

LEITRIM WETLAND MANAGEMENT PLAN

Ottawa, Ontario



October 2018

**Prepared for South Nation Conservation and Leitrim Wetland Advisory Committee
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Executive Summary

October 2018

The Leitrim Wetland is located within the South Nation River Watershed, South-East of the Ottawa MacDonald-Cartier International Airport. The wetland feeds the headwaters of Findlay Creek which eventually drains into the North Castor River. Both the wetland and creek are important natural ecosystems; the Leitrim Wetland has been identified as a provincially significant wetland and Findlay Creek provides habitat for numerous fish and benthic invertebrate species. The Leitrim Wetland Management Plan was prepared for South Nation Conservation and the Leitrim Wetland Advisory Committee during the summer of 2004. The Leitrim Wetland Advisory Committee (LWAC) is currently composed of members from various stakeholders including: City of Ottawa, National Capital Commission, Tamarack Homes, Tartan Homes, Findlay Creek Community Association, the Ontario Ministry of Natural Resources and Forestry, and South Nation Conservation. The goal will be to reach out to other agencies like Ducks Unlimited and Environment Canada and invite them to sit on the LWAC.

The goal of the Leitrim Wetland Management Plan is to provide an action plan to help protect the ecosystem integrity of both the Leitrim Wetland and Findlay Creek. The first draft and subsequent update of the plan provided necessary background information as well as 23 recommendations. This update will endeavour to identify new recommendations, including those from the 2012 update that were not completed, or are ongoing. It will address the work completed towards the original recommendations. The recommendations can be broken down into 6 major management initiatives, these include:

1. Obtaining Baseline Information
2. Monitoring Program(s)
3. Rehabilitation Program(s)
4. Management Intervention
5. Education, Awareness and Provision of Recreational Activities
6. Partnership Development

Both South Nation Conservation and the Leitrim Wetland Advisory Committee are committed to preserving the natural integrity of the Leitrim Wetland and Findlay Creek. In order to achieve this goal, adaptive management practices will be an integral part of the plan. Continual monitoring and assessment of activities will help ensure necessary improvements and adaptations to management practices occur when appropriate.

The focus of the updated management plan is to guide the direction of future management initiatives based on the experiences of the previous five years. In particular, the emphasis will be made on the successes and lessons learned in community outreach, as well as creating a mandate for a potential new Scientific Working Group. The new working group will be expected to take the lead on some of the recommendations. These recommendations will be identified in the list at the end of the document. Where appropriate, the work completed has been summarized and referred to in the new recommendations.

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1.0 INTRODUCTION

1.1 Scope of Plan

The Leitrim Wetland Management Plan (LWMP) pertains to the portion of the Leitrim Wetland owned by the South Nation River Conservation Authority (SNC); however, sections of the plan may have pertinent information for wetland(s) managed by other private and public owners in the surrounding area, including Transport Canada, the National Capital Commission and the surrounding property developers. The Leitrim plan defines overall goals and objectives, outlines the key issues related to the environmental, managerial and operational considerations of the wetland as well as for the upper reaches of Findlay Creek, and provides recommendations to these issues.

1.2 Adaptive Management Principles

Adaptive management principles shall be an integral part of the Leitrim Wetland Management Plan. Adaptive management is as a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. All activities/non-activities of the SNC and the Leitrim Wetland Advisory Committee (LWAC) with respect to the Leitrim Wetland shall be continually reviewed and adapted to ensure that the goals and objectives of this management plan are met.

1.3 Key Organizations and their Mandates

South Nation Conservation (SNC)

The SNC was established in 1947 with a mission to ensure that “the management of natural occurrences, natural resources and human activities results in the protection or improvement of water resources”. The 1946 Conservation Authorities Act of Ontario outlines that the designated Conservation Authorities have the responsibility to “promote the management, restoration, development and conservation of renewable natural resources in their watersheds” (SNC 2004). The Leitrim Wetland is within the South Nation watershed and is therefore under the jurisdictional authority of SNC. In the year 2000, the Kellam Family donated one hundred acres of land within the Leitrim Wetland as an ecological gift to SNC to be protected and managed.

Leitrim Wetland Advisory Committee (LWAC)

The LWAC was formed in 2001, to “provide direction to the Board members of the South Nation Conservation (SNC) on how to manage the Leitrim Wetland”. The objectives of the LWAC are “to preserve the integrity of the Leitrim Wetland, manage it properly and use the wetland as an educational tool for the surrounding communities” (SNC). The LWAC is a collaboration of various stakeholders, including: developers, the National Capital Commission, the City of Ottawa, the Findlay Creek Community Association, the Ministry of Natural Resources and Forestry, and South Nation Conservation. Other groups have been a part of the LWAC in the past and may have interest in joining again in the future. These include Ducks Unlimited Canada and Environment Canada. There is also the opportunity for other environmental interest groups such as stewardship councils or fish and game clubs to join the LWAC.

Scientific Working Group (SWG)

The SWG will provide an opportunity for experts from outside the groups listed in the LWAC to provide critical guidance on the restoration and management of the wetland. The scope of this group will be limited to scientific analysis of baseline data, providing specific advice on restoration of the wetland, providing advice on the flora and fauna of the wetland when requested to do so by the LWAC, and to aid in the grant writing process by backing the proposals with sound scientific evidence. The LWAC will submit requests for input to the SWG, and the SWG will pass reports and advice back to the LWAC, and not act without the explicit input from the LWAC.

Environment Canada (EC)

Environment Canada is the main department in the federal government that promotes the protection of natural areas and wildlife. EC has played an advisory role and has been involved in various environmental assessment reviews of the Leitrim Wetland since 1992. They would like the opportunity to continue to work in collaboration with SNC and other groups towards any conservation efforts within the Leitrim Wetland in the future.

City of Ottawa

The City of Ottawa plays a major role in shaping the urban and rural components of the Ottawa region, by designating appropriate land-uses through the Official Plan and Zoning By-law. The City of Ottawa actively promotes the protection of significant wetland habitats through a set of policies within their Official Plan. They are an active member of the Leitrim Wetland Advisory Committee helping to protect the Leitrim Wetland.

Ministry of Natural Resources and Forestry (MNR)

The Ministry of Natural Resources and Forestry is a provincial government department that promotes the protection and wise-use of natural resources. The MNR have conducted various assessments and have classified the Leitrim Wetland as Provincially Significant. The MNR's role on the LWAC is to provide advice on the management of the wetland to maintain natural heritage features.

1.4 Location

The Leitrim Wetland is located in Ottawa, Ontario, Canada, south-east of the Ottawa International Airport (Refer to Figures 1a and 1b). The wetland is south of Leitrim Road and west of Highway 31 (Bank Street). The portion owned by the SNC is located east of Albion Road, bordering urban lands on the north and north-eastern boundary and on the south and south-eastern boundary. The Leitrim Wetland is located within the South Nation River watershed and contributes to the headwaters of Findlay Creek. Findlay Creek flows to the North Castor River and eventually to the South Nation River.

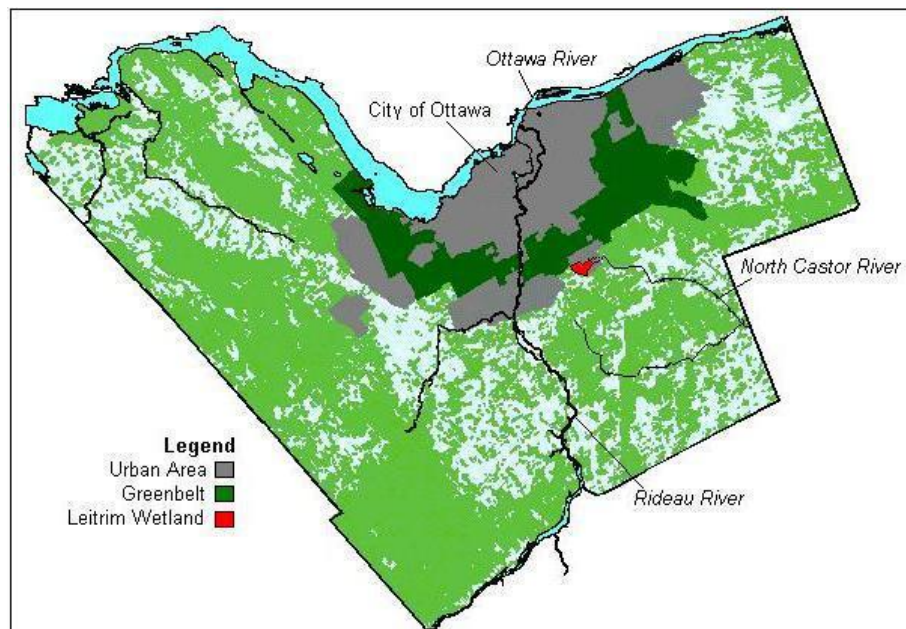


Figure 1a. Location map. Leitrim Wetland within the City of Ottawa.

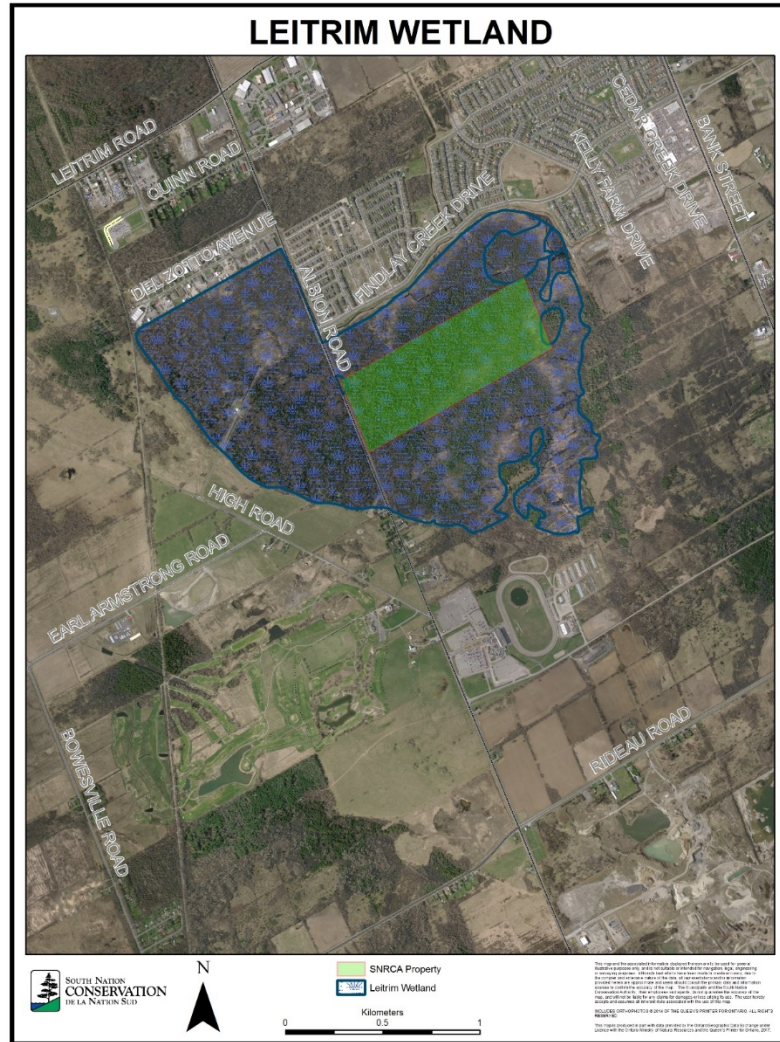


Figure 1b. Location Map (detail). Created by SNC, 2010

2.0 GOALS AND OBJECTIVES

2.1 Vision and Goal

Vision

The vision of SNC and LWAC is to sustainably maintain species and their associated habitats in the Leitrim Wetland and Findlay Creek harmoniously with future communities.

