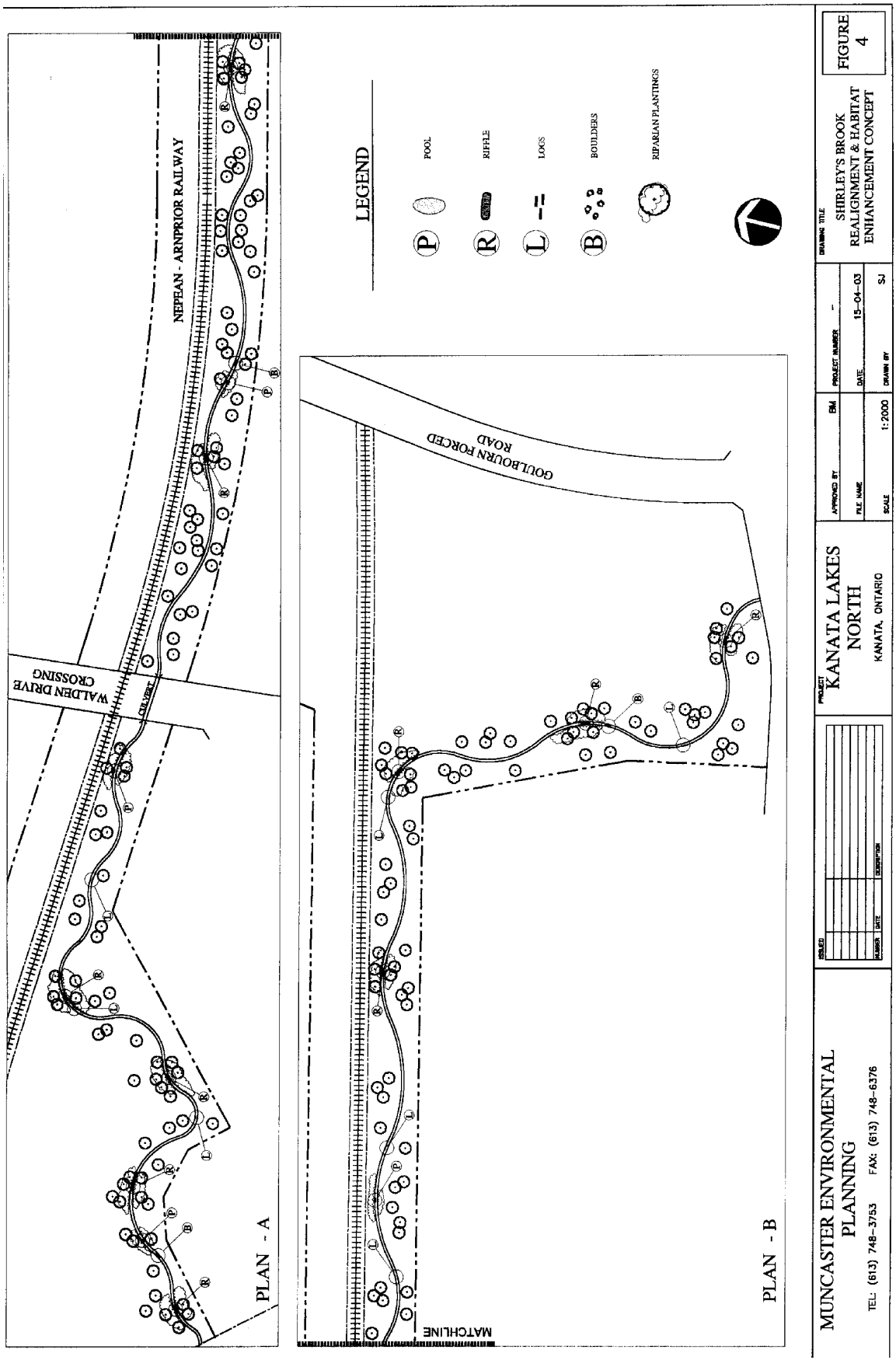

Fig. 4 Shirley's Brook Realignment and Habitat Enhancement Concept

6.0 MITIGATION of IMPACTS

6.1 Natural Environment Areas

6.1.1 Restoration of Impacted Areas

The remediation of damaged areas as a result of the tree removal that occurred in March and April of 2002 and trail alignment around the Kizell Pond commenced in March 2003, and as of early April the cleanup is approximately 25 percent complete and the trail alignment is cleared but no surfacing, boardwalks or the like installed (Photos 7 and 8, Appendix A).

