OAIA 2014 :
Collaboration and Innovation in Impact Assessment

What's next for EA: A case study

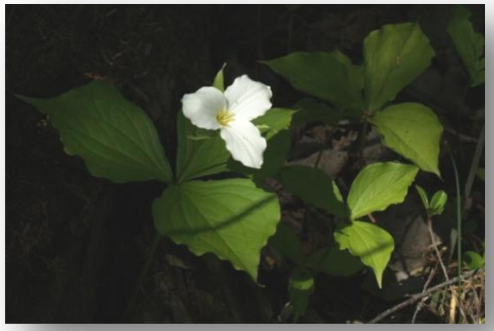
Assessment of Cumulative Effects of Transportation Infrastructures on the National Capital Greenbelt

Joint Study Sponsored by the National Capital Commission (NCC) and City of Ottawa

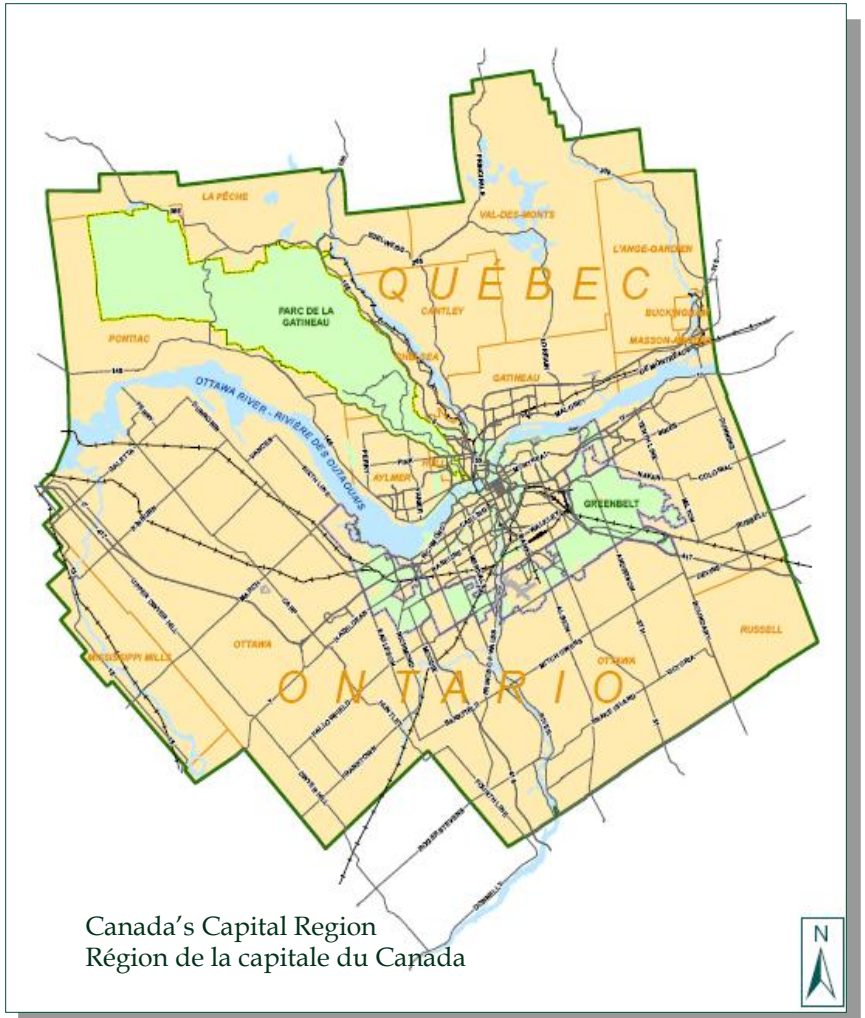
October 2014

Presentation Overview

- Before the study
  - Context
- During the study
  - Goals and objectives of study
  - Methodology
  - Projects identified within the Greenbelt
  - Study Findings and Conclusions
- After the Study
  - CE Assessment Approach Benefits