Goal

The goal of the Leitrim Wetland Management Plan is to provide an action plan to help protect the ecosystem integrity of both the Leitrim Wetland and Findlay Creek. Here ecosystem integrity is defined as the ability for the wetland and creek to sustainably maintain structural, compositional and functional characteristics and services.

2.2 Objectives

The objectives of the LWMP are:

1. To help maintain ecological processes that support structural, compositional and functional characteristics within the wetland and creek, and to improve these components if and when possible;
2. To protect and maintain healthy populations of significant species that inhabit the wetland;
3. To provide public education and opportunities for the entire City of Ottawa, especially the residents within the Findlay Creek Village, to participate in wetland stewardship activities (These activities shall be consistent with objectives 1 and 2);
4. To identify and develop components of a comprehensive monitoring program that will aid in the early detection of ecosystem degradation and aid in identifying management needs;
5. To identify appropriate management actions and rehabilitation projects; and
6. Clarify which parties are responsible for various management issues.

3.0 BACKGROUND

3.1 Findlay Creek Watershed Description

3.1.1 *Physical Characteristics (General Topography, Geology and Hydrology)*

Topography

The terrain within the watershed gently slopes down from both the north and south into the Leitrim Wetlands and from west to east. Tributaries west of Highway 31 consisting of flows exiting the wetland and flows carried by numerous ditches converge to form Findlay Creek which then flows easterly under Highway 31 through a culvert. From west of the wetland to the Highway 31 culvert, the elevation drops approximately 21.6 m. The elevation from south to the low lying areas of the wetland drops approximately 13.7 m, while the elevation from north to the low lying areas of the wetland drops approximately 3.3 m (CCL 1991).

Geology

Bedrock:

Major bedrock types that exist in the watershed, west of Highway 31 around the wetland area, consist of, from youngest to oldest respectively, the Oxford, March and Nepean formations (Refer to Figure 2). These calciferous sedimentary formations were formed between the late Cambrian and early Ordovician periods. All three types serve as aquifers as they were found to provide water for private wells in the surrounding area (CCL 1991). The water can be transmitted via joints and fractures within all three types (NRCAN 2004). To the east of the wetland and Highway 31 there exists the Gloucester Fault, a major fault that brings these more permeable layers of bedrock in contact with a younger, less permeable shale formations, referred to as the Queenston at the initial contact zone and Carlsbad formation. The Carlsbad shale formation lies east of the Gloucester Fault acts as a barrier to groundwater flow and is partially responsible for forming the Leitrim Wetland in combination with the less permeable surficial soils that lie above (Glacial Till), both features impede groundwater movement to the east (CCL 1991). The bedrock is closer to the surface near Highway 31 and declines further below the surficial soils travelling west.

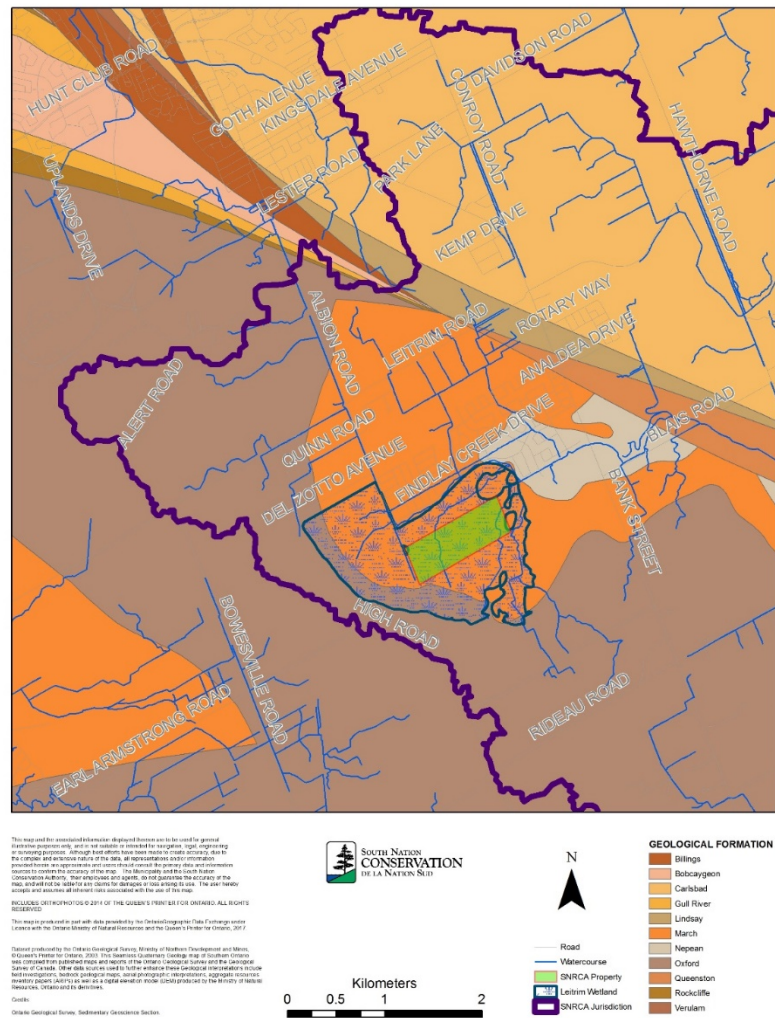


Figure 2. Bedrock Geology of Findlay Creek Watershed (Natural Resources Canada 2003 (a))

Surficial Soils:

Surficial Soils of the Findlay Creek watershed date back several thousands of years as they originate from glacial activities (Refer to Figure 3). Surficial soils west and south-west of the Leitrim Wetland consist of subaqueous outwash deposits of sand and gravel; as these soils are highly permeable, this region is considered to be the major groundwater recharge zone for the surficial soils in the Leitrim Wetland. North of the existing East-West Ditch, where the Findlay Creek Village is located, there is a less permeable layer of silt and fine-to-medium (calcareous) sand nearshore sediments. Most of the rainwater captured in this area to the north would have flowed into the Leitrim Wetland via surface streams, but has been diverted via historical agricultural ditches away from the Leitrim Wetland and east to Findlay Creek. To the east and south-east of the wetland there are deposits of less permeable till (CCL 1991).

Within the Leitrim Wetland itself, the soil is classified as organic comprised mostly of poorly decomposed peat accumulations. The maximum depth of peat has been found to reach 2.4 meters. Given this depth, Cumming Cockburn Limited has estimated that the peatland is at least 4,400 years old (CCL 1991). In addition, marl deposits as thick as 40 cm have been observed below the peat layer. Marl is a highly calcareous unconsolidated material of clay, silt, and sand-sized particles that usually contains shells. The

presence of it may suggest that the wetland was located in the basin of an ancient fresh water lake and was in an area that was formerly glaciated around sedimentary calcareous rocks (CCL 1991).

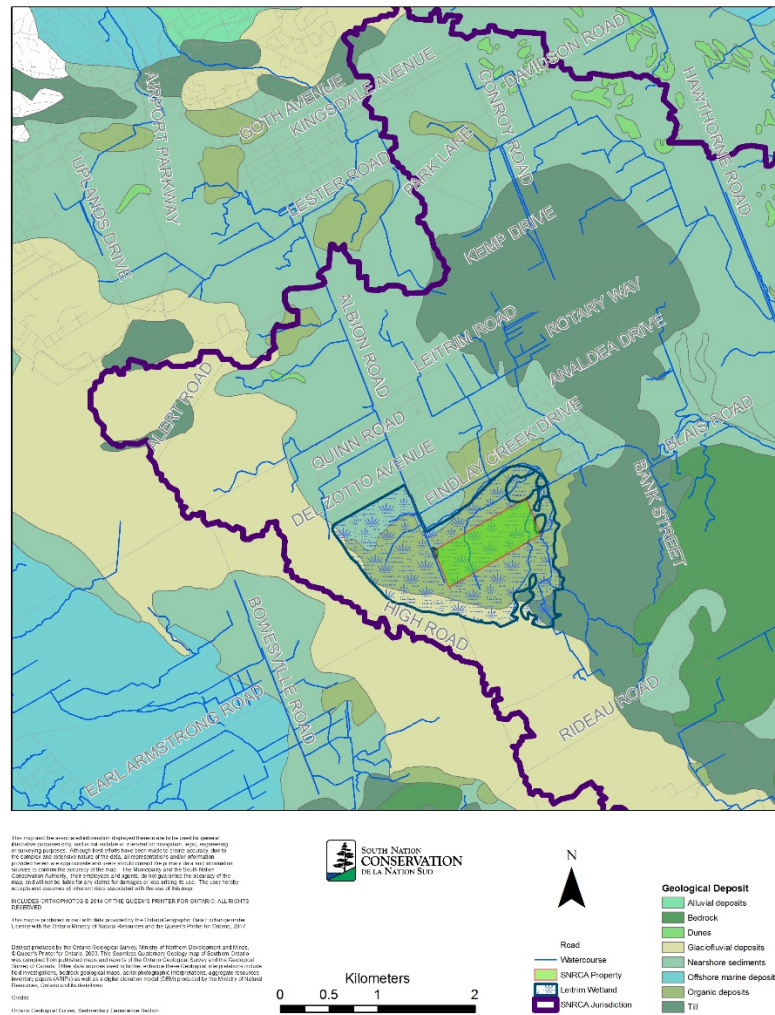


Figure 3. Surficial Geology of Findlay Creek Watershed (Natural Resources Canada 2003 (b))

Hydrology

Groundwater and surficial flow parameters in terms of the topography, bedrock and surficial soils within the area are described above.