No planting has been done, however it appears that the area at west end of the pond could be done in early May of 2003. Clean up operations can continue into spring as long as the ground is dry enough to support equipment, and the trail could be built in summer weather. Planting is best done in early spring before the plants are in bud and the weather is hot, so that planting of the damaged areas at the east end of the Pond may have to wait until spring of 2004.

The clean up, and planting operation has been based on the recommendations of the NEA Report. The specific direction of the clean up operation, layout of the trail and recommendations for reforestation and integration of the forebays has come from Corush Sunderland Wright limited, Landscape architects and is based on the NEA Report recommendations, field analysis and consultation with Alan Cameron of the City of Ottawa. Additionally the trail alignment was walked with several City of Ottawa Planning staff members to introduce them to the scale and character of the Kizell Pond environs as well as the specific trail alignment and proposed construction techniques in late April. Copies of a draft form of the trail and woodland reinstatement Concept Plan drawing were distributed to staff at that field meeting (CSW, 2003).

The timing for the site restoration work was ideal as the ground was still frozen, but the snow cover was generally gone. This reduced impacts such as rutting and damage to seedlings. The ongoing remediation includes the removal of woody debris and cutting down of stumps to improve the general appearance and reduce the volume of woody material left to decompose on the ground. There are reasonable populations of very small seedlings remaining in these denuded areas, which with the removal of canopy will put on rapid growth. To assist and diversify this remnant plant stock, planting of additional native tree and shrub species will accelerate the natural restorative process. Some debris will remain in delicate ecological areas and areas of low development impact, such as the south side of Kizell Pond in order to minimize the damage by large equipment in these wet and soft soil areas. In areas of high impact where removal of debris is necessary and the ground is high and dry, the debris has been chipped and spread over the impacted area to a maximum diameter of l Ocm, and all material over 100cm diameter will be hauled off site. The chipped material will also be used as a protection area against sediment fencing as described in Section 6.1.3. During the removal of woody debris, the use of heavy equipment was minimized to avoid as much as possible additional damage to regenerating deciduous and coniferous stems and ground cover vegetation.

Figure 3, completed by John Wright of Corush Sunderland Wright, identifies the woodland reinstatement. Reforestation will focus on the planting of native tree and shrub species that

will re-establish the existing plant communities of the woodland, upland and wetland habitats. Upland areas of mixed forest, such as the areas south-east and south-west of Kizell Pond (immediately west of Goulbourn Force Road and immediately east of First Line Road allowance, respectively), will be reinstated with the planting of coniferous species such as white pine, white spruce, eastern hemlock and eastern white cedar, and deciduous species such as sugar maple, a white oak, basswood and yellow birch. White spruce, eastern hemlock, sugar maple and basswood will be planted on the north and east facing slopes, with white pine, eastern white cedar, white oak and yellow birch on south and west facing slopes. Reforestation in these areas will be dense (planting at approximately 1.2 metres on centre) to establish the desired visual screen of the adjacent residential development from the view of the recreational pathway. Low lying areas such as the region immediately west of the aforementioned area, and the flooded region west of Kizell Pond will be reinstated with plantings of white birch, black cherry, ironwood, American beech, striped maple and balsam fir. Striped maple, American beech and ironwood will be planted on the moist, shady lower slope portions, with white birch and black cherry on upper portions and balsam fir interspersed throughout. These species will also provide erosion protection for the more dramatic slope faces. Reforestation in these areas will be less dense (planting approximately three metres on centre) as the visual screen effect is not desired. These areas are identified on Figure 3, developed by Corush Sunderland Wright Limited.

The reinstatement will include site preparation and plantings of portions of the skidder trails created during the tree removal that have not been used as part of the recreational trail.

6.1.2 Recreational Trail

A passive recreational trail, with a width of approximately 1.2 -I .5 metres and a compacted cedar chip surface, will be constructed within the NEA lands on the west side of Goulbourn Forced Road (Figures 2 and 3). The trail was roughed out in April, 2003, and was sited on stable land, where direct impacts such as tree removal would be minimal. Where possible existing recreational trails or damaged areas from the tree removal and subsequent skidding were utilized. The only area of the trail where existing impacts were relatively minor was in the north-central portion of the trail on the north side of the Kizell Pond. In this location, approximately 300 metres in length, careful siting of the trail minimized removal of woody vegetation and small equipment such as small rubber tired shovels were used to minimize the width of disturbance.