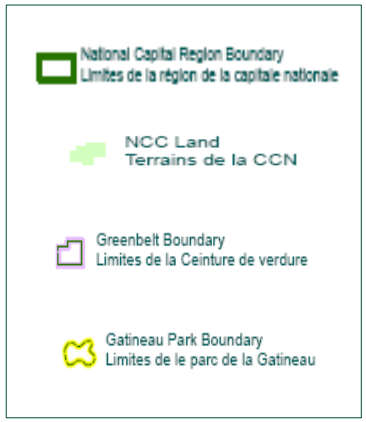
Capital Context



Canada's Capital Region
Région de la capitale du Canada

About the NCC

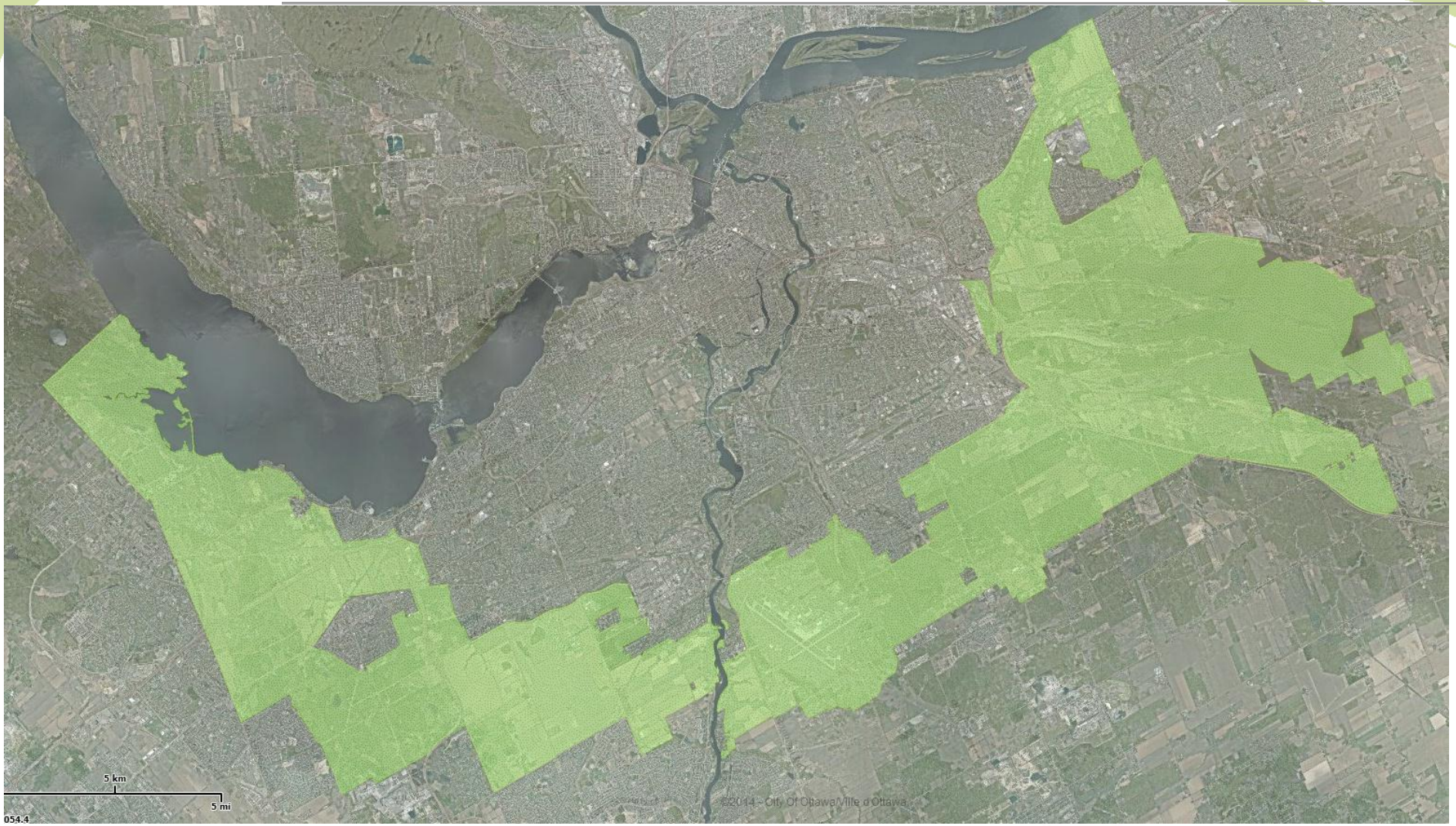
- Federal Crown Corporation
- Building a Capital for all Canadians
- Steward and caretaker of the Capital
- Accountable to Parliament through the Minister of Foreign Affairs
- Gatineau Park, pathways, parkways, bridges, Greenbelt