Surface Flows:

Historical anthropogenic influences, mostly in the form of agricultural ditches have greatly altered the natural surficial flow regime in the area. Prior to ditching, several small streams within the wetland and surrounding area most likely fed Findlay Creek (Dugal 1992). Between 1879 and 1906 a system of ditches diverted and channelized much of these natural streams. In the 1920's a more extensive ditching system involved the lowering of a portion of Findlay Creek. Evidence of a drawdown in the water table from activities in the 1920s, up to 100m away from the ditching, can still be observed today, in the form of perched trees (from ground subsidence due to peat decay) and larger growth rings (starting approximately

85 years ago in some trees within the wetland, due to the ground water lowering and a possible increase in nutrient availability) (Dugal 1992, CCL 1991).

Currently, the majority of surficial flows west of Albion Road are transported under a culvert in an easterly direction and diverted around the wetland via a major East-West ditch located north of the wetland (Refer to Figure 4). Surficial flows north of the wetland are also diverted from the wetland by a network of ditches that drain directly into the headwaters of Findlay Creek. Within the the wetland itself, there exist several surface flows, some formed by natural processes and others formed by old agricultural ditches. A municipal drain was also constructed in 1988 through the northern third of the wetland, carrying flows west to east, but was found to be causing a drastic drawdown within the wetland and was subsequently 'plugged' with peat dams in 1991 by the MNRF to help raise the water level. All surface flows west of Highway 31 eventually converge to provide the headwaters of Findlay Creek. The flows of Findlay Creek then travel easterly through a culvert at Highway 31 (CCL 1991).

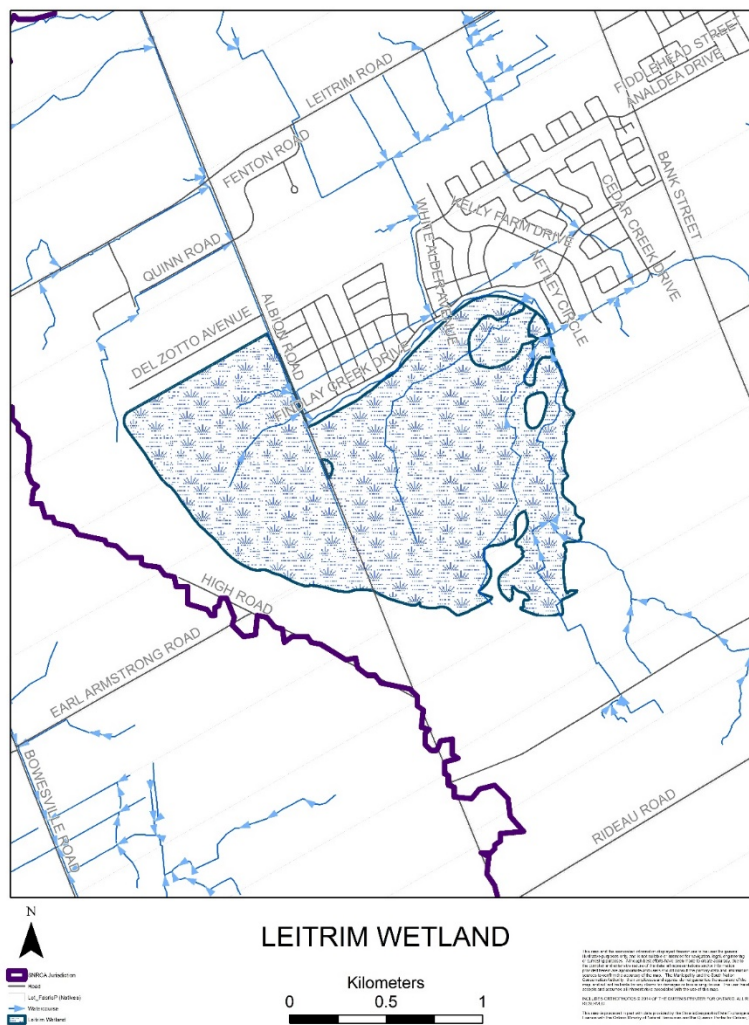


Figure 4. Surficial Flow of Study Area

Groundwater Flows:

The surficial soils and the bedrocks previously described, are driving forces in the groundwater flow regime. According to Cumming Cockburn Limited and Golder Associates groundwater is impeded from travelling

north of the wetland and east due to the less permeable overburden in these areas and the less permeable bedrock ridge travelling almost parallel to Highway 31 (caused by the Gloucester fault). As mentioned previously, these features are considered to influence the water levels in the wetland by preventing the majority of groundwater from exiting the area (CCL 1991).

Gravel and sand deposits to the west and south of the wetland have been identified as major groundwater recharge zones supplying the Leitrim Wetland with an estimated flux of 450-700 m³/day along the southern boundary and 35-40 m³/day along the western boundary (DFO 2003). Groundwater discharges into the Leitrim Wetland as a result of a 'pinching out' of the gravel and sand deposits. A portion of these discharges also provide cool water to Findlay Creek, providing suitable fish habitat. As the overburden to the north and east of the Leitrim Wetland is relatively impermeable, it is not considered to contribute a significant amount of the groundwater to the wetland (CCL 1991). In addition, shallow groundwater movement from the west of the wetland appears to be impeded by Albion Road and is subsequently channelled through a network of ditches (DFO 2003).

3.1.2 *Biological Characteristics*

There are several natural areas in addition to the Leitrim Wetland within or surrounding the Findlay Creek watershed that may provide habitat for significant species (DFO 2003). Given the proximity of these natural areas to the Leitrim Wetland, it is possible that these areas may serve as sources of meta-populations for certain species. Based on the principles of the Island Biogeography Theory, the movement of species from one natural area to another is generally inversely related to the distance between sites; for example, the less distance between sites results in a greater probability of movement of species between sites (Meffe et al. 1997). Thus, it is important to identify what other species have been found in the surrounding natural areas, as the Leitrim Wetland may provide suitable habitat for such species in the future.

Appendix A provides a list of significant species that have been reported in the Findlay Creek watershed (List taken from DFO 2003 report).

3.1.3 *Development*

Historical Ditching

Refer to section 3.1.1 under Hydrology > Surface Flows, for information concerning previous agricultural ditching activities.

Historical Land Clearing

Almost all of the lands north and east of the Leitrim Wetland were cleared and used for agriculture (Figure 5a and 5b). Some of these agricultural fields were still active as of 1991, while others were abandoned only a few decades ago (CCL 1991).

In the past, portions of the Leitrim Wetland mostly along the boundary were also historically cleared for agricultural use, but were soon discovered to be unsuitable for farming and were subsequently abandoned. Lands that were abandoned in the wetland are at various stages of succession, as of 1991, when the last thorough environmental analysis occurred. These previously cleared areas consisted of poplar woods, marsh, wet meadows, and shrub dominated areas (CCL 1991).



Figure 5a. 1945 Air Photo of Leitrim Wetland (NAPL 1945)



Figure 5b. 1953 Air Photo of Leitrim Wetland



Figure 5c. 1991 Air Photo of Leitrim Wetland



Figure 5d. 1994 Air Photo of Leitrim Wetland (NAPL 1994)



Figure 5e. 2008 Drape Air Photo of the Leitrim Wetland (Groupe Alta Inc., 2010)



Figure 5f. 2014 Drape Air Photo of the Leitrim Wetland (Groupe Alta Inc., 2010)

History of Urban Development

In the early 1970's, the former City of Gloucester had begun to consider the land at Leitrim for urban development. In 1988, the Regional Council of Ottawa-Carleton adopted a Regional Official Plan (ROP) which had designated 500 hectares of land at Leitrim as urban area under Section 2.2.1 (f) (Refer to Figure 1b). In 1989, following the Regional Council's adoption of the ROP, the former City of Gloucester advanced their own Official Plan Amendments (OPA) 10 to conform with the ROP, which subsequently also designated the lands at Leitrim as urban area (CCL 2001). The urban land is expected to accommodate approximately 5,500 dwelling units by 2021 (City of Ottawa 2005).

In November 1989, shortly after the former City of Gloucester adopted the OPA 10, a portion of the area designated for development was recognised by the Ministry of Natural Resources as a Class 1 wetland of Provincial Significance. Since the recognition of the land's environmental importance, 100 acres of land has been donated to South Nation Conservation from the Kellam Family, and Tartan and Tamarack Homes Limited will also donate an additional 75 acres for conservation.

A Leitrim Community Design Plan was prepared in collaboration with a technical advisory committee, landowners, consultants, interest groups, and members of the public. The purpose of the community design plan was to provide Findlay Creek Village with a detailed development concept plan and servicing study to help guide future development. Both the developers and residents of Findlay Creek Village have demonstrated a keen interest to incorporate conservation initiatives as a major focal point within the community. Finding the harmonic balance between development and conservation initiatives promises to be both a challenging and rewarding experience.

Findlay Creek Village is an urban mixed-use development located on Part Lots 16, 17, 18, 19 & 20, Concession 4 RF (Rideau Front) within the City of Ottawa (Gloucester).

The area has been under development for more than 10 years north and east of the Leitrim Wetland. Construction continues in the community and full build-out is expected by 2031. Overall, the development will result in 3025 single family dwelling, 440 semi-detached dwellings, 3081 townhouses and 593 apartment units. Development includes a commercial plaza and mixed use development along Bank Street.

Further south, the Remer/Idone Lands are located on Part Lots 21 and 22, Concession 4 RF (Rideau Front), City of Ottawa (Gloucester), Ontario.

The Remer lands were subject to a 1994 Ontario Municipal Board (OMB) decision (No. 900220) that designated the Remer lands for urban development and established the boundary for the Leitrim "Core" Wetland. This boundary was reaffirmed in the 2003 City of Ottawa Official Plan, in the 2005 Leitrim Community Design Plan, and by Official Plan Amendments No. 76 and No. 150. The 2003 Official Plan for the amalgamated City of Ottawa designated the Remer lands General Urban Area. The Remer lands have Draft Plan of Subdivision approval from the City of Ottawa (File No. D07-16-14-0006), with Draft Approval extended to 2017. As a result of the General Urban Area designation of the Remer lands and the Draft Approval that applies to them, the draft approved portion of the Remer lands are recognized as appropriate for residential development. The Idone lands have been added to the General Urban Area as a result of an OMB decision on Official Plan Amendment 76.