The existing stonedust pathway on the north side of the Beaver Pond is entirely within the NEA lands, and no new trail work will be undertaken on the east side of the Goulbourn Forced Road.

Several components were included in the design of the recreational trail to minimize potential impacts on the natural environment features and functions (CSW, 2003). Footbridges will to span outflows in the west portion of the Kizell Pond and just south of where the trail joins the existing trail on the north side of the pond (Figure 3). Cedar stringers with rough cut cedar decking will be used to construct the footbridges. A boardwalk will cross approximately fifty metres of wet meadow on the south side of the Kizell Pond. Where steeper cross-slopes are encountered, crush stone and filter cloth will be placed under the cedar chips (Figure 3). Where the cross-slopes are not as steep, cedar log ‘curbs’ will retain the cedar chips in a stepwise fashion.

6.1.3 Development Guidelines for Adjacent Lands

An important component for protection of the NEA lands is mitigation measures for the adjacent residential development. The major mitigation measure developed for the protection of the NEA lands is a buffer of 10 or 15 metres 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 is 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 has been utilized.

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.

Soil compaction and other potential impacts on the core of the root system of trees at the edge of the NEA lands should be avoided by restricting grading and other site alteration activities to outside of the buffers. 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 vegetation and associated habitat along the edge of the NEA lands will be protected by the buffer from any indirect impacts associated with the installation of services and other structures such as blasting and grading on the adjacent development lands. Although some impact on the vegetation within the outer portions of the buffer is anticipated from the adjacent blasting and grading, the balance of the vegetation within the buffer will protect the NEA lands. Any damage vegetation in the buffer will eventually regenerate in a natural state.

Along similar lines as above, the natural vegetation within the buffer will prevent a new forest edge from being created along the edge of the NEA lands. This will eliminate potential increases in indirect impacts such as wind throw and sunscald on the vegetation along the outer edges of the NEA.

A potentially serious impact on the NEA lands associated with the large number of units

proposed for the development is an increase in human and pet intrusions into the NEA lands. The buffer on its own will minimize to some extent the intrusions into the actual NEA lands, but it is recommended to install fencing along the outer edge of the buffer where rear lots abut the buffer. The City has requested and the developer will provide a manual for new residents outlining the attributes of the NEA and providing guidance as to how the area can be enhanced and protected by careful attention to maintaining the environmental features. In addition the City must police the NEA lands, which will be publicly owned, to prevent more active recreational activities, such as mountain biking, which could impact the features. The recreational trail will feature interpretative panels explaining the importance of restricting human access to the trail network and keeping pets leashed and otherwise under control.

The buffer will also be important in reducing the potential for other indirect impacts from the adjacent development in the form of increases in noise and light pollution. Given that the rear of the lots will abut the buffer, it is felt that the natural woody vegetation in the buffer will be sufficient to eliminate significant noise and light impacts on the NEA lands.

There will be no construction activity or other activity that may lead to site alteration within the buffers. The outside side of the buffers will be clearly delineated with construction fencing prior to any grading or other site alteration within the vicinity of the buffers. The buffers will be retained in their natural state. 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.

6.2 Preliminary Tree Study and Conservation Plan

The objectives of the preliminary tree study and conservation plan, as outlined in Section 5.2.1 of the Regional Official Plan, Policy 4, are:

- to produce a plan showing forested areas and smaller tree stands containing trees which warrant initial consideration for conservation measures as well as major groupings of other natural vegetation - this is completed in Figure l;
- to provide a general description of the wooded areas including species composition, age, vigour, soil drainage, topographic characteristics and degree of disturbance - this is described in Section 3;
- to assess the existing health of the wooded areas, the existing and potential functions, if any, with respect to ecological features and aesthetics, and the sensitivity of such areas to changes in grades, drainage, sun and wind exposure and water table elevation - this is described in Sections 3 and above;
- to provide a professional opinion on the priority for retention of any wooded areas; and,
- to review the proposed subdivision layout to determine if appropriate opportunities for tree retention and planting exist and have been taken into consideration.