The Idone lands are proposed to be developed with approximately 119 single dwelling units, 213 townhouses, 108 condominium units for a total of 440 units, while the Remer lands will contain 403 single dwellings, 326 townhouses and 96 apartment units for a total of 825 units.

On the east side of Bank Street, 61.74 ha of land was also added for development purposes. This would result in approximately 463 single detached units, 72 semi-detached dwellings, 617 townhouses and 98 apartment units.

3.2 Significance of the Leitrim Wetland

It is estimated within the last century, that more than half of all wetlands worldwide may have perished due to anthropogenic causes (Ramsar Convention Bureau 1996). In addition, it has been estimated that within the lower coastal great lakes region of Ontario, over 90% of wetland habitat has been lost (Ducks Unlimited Canada 2004). These estimates emphasize the importance of protecting remaining wetlands both globally and locally, especially around major urban centers where loss has been high due to the conversion of wetlands to agricultural and urban lands (NRCan 2004).

The Leitrim Wetland has been classified by the MNR as a Provincially Significant Wetland, a Life Science Area of Natural and Scientific Interest (ANSI), and a moderately significant natural area within the City of Ottawa under the Natural Environment Systems Strategy (DFO 2003).

Ecosystem Services:

Wetlands, in general, capture and effectively filter large amounts of water; improving water quality and preventing soil erosion and flooding downstream. They can serve as habitat for a diverse number of species dependent on wet habitats, including numerous resident and migratory bird species, amphibians, mosses, lichens and vascular plants.

Habitat Types:

In 1990, the Leitrim Wetland complex was classified into various ecological subunits (CCL 1991). Among the most note-worthy of subunits identified include: a calcareous fen, a mature cedar wood/swamp, several marsh subunits, and a surface discharge area.

Calcareous Fen

In 1990, of the three fens observed in the Leitrim Wetland (DFO 2003), the fen located to the north-east was reported to have a relatively greater proportion of significant plant species in comparison to other subunits (CCL 1991). As fens are supplied with water via groundwater sources, they can provide the right habitat for mineral-tolerant and mineral dependant plant species. Calcareous fens are uncommon in the Ottawa area with only 5 others previously documented (Reddoch 1989, CCL 1991). It should be noted, as of 2003, the fen had drastically been invaded by Glossy Buckthorn (*Rhamnus Frangula*) an exotic shrub; the shrub currently dominates the fen community with greater than 90% coverage over the area (CCL 2003).

Cedar Woods and Cedar Swamp

The cedar woods and cedar swamp are woodlands located in the south-west portion of the wetland; they may be well over 200 years in age (CCL 1991). Some of the trees in these woods have reached ages of up to 250 years, and are considered to be among the oldest trees in the Ottawa-Hull district (CCL 1991). These wooded lands provide several structural attributes typical of mature-old forests including dense uneven age stands and abundant coarse woody debris (CCL 1991). Attributes such as these may provide habitat for numerous old forest dependent and associated species. This forested area has been reported to provide potential nesting habitat for numerous birds including the Cooper's Hawk (*Accipiter cooperii*), Northern Goshawk (*Accipiter gentiles*), Red Shouldered Hawk (*Buteo lineatus*), Screech Owl (*Otus asio*), Barred Owl (*Strix varia*), Long-eared Owl (*Asio otus*), and Northern Saw-whet Owl (*Aegolius acadicus*) (CCL 1991).

Marsh Subunits

Several marsh subunits along the northern boundary of the Leitrim Wetland just east of Albion Road, were reported to have many species of locally rare plants found in few or no other locations in the wetland (CCL 1991). These marshes have also been observed to provide habitat for numerous amphibians and bird species, including: Snapping Turtle (*Chelydra serpentina*), Green Frog (*Rana clamitans*), Leopard Frog (*Rana pipiens*), Muskrat (*Ondatra zibethicus*), Great Blue Heron (*Ardea herodias*), Northern Harrier (*Circus*

cyaneus), Swamp Sparrow (*Melospiza Georgiana*), and Common Yellowthroat (*Geothlyis trichas*) among others.

Surface Discharge Area

The Surface Discharge Area is located in the south-east portion of the wetland and provides the only upland predominantly deciduous habitat within the wetland. Numerous groundwater seepage channels that characterize this area are believed to contribute significantly to the cool water feeding the headwaters of Findlay Creek.

Significant Species and Diversity:

Flora

Five provincially significant vascular plants have been reported in the Leitrim Wetland: Boott's Wood Fern (*Dryopteris x boottii*), Dowell's Wood Fern (*Dryopteris x dowelli*), Limestone Oak Fern (*Gymnocarpium robertianum*), Sandberg's Birch (*Betula x sandbergii*), and Swamp Valerian (*Valeriana uliginosa*). In addition, the Leitrim Wetland and surrounding natural areas (such as the South Gloucester Natural Area) have cumulatively been reported to provide habitat for over 100 vascular plant species of regional significance (DFO 2003).

Fauna

Fish:

The Leitrim Wetland provides a portion of the headwaters for Findlay Creek. As this is groundwater fed, Findlay Creek thus exhibits cool water characteristics, and is one of the only actively stocked trout streams remaining in the City of Ottawa (MNR 2010). However, there has been no documentation of naturally reproducing trout populations, and their habitat is believed to be restricted between Bank Street and Hawthorn Road. In addition, Findlay Creek is considered a warmwater stream below Rideau Road (DFO 2003). The Department of Fisheries and Oceans considers the creek to have suitable fish habitat both east and west of Highway 31. Between the years 1963 and 1968, the Ichthyology section of the National Museum of Nature observed up to 10 species of fish in Findlay Creek around this location (CCL 1995). Fish recorded include: Northern Pike (*Esox Lucius*), Central Mudminnow (*Umbra Limi*), Common Shiner (*Luxilus Cornutus*), Bluntnose Minnow (*Pimephales notatus*), Longnose Dace (*Rhinichthys cataractae*), Creek Chub (*Semolitus atromaculatus*), White Sucker (*Catostomus commersonii*), Johnny Darter (*Etheostoma nigrum*), Logperch (*Percina caprodes*), and the Brook Stickleback (*Culaea inconstans*); many of which are warm water species.

Fisheries studies completed by South Nation Conservation in 2010 confirmed the presence of Bluntnose Minnow (*Pimephales notatus*), Common Shiner (*Luxilus Cornutus*), Blacknose Dace (*Rhinichthys atratus*), Brook Stickleback (*Culaea inconstans*), *Etheostoma species*, Central Mudminnow (*Umbra Limi*), Pumpkinseed (*Lepomis gibbosus*), Northern Redbelly Dace (*Phoxinus eos*), Creek Chub (*Semolitus atromaculatus*), White Sucker (*Catostomus commersonii*), and Fathead Minnow (*Pimephales promelas*).

Birds:

The Leitrim Wetland is home to 90 resident bird species and approximately 130 bird species during periods of migration. Among them, the Red-shouldered Hawk (*Buteo Lineatus*) and the Short-eared Owl (*Asio flammeus*) are two national species of special concern (Committee on the Status of Endangered Wildlife in Canada – COSEWIC 2002). The Red-shouldered Hawk has also been identified as a provincially vulnerable species in Ontario (Committee on the Status of Species At Risk in Ontario –COSSARO 2002).

In addition, the Henslow's Sparrow (*Ammodramus henslowii*) and the Loggerhead Shrike (*Lanius ludovicianus migrans*) are two nationally and provincially endangered species that were historically reported to inhabit the Leitrim Wetland (DFO 2003).

Twenty-four species of birds in the wetland have been identified as forest interior species (Refer to Table 1). Forest interior species are sensitive to edge habitat as edges are associated with such things as increased nest predation and parasitism (DFO 2003). As these sensitive species require forest interiors to successfully nest and raise their young, the abundance of forest interior bird species in the Leitrim Wetland illustrates how it may serve as a healthy forest interior habitat.

Table 1. Interior Forest Bird Species of the Leitrim Wetland. (Table adapted from DFO, 2003)

Species	Notes
Cooper's Hawk	Rare in Ottawa
Northern Goshawk	Rare in Ottawa
Broad-winged Hawk	
Great Horned Owl	
Barred Owl	Rare in Ottawa
Long-eared Owl	Rare in Ottawa
Hairy Woodpecker	
Downy Woodpecker	
Red-breasted Nuthatch	
White-breasted Nuthatch	
Brown Creeper	
Winter Wren	Rare in Ottawa
Golden-crowned Kinglet	Rare in Ottawa
Hermit Thrush	Rare in Ottawa
Veery	
Magnolia Warbler	Rare in Ottawa
Yellow-rumped Warbler	
Black-throated Green Warbler	Rare in Ottawa
Black-and-white Warbler	
American Redstart	
Ovenbird	
Northern Waterthrush	
Canada Warbler	Rare in Ottawa
Scarlet Tanager	

Mammals:

In settled landscapes such as the one around the Leitrim Wetland, it is typical that the majority of mammal species are those that have benefited from agricultural expansion and other human activities. Sensitive species such as Wolf (*Canis lupus*), Cougar (*Felis concolor*), Lynx (*Lynx canadensis*), and Bobcat (*Lynx rufus*) have long been extirpated from the region.

A total of 31 species of mammals can be expected to occur in the study area (Refer to Table 2). The majority of these species can be considered common to the Ottawa area. Several can be said to be dependent, for the most part, on the presence of larger tracts of forest, while others are generalists in their habitat requirements. Generalist species include: Big Brown Bat (*Eptesicus fuscus*), White-footed and Deer Mice (*Peromyscus* sp.), White-tailed Deer (*Odocoileus virginianus*), Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), Raccoon (*Procyon lotor*), Eastern Cottontail (*Sylvilagus floridanus*), Grey Squirrel (*Sciurus carolinensis*), and Striped Skunk (*Mephitis mephitis*).

The Little Brown Myotis (*Myotis lucifugus*) is a species considered to be provincially Endangered (COSSARO 2013).

Table 2. Mammal Species of the Leitrim Wetland. (Table adapted from DFO, 2003)

Species	Notes
Common Shrew	
Pygmy Shrew	
Water Shrew	Rare in Ottawa
Short-tailed Shrew	
Star-nosed Mole	
Little Brown Myotis	Rare in Ottawa
Big Brown Bat	
Eastern Cottontail	
Snowshoe Hare	
Eastern Chipmunk	
Woodchuck	
Grey Squirrel	
Red Squirrel	
Beaver	
Southern Red-backed Vole	
Meadow Vole	
Meadow Jumping Mouse	
Woodland Jumping Mouse	
Muskrat	
Porcupine	
Coyote	
Red Fox	
Raccoon	
Fisher	Rare in Ottawa
Ermine	
Long-tailed Weasel	
Mink	
Striped Skunk	
River Otter	
White-tailed Deer	
Moose	Rare in Ottawa

Herpetofauna:

The Leitrim Wetland provides habitat that supports a fairly typical assemblage of eastern Ontario amphibian and reptile species (Refer to Table 3). The wetland also provides important breeding habitat for several common frog and salamander species.

Table 3. Amphibian and Reptile Species of the Leitrim Wetland. (Table adapted from DFO, 2003)

Species	Notes
Red-spotted Newt	
Jefferson/Blue-spotted Salamander complex	Jefferson rare in Ottawa, status of hybrids in Ottawa unknown
Red-backed Salamander	
Northern Two-lined Salamander	
American Toad	
Spring Peeper	
Western Chorus Frog	Rare in Ottawa
Gray Treefrog	
Wood Frog	
Northern Leopard Frog	
Green Frog	

Bullfrog
Snapping Turtle
Midland Painted Turtle
Eastern Garter Snake
Northern Water Snake
Northern Redbelly Snake

Of the species listed in the table, four have been identified as Species at Risk. The Jefferson Salamander (*Ambystoma jeffersonianum*), Western Chorus Frog (*Pseudacris triseriata*), and Midland Painted Turtle (*Chrysemys picta marginata*) have been assessed by COSEWIC as Endangered, Threatened, and Special Concern respectively. The Snapping Turtle (*Chelydra serpentina*) is a species that has been assessed as Special Concern (COSSARO 2009).

4.0 SUMMARY OF KEY ENVIRONMENTAL ISSUES

4.1 Hydrology

Hydrological factors are very important for maintaining the ecological integrity of the Leitrim Wetland and Findlay Creek. The following hydrological issues for the Leitrim Wetland and Findlay Creek have been identified:

- Base Flow Quantity
- Groundwater Quantity
- Water Quality

Base Flow Quantity: Any surficial flow that provides habitat for fish (ie, Findlay Creek), could be detrimentally affected by an increase or decrease in water levels. Greater surficial flows would likely increase turbidity and could potentially obstruct upstream travel for some fish species. A substantial decrease in surficial flows could reduce fish habitat completely.

Groundwater Quantity: Groundwater levels are critical to maintaining wetlands. The water table in the wetland must remain near or at the surface, especially for flora that rely on hydrous conditions. If water levels were to drop for a prolonged period of time within the wetland then many significant species would not be able to persist (plants on the wetland fringe may be able to be used as early indicators of the wetland drying).

Water Quality: Water quality is a common concern among wetlands. Contamination including sedimentation loads, pesticides, nutrient loads, and temperature are serious issues that can detrimentally affect the health and/or survival of the flora and fauna within these ecosystems and ecosystems downstream. For instance, Findlay Creek is a cool water fish habitat that would be sensitive to alterations in water quality, including increases in temperature.

Five potential impacts to hydrological issues that have been identified in various studies and/or reports (as referred below), include:

1. Construction, Operation and Maintenance of the Leitrim External Storm System (refer to section 5.1, for more information)

Current compensation, mitigation, monitoring and contingency plans for the construction, operation and maintenance of Leitrim External Storm System are outlined in the CCL 2005 Environmental Management Plan and the DFO's 2005 Environmental Screening Report. The plans address each hydrological issue where it is applicable to the storm system.

2. Remer/Idone Lands

The present proposal is to develop a residential community on the properties which will include a constructed channel that will divert surface drainage around the development into the wetland buffer.

3. Any impact from the former Gloucester Land Fill

Continual and ongoing monitoring programs and extensive studies by Transport Canada have concluded that there is no impact to the Leitrim Wetland (Refer to section 5.2 for more information).

4. Residential Management Practices (i.e. Pesticide-Use, Vegetation Removal, etc.)

A Residential Booklet that outlines Homeowner Best Management Practices was developed to help address this issue. (Please Refer to Section 7.3 for more discussion).

5. Any impact from Gravel and Sand Resource Extraction and/or other activities in the surrounding area. (Refer to section 5.4 and 5.5 for more information).

Recommendation 1: Evaluate cumulative impact of all planned development and urbanization and integrate storm water management plans.

Recommendation 2: Monitor performance of mitigation measures.

4.2 Community Interaction with the Wetland

The urban lands designated under the City of Ottawa Official Plan 2009, Schedule B, are expected to develop into an extensive residential community, supporting approximately 5000 dwelling units. Given the magnitude of this community it is important to identify any impacts the community may pose to the wetland. Possible concerns include:

- Domestic Animals
- Direct Human Disturbance
- Indirect Human Disturbance

Domestic Animals: A recent survey suggests that 53% of Canadian households own either a cat or a dog; with approximately one third owning at least one cat and one third owning at least one dog (Ipsos 2001). Release of domestic animals (especially cats or dogs) may harass or physically harm animals within the wetland, cause damage to vegetation or impact the environment and wildlife via pet feces. City legislation does exist under the Animal Care and Control By-Law that would allow SNC to prohibit dogs from entering the Leitrim Wetland, and would restrict dogs to leashes in other areas while outdoors. However, such a bylaw does not exist for cats as they may be released at large (without a leash).

Direct Human Disturbance: Given the diversity of personal values and levels of understanding there is the possibility that uninformed and/or unconcerned person(s) may intentionally or unintentionally be involved in the capture, collection, disturbance or destruction of significant species in the wetland.

Indirect Human Disturbance: Certain activities that are not directly in the wetland or Findlay Creek that may harm the environment include: increased noise, air and light pollution, release of invasive garden plants, use of pesticides, and impacts to water levels through clearing the land.

Conversely, there is a human health concern that the wetland may pose to the community, which is the West Nile virus. Standing surface water in the wetland may provide some suitable breeding habitat for mosquitoes. It should be noted that certain mosquito species are vectors of the West Nile virus. As there have been recent reports of West Nile Virus in the City of Ottawa it is important to consider this as a human health concern. There will be opportunities to educate the public on this issue and provide preventative measures to reduce risk of exposure through the distribution of a community booklet and signage.

Extensive education opportunities were pursued between 2004 and 2010. An outline of what was accomplished can be found in Section 7.0. Further recommendations have been made to continue these efforts.

4.3 Invasive Species

Invasive species may impose serious detrimental effects on wetland flora and fauna. Current and future threats must be mitigated in order to protect vulnerable habitats. One of the major threats in the Leitrim Wetland is the invasive shrub Glossy Buckthorn (*Rhamnus frangula*) which is presently abundant in the wetland, and has already drastically degraded a sensitive fen habitat.

Refer to section 6.2.4 for a recommended Volunteer Monitoring Program for invasive species.

Refer to Section 6.3.1 for a recommended rehabilitation project to eradicate glossy buckthorn from the fen area of the wetland and other sensitive habitats.

5.0 ADJACENT LAND INFLUENCES AND MANAGEMENT ISSUES

As the Leitrim Wetland and Findlay Creek are interconnected physically, chemically and biologically to their surroundings; it is important for this management plan to address adjacent land influences and respective management issues beyond the boundaries of the area designated for conservation.

5.1 Leitrim External Storm System

The urban development plan for the development on the northern, eastern and southern perimeter of the Leitrim Wetland requires a storm water drainage system (referred to as the Leitrim External Storm System) that may pose some hydrological impacts on the integrity of the Leitrim Wetland and on Findlay Creek if proper mitigation and contingency measures are not applied. Mitigation, monitoring and contingency plans related to the Leitrim External Storm System have been prepared. Both groundwater levels in the wetland and surficial flow quantity and quality in Findlay Creek will be monitored. For a detailed review of the current plans, refer to the following reports:

CCL (Cumming Cockburn Limited) and Golder Associates. March 2003. Environmental Management Plan, Leitrim External Storm System, City of Ottawa. Prepared for the City of Ottawa.

DFO (Department of Fisheries and Oceans). June 2003. Canadian Environmental Assessment Act Environmental Assessment Screening Report for Creek Reconstruction, Storm Water Management, Findlay Creek, City of Gloucester (Leitrim External Storm System). Prepared for the City of Ottawa.

Final Updated Serviceability Report (Class EA OPA 76 Areas 8a, 9a and 9b) – Leitrim Development Area. Prepared by IBI Group. Dated September 2016.

Or for further information contact the City of Ottawa.

5.1.1 Responsible Authorities

The DFO is the responsible authority under the Canadian Environmental Assessment Act (CEAA) to ensure that the City of Ottawa complies with all necessary mitigation, monitoring and contingency measures related to the Leitrim External Storm System. The City of Ottawa shall be bound to these obligations through a commitment to the DFO. The City of Ottawa is currently responsible for the collection of all water monitoring data related to the Leitrim External Storm System and for reporting these results to the Department of Fisheries and Oceans (DFO 2003). Current water monitoring plans include measuring groundwater levels in the wetland and measuring water quantity and quality in the base flows around Findlay Creek. A copy of these monitoring results shall also be sent to South Nation Conservation.

An Environmental Compliance Approval (ECA) - formerly known as Certificate of Approval (C of A) - is authorization from the Ontario Ministry of the Environment, Conservation and Parks (MOECP) for the regulated discharge of contaminants to the natural environment. A business's ECA outlines legally binding conditions (e.g. surface and groundwater monitoring, maintenance, etc.) of operation to ensure that the environment and community are protected from the adverse effects of any contaminants that are produced by the business's operations. The existing and proposed stormwater management facilities for this development all fall under an ECA.

5.2 Future Development to the South

Remer/Idone Lands

Land directly south and east of the Leitrim Wetland is designated as urban area and is expected to be developed within the next few years. To accommodate this new development, the existing stormwater management pond will be extended and a constructed channel is proposed to redirect surface water around the development. At the time of the preparation of this management plan, the approval process was currently underway.

Hard Rock Casino

In May 2017, the Ontario Lottery and Gaming Corporation (OLG) announced that Hard Rock Casino Ottawa was selected as the service provider for the Ottawa area gaming entertainment centre, to be located at the Rideau Carleton Raceway. In September 2017, the City sought public input on establishing the Rideau Carleton Raceway as a gaming site and, following that, City Council advised OLG by letter that the Rideau Carleton Raceway is its preferred site. Hard Rock Ottawa has taken over the ongoing operations of the Rideau Carleton Raceway and will open 35 previously-approved gaming tables within the existing facility in 2018.