The concept plan and previous agreements permit an extensive amount of retention within the Natural Environment Areas described in Section 3, including Trillium Woods and the lands adjacent to the Kizell Pond and north of the Beaver Pond. The NEA areas were selected to provide a variety of core habitats retained in the natural state. Thus the tree retention within the NEA lines will include coniferous, mixed and deciduous forests as described in Section 3 and Figure 1. Tree retention will also occur within the linkages and open space areas identified in the Concept Plan (Figures 1 and 2). The habitat to be retained in these areas include:

- deciduous forest of maple, ash and basswood in the open space to be preserved just south of the Nepean-Arnprior Railway line along the west edge of the site;
- riparian vegetation along Shirley's Brook as part of the open space to be preserved on the east side of the Goulbourn Forced Road. Large crack willow trees are included along the creek corridor;
- mixed forests of white pine, maple and basswood and deciduous maple forests in the open space to be preserved on the west side of the Goulbourn Forced Road. Along Shirley's Brook, the larger white pines trees are up to 70cm dbh;
- remnants of the deciduous forest of maple and ash on the west side of the new Goulbourn Forced Road alignment as part of the periphery of the proposed soccer pitches; and,
- portions of the deciduous forest north of the Beaver Pond as part of the linkages between the Beaver Pond and Trillium Woods to the north.

Retention of trees outside of the NEA and linkages areas will be difficult due to the typical urban area lot sizes and extensive bedrock near the surface throughout the study area. The bedrock will necessitate blasting for installation of the services. Due to the relatively shallow root network of the trees in response to the bedrock, the root area is likely extended. In addition trees in shallow soils are generally more susceptible to wind throw.

The buffers identified in Section 6.1.3 will provide a setback designed to protect the root system of trees along the edge of the NEA lands.

The above tree retention can be enhanced through:

- minimizing the extent of vegetation removal as much as possible in areas where the blasting and servicing requirements are minimized;
- where retention of regenerating stems will not be feasible due to their location in a lot, the seedlings should be considered for transplanting to provide a source of native trees as part of the rehabilitation of the NEA lands damaged by the tree cutting (Section 6.1.1) and where blasting, grading or construction access will require planting after development;

- to protect breeding birds, tree removal should not occur between May 15th and July 10th, unless a breeding bird survey is conducted and trees removed within five days of the survey.
- close cutting of existing vegetation during clearing as opposed to grubbing where woody vegetation removal is required for access or work areas only and no regrading or blasting is required, to encourage revegetation; and,
- additional planting of native trees on a lot by lot basis. To provide a natural appearance, trees should be planted in a random, cluster fashion rather than in a grid system. Species present in the existing forests, as identified in Sections 3.1.2 and 6.1.2, should be preferred.

6.3 Stormwater Management

Site level or source controls will be used to manage stormwater runoff. Examples of these mitigation measures include flat site grading, roof leaders, vegetation plantings and groundwater recharge. These measures will be used during construction, build out and final development. They are discussed in detail in the Stormwater Site Management Plan and Erosion and Sediment Control Plan by Cumming Cockburn Limited (CCL, 2003a; CCL, 2003b). For groundwater infiltration, relatively flat grassed swales will be utilized in the rear yards. Groundwater infiltration on the site is enhanced with the abundance of Precambrian bedrock containing many fractures and seams. Additional stormwater mitigation includes the use of catch-basins and storm maintenance holes with deep sumps to trap pollutants, sand, grit and other debris.

As indicated in Section 4.2, to reduce the impact of the stormwater outflows it is proposed to construct energy dissipators at the outlets that will prevent erosion damage during peak flows. The energy dissipators will also separate coarse sediments that can be removed without disturbing the natural pond areas. Flows entering the energy dissipator will be the first flush flow up to the 25mm rainfall design flow. The balance of the storm flows will be diverted to an overflow channel. Flow from the overflow channel will be dispersed with large rocks to prevent soil erosion. The length of the dissipator is designed to slow the flow to 0.5 m/s.

The energy dissipators will be constructed with natural rock to provide a hard bottom surface and a permeable bean that will be integrated into the marsh wetland. With this flow and design, impacts on the cattail marsh from an energy perspective are not anticipated. The water quality entering the cattail marsh will be protected as coarse solids will settle out in the energy dissipators. The splitting of flow described above is designed to avoid re-suspension of coarse solids in the energy dissipators. To minimize the size of the forebays associated with the energy dissipators, fine particles will enter the cattail marsh. Such marshes are often constructed to treat such inputs, while thriving over the long term. By directing the stormwater towards the cattail marshes, there will be no reduction in quantity of flow to the wetland habitat that would be detrimental to the marsh.