Hard Rock Ottawa wishes to create a diversified entertainment venue at the existing casino. New construction, including the expanded casino and entertainment space, a nine-storey hotel, a theatre and a parking garage, is proposed on the north side of the existing building.

Earl Armstrong Road Extension

The City's 2013 Transportation Master Plan identifies the need for the extension of Earl Armstrong Road from Albion Road to Hawthorne Road in the Network Concept Plan. The timing for the road extension is planned for beyond the year 2031. The City of Ottawa has presently initiated the Earl Armstrong Road Extension Environmental Assessment (EA) Study to establish the future right-of-way requirements and protect the corridor from encroaching development. The findings of the study will also inform and guide the ongoing planning and development of adjacent lands.

5.3 Gloucester Landfill

The Gloucester Landfill is located on Transport Canada lands, within the Findlay Creek Watershed, west of Albion Road and north-west of the Leitrim Wetland. Between 1957 and 1980 the Gloucester Landfill served as a municipal waste disposal site. Extensive continued and ongoing monitoring indicates that there is no ecological risk to the Leitrim Wetland (Franz Environmental Inc. and ESG International Inc. 2003).

5.3.1 *Responsible Authority*

As the Gloucester Landfill Site is located on Transport Canada lands, Transport Canada is the designated authority responsible for monitoring and remediation programs related to the site. South Nation Conservation shall receive a copy of Transport Canada's annual monitoring results.

5.4 Sand and Gravel Resource Area

The City of Ottawa has designated a large portion of land to the south and west of the Leitrim Wetland, beyond the urban area, as a Sand and Gravel Resource Area. The abundance of sand and gravel in this area is assumed to

be the result of a subaqueous outwash deposit from glacial activities that occurred more than 10,000 years ago. As the overburden deposits of sand and gravel in this area are considered to be more hydrologically conductive than other areas within the watershed, this area has subsequently been identified as the major groundwater recharge zone for the Leitrim Wetland and Findlay Creek, as mentioned in section 3.1.1. Thus, sand and gravel extraction activities may reduce the area's ability to act as a recharge zone. If rehabilitation projects are not implemented, excessive draw-down or runoff may occur.

Several aggregate extraction operations are presently active within this area. Rehabilitation on aggregate resource sites is regulated by the Ministry of Natural Resources and Forestry via the Aggregate Resources Act. Section 48.(1) of the act, describes that: "Every licensee and every permittee shall perform progressive rehabilitation and final rehabilitation on the site in accordance with this Act, the regulations, the site plan and the conditions of the licence or permit to the satisfaction of the Minister" (Government of Ontario 1990).

Recommendation 3: Use groundwater recharge zone for Leitrim Wetland and Findlay Creek as a tool to encourage mitigation and rehabilitation programs within Sand and Gravel Resource Areas.

5.5 Area-wide Nutrient and Pesticide Application

Nutrient and pesticide application on developed lands within the Findlay Creek Watershed may result in adverse effects on the Leitrim Wetland and/or Findlay Creek. These chemical controls may be non-target specific and subsequently enter the wetland and/or Findlay Creek, affecting water quality and wildlife.

Recommendation 4: Deliver a Best Management Booklet/Letter to surrounding landowners, providing advice on safe amounts of fertilizers, and alternatives to herbicide/pesticide application.

6.0 LWAC AND SNC MANAGEMENT ISSUES

6.1 Community Engagement

Interested residents of the Findlay Creek Community can directly participate in activities that promote the protection and wise use of the Leitrim Wetland through the LWAC. Activities could include the development of volunteer monitoring programs, rehabilitation projects and/or distribution of a residential Leitrim Wetland booklet. All projects and/or programs should be done in collaboration with the Findlay Creek Community Association (FCCA). The FCCA could provide a volunteer base for programs and projects, and may also help raise awareness and interest about the importance of the Leitrim Wetland.

6.2 Supplementary/Long-term Monitoring

South Nation Conservation and the Leitrim Wetland Advisory Committee have established supplementary and long-term monitoring programs using staff, consultants and trained volunteers. Monitoring equipment, expertise and other resources are supplied by SNC and/or LWAC. Results from all monitoring activities are reported to the SNC and LWAC for further interpretation. The following are monitoring programs currently being pursued:

- Long-term Monitoring of Surface Water
- Vegetation Monitoring
- Species at Risk Monitoring
- Invasive Species Monitoring
- Monitoring of Community Activities on SNC Property

6.2.1 Long-term Monitoring of Surface Water

SNC monitors surface water quality at three locations in the Findlay Creek watershed. Data collected by SNC staff includes temperature and dissolved oxygen levels (using continuous deployable loggers during the summer months), as well as benthic invertebrate communities.

Volunteers have been used by SNC to supplement the data collected by professionals. They have participated under the Riverwatch program. However, volunteer data has been sporadic as they have not always been available or provide consistent information. Data collected by the volunteers is available through SNC. Despite this lack of consistency, the program should be continued.

Recommendation 5: Continue long-term surface water monitoring program (described above).

6.2.2 Vegetation Monitoring

Vegetation monitoring has been limited to the work conducted by Golder Associates (see section 7.2). This should be expanded to include more comprehensive ecological monitoring of the subunits within the wetland. Completing vegetation plots using protocols such as ELC or EMAN will enable long term monitoring of large and fine scale inventories. SNC staff, volunteers, other organizations, or a combination of all three could effectively do this work, with the appropriate funding secured.

Recommendation 6: Identify and implement more vegetation monitoring protocols, such as ELC or EMAN.

6.2.3 Species at Risk Monitoring

For the purposes of wildlife conservation, species at risk that are suspected to occur in Leitrim Wetland should be monitored by SNC. This would be accomplished opportunistically during other wetland initiatives. Currently, studies have focused on education of landowners, and the data collection of turtle populations. South Nation Conservation should consider referring to federal recovery strategies for any direction they might offer, if they exist for species occurring in the Leitrim Wetland.

Recommendation 7: Maintain species at risk monitoring and education programs.

6.2.4 Invasive Species Monitoring

The monitoring program described in section 6.2.2 could aid in monitoring invasive vegetative species such as Glossy Buckthorn, Purple Loosestrife and Phragmites.

Volunteer events to mechanically remove Glossy Buckthorn have proven ineffective. A lot of effort (and resources) is required to eradicate (or even control) this species over a long period of time. Use of the control structure to increase water levels within the wetland to kill buckthorn is one potential alternate solution. Such an action would require a great deal of planning and monitoring to ensure that the sensitive wetland plants are not eliminated from the area.

Residents have also been educated about the Emerald Ash Borer. Infestation sites throughout Ottawa have been identified. Education about the movement of wood is key to protecting the wetland, as the insect would otherwise be slow to reach these areas.

Continued effort to maintain public knowledge of species that could be detrimental to the wetland is encouraged; future events or publications should focus on dog strangling vine, round goby, milfoil, and the proper disposal of gardening waste.

Recommendation 8: Ensure invasive species are monitored within the wetland.

6.2.5 Monitoring of Community Activities on SNC Property

Although one of the primary objectives of the Leitrim Wetland Management Plan is to involve community members in wetland activities for educational purposes, there are negative effects on the wetland's integrity that could occur, due to an expected increase in visitors. Some of these effects may include vandalism to property, littering and removal or harassment of flora or fauna. Volunteers should report immediately to SNC and the LWAC any negative effects that community activities are having on the Leitrim Wetland. Appropriate measures should be considered once notified (i.e. increased signage, closure of a path, etc.).

Recommendation 9: Ensure community activities are monitored in the wetland.

6.3 Rehabilitation Projects

The Leitrim Wetland has historically been degraded due to agricultural/municipal ditching, partial deforestation activities and colonization of invasive species. Numerous rehabilitation projects may be considered desirable in an effort to improve the integrity of the Leitrim Wetland, these include:

- Eradication of Glossy Buckthorn and Improvements to Water Levels
- Maintenance of Important Ecological Subunits
- Creation of Protected Zones Designated for Significant Flora

6.3.1 *Eradication of Glossy Buckthorn and Improvements to Water Levels*

Glossy Buckthorn (*Rhamnus frangula*) is an invasive shrub that has been noted to have dramatically changed the vegetative communities in the core wetland since observations were made in the late 1980's and early 1990's. In certain areas of the wetland coverage of glossy buckthorn had approached 90% (CCL 2003). One of Environment Canada's recommendations in the DFO screening report was to eradicate the species from the wetland (DFO 2003).

Eradication of Glossy Buckthorn within the wetland is a desirable goal; however, there are many issues to consider. Careless removal of shrub vegetation could cause rapid changes in the surrounding micro-climate, including increases in light, temperature and water evaporation. The newly exposed area may also be subjected to increased soil erosion, Glossy Buckthorn saplings or new invasive species. In addition, removal of Glossy Buckthorn may disturb significant wildlife. Finally, fire as a control is not considered practical given the sensitivity of flora and fauna in the Leitrim Wetland and the proximity to dwellings. Thus, any plan to eradicate an area dominated by Glossy Buckthorn would require manual or chemical removal with appropriate precautions to limit negative effects, and may require several years for completion. Areas of priority for eradication may include: locations where there are large amounts of significant flora (i.e. the degraded fen) and/or locations where only small amounts of Glossy Buckthorn currently exist, but could potentially spread.

Recommended Steps for Eradicating Glossy Buckthorn (*Rhamnus Frangula*)

Step 1. Look for both technical and financial support.

Contact organizations such as Ducks Unlimited, the Ontario Wetland Habitat Fund and the Land Stewardship and Habitat Restoration Program for financial support.

Step 2. Remove Glossy Buckthorn in early winter:

Eradication of glossy buckthorn could occur early on in the winter, given that accessibility into the wetland should be improved during this season and erosion would be minimal. The cutting down and disposal of Glossy Buckthorn should be accomplished before the snow is too deep, so that as much of the plant can be removed as possible. Studies suggest that the average annual dispersal rate for Glossy Buckthorn is approximately 6 meter/year from parent plant (Frappier et al., 2003). In addition Glossy Buckthorn takes from 4 to 6 years to reach its reproductive age. An eradication plan would have to also consider these factors.

Step 3. Raise the water level during the following spring:

The recent colonization of Glossy Buckthorn in the wetland may indicate that the local water levels have dropped and that there has been a change in nutrient availability (MNR per. Comm., CCL 2003). Observations on June 14th, 2004 have also concluded that the water levels were below the appropriate level within the degraded fen, as no stream flow was observed.

Raising the water level should occur early-on in the spring, following eradication of Glossy Buckthorn the previous winter. The purpose of raising the water levels in the wetland would be to suppress glossy buckthorn saplings from developing. There are two possible plans to consider that may help raise the water level, these include:

- Replacing the ditch plugs in the drainage ditch running through the northern portion of the wetland.
- Operation of the water control structure to alter surface water levels.

Step 4. After water-levels have been raised to the appropriate levels, re-vegetation of the area may be an appropriate course of action.

Step 5. Continued monitoring and rehabilitation assessment after completion.

* For steps 2 and 3, a monitoring plan should be incorporated for the early detection of negative effects (i.e., soil erosion). Monitoring plan may also require groundwater monitoring and vegetation monitoring programs as discussed in sections 6.2.1 and 6.2.2 respectively.

Recommendation 10: Rehabilitation project. Remove Glossy Buckthorn from fen and other sensitive habitats.

6.3.2 Replace ditch 'plugs in 1988 municipal drain

The OMNRF had previously plugged a major drainage ditch (constructed in 1988) running through the wetland during a 1991 rehabilitation program, in an effort to restore the water levels in portions of the Leitrim Wetland. A preliminary field survey identified that these plugs were no longer functioning, and that they did indeed aid in maintaining water levels in the upstream portions of the wetland. The Committee should restore these plugs.

Recommendation 11: Replace ditch plugs to maintain upstream water levels.

6.3.3 Water levels and the Water Control Structure

Golder Associates have been collecting surface water information since 2003, and groundwater information since 1998. Using this information, The MOECP has recommended surface water levels behind the dam at 92.0 m to 92.5 m elevation. These would maintain ground water levels between those observed at the piezometer levels. Adaptive management should be used to adjust water levels to mitigate negative impacts from lowered groundwater levels (Golder, 2005).

Recommendation 12: Set the surface water level, and adjust as needed, using the Water Control Structure.

6.3.4 Maintenance of Important Ecological Subunits

Many faunal species require more than one type of habitat to complete their lifecycle. For instance, a bird may require one type of habitat for breeding, another for feeding and yet another for nesting. Thus maintaining sufficient amounts of different subunits both in quantity and quality would ensure that the wetland could accommodate for many of the important species specific needs. This type of project would again require a reassessment of the area to help produce an inventory of various habitats that exist. Rehabilitation opportunities should be considered for habitats that appear degraded using appropriate techniques. In addition, opportunities to create new characteristics that improve habitat quality should be considered such as adding features known to support important species.

Recommendation 13: Rehabilitation project. Take measures to monitor, maintain and improve important ecological subunits or restore to a predetermined condition.

6.3.5 Creation of Protected Zones Designated for Significant Flora

If a significant plant species is found or believed to be in danger of being lost within the wetland, then extra measures should be considered to protect this species. Measures may include the relocation of a portion of the plant population to area where they can be monitored and encouraged to propagate (given proper habitat requirements etc.). This could be in-situ or ex-situ project. The purpose of this project would be to maintain a minimum viable population of the species, so it could sustain itself within the wetland. This type of project may be a temporary means of protecting an important species while it's habitat is restored or until there is sufficient evidence to indicate that it is no longer at threat of being extirpated from the wetland.

Recommendation 14: Rehabilitation project. Create protected zones for significant flora after identification of significant species and habitat has occurred.

6.4 Beaver Dams

Beaver Dams within the protected wetland can be a natural phenomenon that may create new opportunities for alterations in the landscape. They can also effectively plug man-made ditches. It is recommended that no action be taken to remove beaver dams unless their activity is found to threaten or damage significant features (significant species, habitats, boardwalks, etc.). It is the landowner's responsibility to control nuisance beavers (Land Owner Resource Centre and OMNR 1999). Beaver activity within the wetland should be monitored periodically by SNC and assessed on an individual basis.

If removal of beavers from an area is required the use of 'beaver baffles' should be considered. Beaver baffles transfer flows under a beaver dam using a concealed pipe, draining water upstream, preventing the beaver from flooding extensive areas (OMNRF, 1999). If this is not feasible, humane and safe trapping must take place.

Any beaver activity in Findlay Creek will be discouraged (DFO 2003).

Recommendation 15: Monitor beaver activity in wetland and manage water levels and/or beaver population if necessary.

6.5 Fire Control

Legislative responsibility related to fire control belongs to the municipality.

Some conservation programs in Ontario use controlled fires as a method of promoting natural ecosystem dynamics. However, the City of Ottawa does not support prescribed fires and given the close proximity of a future urban area to the wetland, the use of fire management strategies is most likely limited to full suppression. Fire suppression techniques used by the City, follow OMNR guidelines (per comm. City of Ottawa).

The City of Ottawa currently has no specific policies related to fire control in wetlands and/or other significant natural areas. A portion of the City of Ottawa's firefighting staff is trained in forest and wildland fire fighting strategies and tactics, including all rural and city district chiefs. One of the biggest issues is grass fires, especially in the spring before new vegetation greens (and old dead grasses have accumulated).

Identification of fuel deposits in and around wetland should be investigated. Removal of excessive fuels should be completed, if possible, provided that the removal of these fuels is not detrimental to ecosystem health (i.e., refrain from removing old logs, tree stumps that have potential to provide unique habitat opportunities for wildlife). Fire control should be accomplished with as little impact on wetland flora and fauna as possible (i.e., use of light on the land techniques).

Recommendation 16: Signs should be posted on any future wetland trails to prohibit smoking and prohibit fire making. Have cigarette disposal at entrance.

Recommendation 17: In the event of a fire, restoration should be promptly considered to secure soils and mitigate negative impacts.

Recommendation 18: Remove any excessive fuels from around wetland, if possible.

6.6 Future Inquiries

Determine if surrounding wetland owners would consider land easements or other courses of action to help with conservation initiatives. Environment Canada's Ecological Gifts Program allows a donation of land or a partial interest in land to be completed through a conservation easement, servitude or covenant. Not only will land-owners be able to ensure long-term conservation of environmentally sensitive lands, but Ecological Gifts will also enable donors to have access to special tax benefits under the federal Income Tax Act. (Environment Canada, Canadian Wildlife Service 2003)

Recommendation 19: Determine if surrounding wetland owners would consider land easements or other courses of action to help with conservation initiatives.

7.0 OTHER MONITORING

7.1 Groundwater Level Monitoring

As mentioned in section 5.1.1, the City of Ottawa is designated as the responsible authority for monitoring any hydrological effects resulting from the Leitrim External Storm System. Several groundwater monitors were constructed between August 26 and October 17, 2003 to conduct groundwater level monitoring. The location and design of these groundwater monitor installations was proposed in the 2003 Environmental Management Plan discussed in section 5.1.1. Additional monitors have been added since that time by Golder Associates (i.e., 2 monitors added to southeast part of Leitrim Wetland in summer 2010, 3 monitors in 2013 and 1 monitor in 2014 to the west of the Remer Lands).

Golder Associates measures groundwater levels in the monitors using pressure transducers (recording frequency set at hourly intervals), as well as monthly manual measurements to ensure data accuracy. During periods of temporary groundwater control, data is downloaded and reviewed every 2 weeks. Monthly data downloads are completed during periods of pumping inactivity.

Golder Associates continuously monitors groundwater levels located: 1) within the Leitrim Wetland adjacent to the Findlay Creek development to the North of the Remer Lands, and; 2) within the Leitrim Wetland Buffer along the west and north sides of the Remer Lands. (Golder, 2017). Furthermore, Golder states that the monitoring ongoing since 2003 demonstrates that the Findlay Creek Village Development has not adversely affected groundwater levels within the Leitrim Core Wetland (Golder, 2017).

Trigger water level elevations are used to provide a threshold for assessing whether groundwater control activities are drawing levels below natural seasonal levels. This provides a mechanism for halting groundwater taking activities.

Groundwater monitoring activities, conducted by Golder Associates, is an ongoing process.

7.2 Monitoring Vegetation (Photo-monitoring and Vegetation Inventories)

To ensure that negative impacts do not occur within Leitrim Wetland, the builders of the Findlay Creek Community fund on-going monitoring. Golder Associates developed a photomonitoring program that was implemented in October 2006, and employed until 2009, with a final report being produced in 2010. The program used four fixed monitoring stations and a standardized background for photographing vegetation. Plant inventories were also conducted, noting dominant species (i.e., at ground, shrub and tree canopy level). Monitoring occurred during the spring and fall.

Through Permit to Take Water No. 0531-87SPQB, and subsequent permits, monitoring activities related to the condition of vegetation and flora within selected portions of Leitrim Wetland were increased, starting in 2009. These changes included:

- Triennial Vegetation Monitoring
 - Conducted during the summer of 2009; next round of monitoring will occur in 2021.
 - 450-m long transect set up in 2009; all plants within 1-m of centreline identified.
 - Transect broken into 10-m long segments to estimate presence and cover densities within 45 10-m by 2-m plots.
 - 4 locations chosen along transect (each separated by 100-m) where 10-m by 10-m plots established along one edge of the transect; all species identified and absolute cover densities were estimated.
- Monitoring of Areas of Regionally Rare and Uncommon Vegetation (Community Plots)
 - Two areas containing vegetation that is regionally significant, rare, and uncommon in the City of Ottawa were originally located and inventoried by A. Dugal during 1989, 1990, 2006 and 2010.
 - Golder Associates staff visited these areas in 2011 to inventory both areas. All plants were identified; subsequent annual visits will be made and any significant changes in plant community will be reported.
- Annual Photomonitoring
 - Conducted during the summer when plant growth is at its fullest expression.
 - Conducted at each 10-m by 10-m plot and community plot

Golder Associates will continue vegetation monitoring until Permit to Take Water No. 0531-87SPQB expires. Additional monitoring will take place as part of the PTTW for the southern development.

Recommendation 20: Continue to use vegetation inventories and photomonitoring to supplement various projects and programs.

8.0 PUBLIC ACCESS AND EDUCATION ISSUES AND RECOMMENDATIONS

8.1 Boardwalk/ Access into the Wetland

Public access into the Leitrim Wetland for educational purposes is an option that the LWAC is interested in pursuing. There are many issues that must be considered with respect to the construction, operation and maintenance of any boardwalk and/or path built within the wetland. These issues are discussed within this section.