The locations of the energy dissipators have been fine-tuned to avoid more sensitive natural environment features. For example, the dissipator on the south side of the Kizell Pond was relocated to the west so the approach to the dissipator would avoid an area of rock outcropping and trees, and would not be visible from the natural lookout to the east. The approach to the dissipator on the north side of the Kizell Pond, west of the Goulbourn Forced Road is located in an area with minimal woody vegetation. The recreational trail was relocated from the field-flagged locations to avoid conflict with both of these dissipators.

Figure 3 identifies coniferous plantings, such as white pine, white spruce, eastern white cedar and eastern hemlock to screen the dissipators from the recreational pathway. Moist border deciduous species such as ironwood, American beech and striped maple will be planted on the Kizell Pond side, creating a visual screen that will enhance cross-pond views and add to the diverse wildlife habitat. The vehicular access road to the outlets will be sinuous in character, preventing a clear line of sight at the trail crossing points. Trail crossings will occur at angles that further impede view lines. A vehicular turn-around will be provided at each outlet to allow service vehicles to exit in a forward direction, rather than backing up a winding road. The outlet on the south side of the Kizell Pond will be located at a low level that does not impede the sight line of the natural lookout location to the east.

6.4 Shirley's Brook

6.4.1 Natural Channel Design

As discussed in Section 3.3, 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 4.4, 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 naturalized corridor (Figures 1 and 4). 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.

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. To provide an adequate buffer from the rear of lots and to allow space for the recreational trail, it is recommended that the meandering be confined to the northerly twenty metres of the 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 rifle habitat (Figure 4). 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. Rifle habitat will consist of individual sections of crush stone and rubble ranging in size from 5 to 10 cm. All rifle coarse material will be washed before use. The rifle habitat will be created in sequence with the pool habitat. The rifle habitat is important for aquatic insect production and some fish spawning. The low flow water depth at the rifle 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.

Detailed planting plans will be provided in 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 15th and June 30th.

6.4.2 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. The setback from the realigned reach to the rear of the lots will average twenty metres, with a minimum setback of ten metres. As the railway to the north of the realigned reach is used very infrequently (approximately twice per week), and the railway ownership extends approximately ten metres from the actual rails, a setback of less than five metres to provide for adjacent plantings is considered suitable on the north side of the naturalized swath, although the actual setback will be much greater for most of the reach due to the meandering nature of the design.

6.5 Construction Phasing and Timing

To protect breeding birds, tree removal should not occur between May 15'~ and July 10~', unless a breeding bird survey is conducted and trees removed within five days of the survey. The connection of the realigned reach of Shirley's Brook should not occur between March 15~' and June 30~' for the protection of the warm water fish community.

The residential development will proceed in four phases, as outlined in CCL (2003a). The first phase will be north of the Richcraft lands and south of the Kizell Pond. The second phase will be east of the Goulbourn Forced Road and north of the Beaver Pond, while Phases 3 and 4 will be west of the Goulbourn Forced Road, and south and north of the Nepean-Arnprior Railway Line, respectively. This phasing of the development is consistent with the City of Ottawa's Wildlife Protocol that requests the construction be phased to avoid trapping wildlife. Phase 1 is adjacent to existing development on the south and east. Phase 2 is north of the existing development on the south side of the Beaver Pond. At the end of each phase, the outer edge of development will extend further north, allowing the wildlife to respond by moving north towards the core of the South March Highlands.

6.6 Sediment and Erosion Controls

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, a sediment and erosion control plan prepared by Cumming Cockburn Limited identifies a number of construction mitigation measures to reduce unnecessary construction sediment loadings (CCL, 2003b). These measures will include:

- groundwater in trench will be pumped into a filter mechanism, such as a trap made up of geotextile filters and straw, prior to release to the environment;
- bulkhead barners will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer. These bulkheads will trap any sediment carrying flows thus preventing any construction-related contamination of existing sewers;
- seepage barners will be constructed in any temporary drainage ditches;
- as indicated in Section 6.1.1, construction fencing will be installed along the outside edge of the NEA lands to ensure machinery will not enter. Filter cloths will be placed along the bottom of the fence as required to stop sediments from leaving the development area;
- construction vehicles will leave the site at designated locations. Exits will consist of a bed of granular material, in order to minimize the tracking of mud on site;
- any stockpiled material will be properly managed to prevent these materials from entering the sewer systems. The stockpiles as well as equipment fuelling and maintenance areas will be located a minimum of 30 metres from the NEA lands, Shirley's Brook, ditches and other conveyance routes.; and,
- until rear yards will be sodded or until streets are asphalted and curbed, all catch-basins and manholes will be constructed with a geotextile filter fabric located between the structure frame and cover.