Given the sensitivity of wildlife within the Leitrim Wetland, this area should be treated primarily as a conservation area, designating it as such offers it a higher degree of protection in comparison to other designations such as a recreational park. Activities in the Leitrim wetland should complement conservation initiatives. Acceptable activities may include: nature walks, bird-watching and/or cross-country skiing on designated trails. Use of vehicles, camping, hunting and removal and/or collection of wildlife within the wetland will be activities that are not permitted.

8.1.1 Boardwalk (Advantages and Disadvantages)

The 'pros and cons' of creating a boardwalk were explored in an effort to determine how the construction, operation and maintenance of it would affect the overall goals and objectives of the Leitrim Wetland. Table 4 provides a list of advantages and disadvantages of creating a boardwalk:

Table 4. Advantages and Disadvantages of Creating a Boardwalk

Advantages	Disadvantages
Educational Purposes: <ul style="list-style-type: none"> • Access into the wetland will provide educational opportunities for local residents, schools, universities and other visitors to study and learn more about the 	Wetland Degradation/Loss: <ul style="list-style-type: none"> • The actual construction of a boardwalk could detrimentally affect the surrounding area. There is the potential for disturbance of wildlife, accidental spills and/or soil erosion.

<p>Leitrim Wetland and wetland ecosystems in general.</p> <ul style="list-style-type: none"> Improved access could promote scientific investigations that may: improve wetland management practices; advance current knowledge of the Leitrim Wetland’s natural history; and/or provide useful information in some other related field of study. These educational opportunities may increase public awareness about wetland issues and could help individuals develop a greater level of respect and interest in conservation initiatives. <p>Monitoring/Rehabilitation Objectives:</p> <ul style="list-style-type: none"> Boardwalks or trails into the Leitrim Wetland may improve the monitoring/ rehabilitation programs by possibly allowing easier access to certain locations. <p>Protection:</p> <ul style="list-style-type: none"> Providing a designated path within the wetland could help concentrate movement within the wetland, thereby protecting areas sensitive to disturbance. 	<ul style="list-style-type: none"> The built boardwalks and trails will directly remove segments of wetland habitat. Significant habitats and/or species may be affected. If wood has been chemically treated, leaching of contaminants may occur over the boardwalks’ operational phase. An increase in the number of visitors into the wetland may cause an increase in: <ul style="list-style-type: none"> The capture, collection, disturbance and/or destruction of significant species Noise pollution Waste (litter) Fire Soil erosion Damage from pets The boardwalk would create a vector by which invasive species could spread through the wetland. This could occur by pets and pedestrians as well as by the disturbance caused through construction of the boardwalk.
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8.1.2. Requirements for Designing a Boardwalk

The requirements for designing a boardwalk must include a detailed plan of its preconstruction, construction, operation and maintenance. Issues identified in section 8.1.1. related to wetland degradation and loss are very important to consider; and should be addressed within all of the boardwalk’s development phases. In addition, human health and safety concerns should also be incorporated in the plan in order to protect workers and visitors from harm, and to prevent any liability issues.

All of these items were taken into account when planning and constructing the Leitrim Boardwalk, and are continually reviewed when completing any maintenance activities.

8.1.3 Construction of the Boardwalk

In March of 2011, SNC began the process of building the Leitrim Boardwalk. The following table sets out the timeline and decisions/approvals made to minimize impacts on the wetland.

Table 5. Construction of Leitrim Wetland Boardwalk Activities

Month	Activity	Rationale
March 2011 (Completed)	Site selection and design	<ol style="list-style-type: none"> Identify the most interesting (feasible) route; minimize impacts Avoid sensitive fen area, provide viewing platform of system Incorporate access regulations
March 2011 (Completed)	LWAC feedback	<ol style="list-style-type: none"> Present intended route to LWAC for comment Present intended timeline to LWAC for comment

June 2011 <i>(Completed)</i>	Finalize route	<ol style="list-style-type: none"> 1. Identify summer vegetation, ensure route is still viable 2. Finalize route based on finances
January 2012 <i>(Completed)</i>	Obtain permits and letters of recommendation from the City of Ottawa, Rideau Valley Conservation Authority, and Findlay Creek Co-tenancy	<ol style="list-style-type: none"> 1. Secure approvals; ensure best management practices used
February 2012 <i>(Completed)</i>	Cut vegetation	<ol style="list-style-type: none"> 1. Remove vegetation and hazard trees from route; minimize impacts
March 2012 <i>(Completed)</i>	Install anchor system (helical piles)	<ol style="list-style-type: none"> 1. Helical piles used in wet/sensitive sections to minimize impacts
Summer 2012 <i>(Completed)</i>	Build boardwalk	<ol style="list-style-type: none"> 1. Build some sections off site, and bring into wetland for installation during dry season
Winter 2012 <i>(Completed)</i>	Official opening	<ol style="list-style-type: none"> 1. Host official opening of Boardwalk; invite Findlay Creek Community members, media, City of Ottawa councillors, Tartan and Tamarack homes, LWAC members
2016 <i>(Completed)</i>	Signage	<ol style="list-style-type: none"> 1. Determine best signage; refer to City of Ottawa templates
Ongoing	Outreach	<ol style="list-style-type: none"> 1. Obtain funding for education and restoration based on access/opportunities provided by Boardwalk

Suggestions have been made to extend the Leitrim Boardwalk through the wetland to connect to new development areas further south. This is strongly discouraged as it would fragment the wetland and result in the continued spread of invasive species further into sensitive wetland habitats.

9.0 SUMMARY

9.1 List of Recommendations

- R 1. Evaluate cumulative impact of all planned development and urbanization and integrate stormwater management plans.
- R 2. Monitor performance of mitigation measures.
- R 3. Use groundwater recharge zone for Leitrim Wetland and Findlay Creek as a tool to encourage mitigation and rehabilitation programs within Sand and Gravel Resource Areas.
- R 4. Deliver a Best Management Booklet/Letter to surrounding landowners.
- R 5. Continue long-term surface water monitoring program.
- R 6. Identify and implement more vegetation monitoring protocols, such as ELC or EMAN.
- R 7. Maintain species at risk monitoring and education programs.
- R 8. Ensure invasive species are monitored within wetland.
- R 9. Ensure community activities are monitored in wetland.
- R 10. Rehabilitation project. Remove Glossy Buckthorn from fen and other sensitive habitats.

- R 11. Replace ditch plugs to maintain upstream water levels.
- R 12. Set the surface water level, and adjust as needed, using the Water Control Structure.
- R 13. Rehabilitation project. Take measures to monitor, maintain and improve important ecological subunits or restore to a predetermined condition.
- R 14. Rehabilitation project. Create protected zones for significant flora, after update of the wetland and identification of significant species and habitat has occurred.
- R 15. Monitor beaver activity in wetland and manage water levels and or beaver population if necessary.
- R 16. Signs should be posted on any future wetland trails to prohibit smoking and prohibit fire making. Have cigarette disposal at entrance.
- R 17. In the event of a fire, restoration should be promptly considered to secure soils and mitigate negative impacts.
- R 18. Remove any fuels identified as excessive from around wetland, if possible.
- R 19. Determine if surrounding wetland owners would consider land easements or other courses of action to help with conservation initiatives.
- R 20. Continue to use vegetation inventories and photomonitoring to supplement various projects and programs.

10.0 Outcomes

Table 5. Action Items and Outcomes Since 2005

Management Initiative	Action Item	Description
Obtain Baseline Information	1. Biological inventory update	Natural Environment Photomonitoring 2006/2007, Golder Associates. Anecdotal Vegetation Collection, Dugal, 2010
	2. Watershed activities update	Leitrim Development Area Stormwater Management, IBI/CCL 2005, Findlay Creek Village Stormwater Management Facility Temperature and Flow Monitoring Report, IBI 2008. Rideau Carleton Raceway Hydrogeological Investigation, Oliver, Mancione, McCalla & Associates 1999
Monitoring Program(s)	3. Groundwater, surface water and vegetation monitoring	Annual monitoring reports produced by Golder Associates outline findings based on Groundwater Level Monitoring Program and Vegetation Monitoring Program. Some water quality monitoring data is also available. Benthic invertebrate monitoring and water chemistry monitoring has been completed by SNC from 2005-2018.
Rehabilitation Program(s)	4. Fen rehabilitation/ eradication of Glossy Buckthorn project	A volunteer eradication program was attempted in 2008. This program covered a small area of the wetland. Buckthorn were removed and replaced with native tree species. Further control projects have been carried out within the remnant fen habitat and at the end of

	<p>the boardwalk in 2016, 2017 and 2018. Buckthorn were removed mechanically, and the area was planted with native tree species.</p> <p>SNC is planning another removal project in the same area in 2018 using chemical control methods. Buckthorn will be cut, and the stumps directly treated with herbicide.</p> <p>Buckthorn control efforts are ongoing along the length of the boardwalk.</p>	
Education, Awareness and Provision of Recreational Activities	<p>5. Preparation of a residential booklet</p>	<p>A homeowners guidebook “<i>Living Beside A Wetland: Best Management Practices</i>” was prepared and distributed to new homeowners.</p>
	<p>6. Community speakers</p>	<p>Community speakers on wetland issues and other topics such as gardening with native plants (i.e., Michael Runtz, Ottawa Field Naturalist Club/Fletcher Wildlife Garden, Algonquin College).</p>
	<p>7. Community tree planting days</p>	<p>Community tree planting days (spring 2006, fall 2008); 100 trees planted.</p> <p>Annual shrub giveaway for residents.</p>
	<p>8. Interpretive Hikes</p>	<p>Interpretive hikes - education on Findlay Creek water quality (2 events), BUG WATCH (3 events).</p> <p>Specialist High Skills Major and Innovation, Creativity and Entrepreneurship training for area high school students. One full day event in 2017 and 2018.</p>
	<p>9. Habitat enhancement projects</p>	<p>Approximately 30 bird boxes were built by local Findlay Creek Community youth; boxes were installed by St. Mark’s High School students.</p>
	<p>10. Participation in local community fairs and events</p>	<p>Outdoor Living Fair, Winter Carnival, Findlay Creek Community Association Annual General Meeting</p>
	<p>11. Findlay Creek Conservation Area</p>	<p>Interpretive signage for Leitrim Wetland has been erected in the triangle-lot off Findlay Creek Drive (donated to SNC by Findlay Creek co-tenancy).</p> <p>This area connects to the Leitrim Boardwalk via a multi-use stonedust path installed by Tartan Development Corporation in summer 2012.</p>
	<p>12. Leitrim Boardwalk</p>	<p>Construction of Leitrim Boardwalk was completed in the winter of 2012.</p>

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