Location and details of proposed sediment and erosion control features are provided in CCL (2003b).

7. 0 MONITORING PLAN OUTLINE

The objective of a monitoring plan is to ensure the mitigation measures recommended for the construction and the post-construction periods are sufficient to prevent adverse impacts on the environment through proper implementation of the recommended mitigation measures.

Regular inspection and maintenance of the erosion control measures and other construction activity by agents of the proponent during construction will include:

- the contractor will inspect and maintain the filters used for trench de-watering, the geotextile fabric on catch-basins and manholes, the bulkhead barriers and the seepage barriers. The maintenance will include sediment removal and disposal, and material replacement as required;
- construction vehicles and chemicals, fuels and other potentially hazardous materials remain in designated areas; and,
- all construction and sediment fencing will be regularly inspected to ensure the proper function of the fencing. Any accumulated sediment will be removed and the sediment fencing will be keyed in properly to ensure no surface flow and associated potential sediment contamination under the fencing. Any breaks in the construction fencing will be fixed immediately to ensure no direct damage to the vegetation within the buffers and NEA lands. The contractor will be held responsible for all damage to vegetation outside of the work areas.

The connection of the realigned channel to the existing Shirley's Brook will be monitored by a qualified environmental inspector, at the responsibility of the proponent, to ensure no unacceptable downstream sedimentation occurs. Check dams will be maintained and replaced as required and the existing channel will be reconnected if sediment levels are unacceptable as indicated by a sediment plume.

After construction, it will be ensured that all sediment and construction fencing is removed and sodding, seeding and tree planting is conducted correctly and as soon as weather permits. The condition of the setback area along Shirley's Brook should be monitored including identification and restoration of any areas of erosion.

If required in the Department of Fisheries and Oceans Canada authorization under Section 35 of the *Fisheries Act*, the proponent will monitor the realigned reach of Shirley's Brook for fish use post connection.

The accumulated sediments in the forebays of the energy dissipators should be periodically removed. Access to the forebay will be provided by a three metre wide access lane adjacent to the facility.

The success of all vegetative plantings will be assessed through visual inspections as detailed in the landscaping warranty. Any plantings that are dead or dying will be replaced.

8. 0 CONCLUSIONS

The forested portions of the study area are dominated by mature and early successional deciduous forests with mixed and, to a lesser extent, 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 the tree removal in March and April of 2002.

The NEA boundaries are similar to the initial NEA boundaries described in the 1980s. 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.

Measures are provided to ensure that impacts on the NEA lands as a result of construction and implementation of the Concept Plan will be minimal. This includes establishment of buffers beyond the NEA boundaries. Human and pet access to the NEA lands will be restricted by fencing and the buffers, and the potential impacts of human and pet intrusions into natural areas will be highlighted in an interpretative program. A recreational trail has been sited within the NEA lands, utilizing mostly existing trails and areas damaged by the tree removal. The trail has been designed and carefully sited to avoid notable tree removal and other potential impacts on the NEA lands. The trail will be approximately 1.3 metres in width, with a compacted cedar chip surface.

The stormwater energy dissipators and access to the facilities were located to avoid more sensitive habitat and conflicts with the recreational trail. Plantings will be provided to screen the facilities. The facilities have been designed to minimize the energy directed to the cattail marshes and therefore avoid erosion in the marshes. Coarse materials will be removed in the forebays of the energy dissipators. No impacts are anticipated on the discharge of finer particles into the cattail marsh, as the bio-characteristics of the cattails are capable of treating the discharge. The discharge of finer particles into the marshes minimizes the area required for the stormwater energy dissipators.

Notable tree removal and associated loss of wildlife habitat will occur outside of the NEA lands. Although this represents a significant loss of natural function, the greatest diversity of natural features have been retained within the NEA lands. Given the extent of existing and proposed development in the vicinity of the Beaver Pond, an extensive natural linkage between the NEA lands along the Beaver Pond and Trillium Woods to the north is not required. Two smaller linkages in the concept plan will provide a recreational and some wildlife linkage to the north. Efforts should be concentrated on connecting Trillium Woods and the core NEA lands in the west part of the site to the core of the South March Highlands to the north.

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. Photographs of Site Representative Features

(The photographs have been prepared in a separate file.)