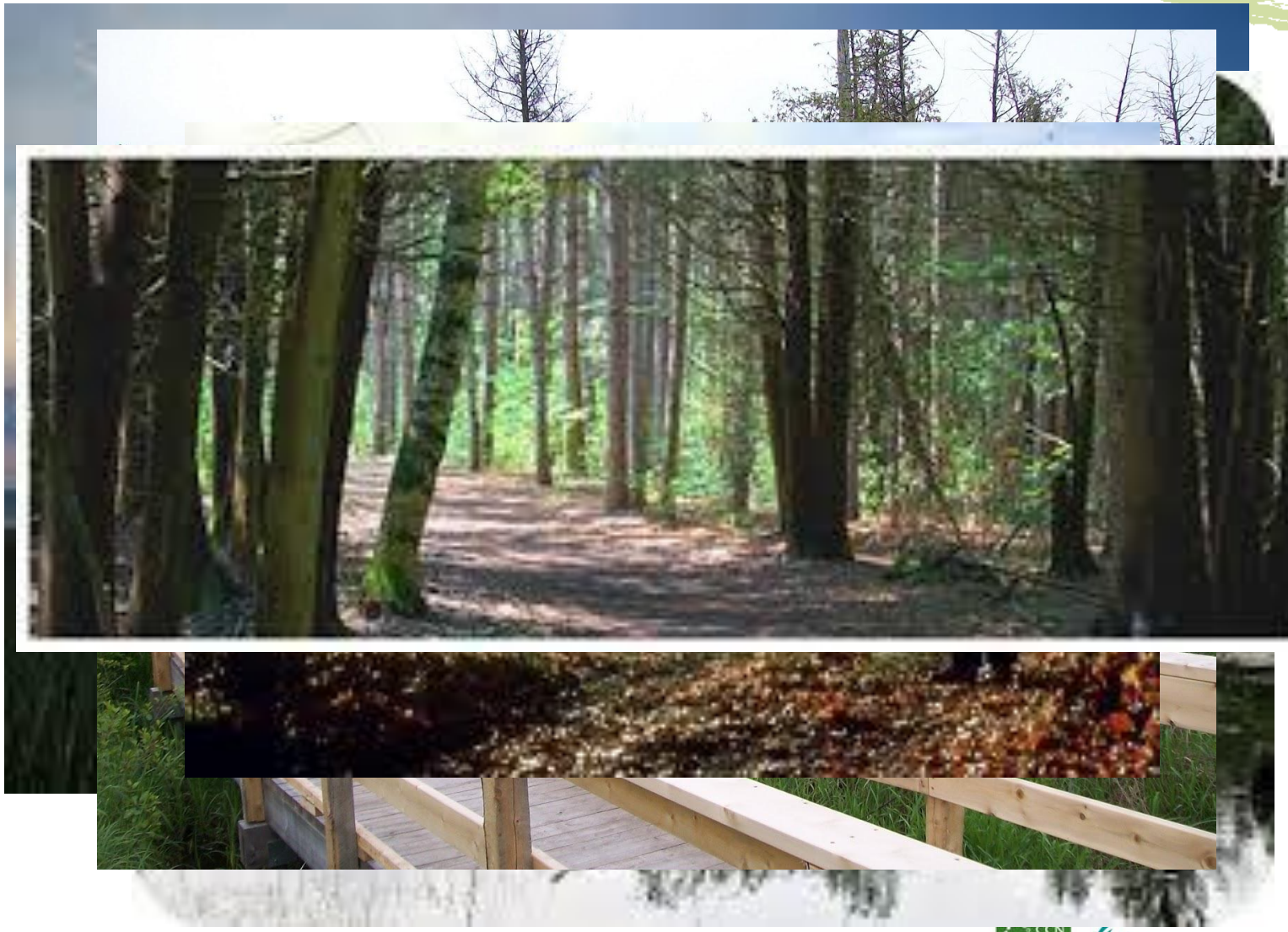
Area - 5,320 sq. km.

NCC land ownership - 470 sq km

Canada's Capital Greenbelt



Why was this Study Done?



What is Cumulative Assessment?

Cumulative Effects Assessment examines changes in an area through time, and studies how these changes affect the resources in a study area.

- Transportation and transit projects may individually have 'insignificant' effects while cumulatively they may have important effects.
- This study evaluated past, present and reasonably foreseeable future transportation projects that affect Greenbelt lands.
- The reasonable foreseeable future for this study is defined as 2031.

Goals

- Promote a comprehensive and integrated approach to land use and transportation planning within the Greenbelt.

- Promote a mutual understanding of the challenges associated with integrating the strategic goals of the City's Transportation Master Plan with the NCC's goals of managing the long-term natural and cultural integrity of the Greenbelt.

Study Objectives

Key objectives were to:

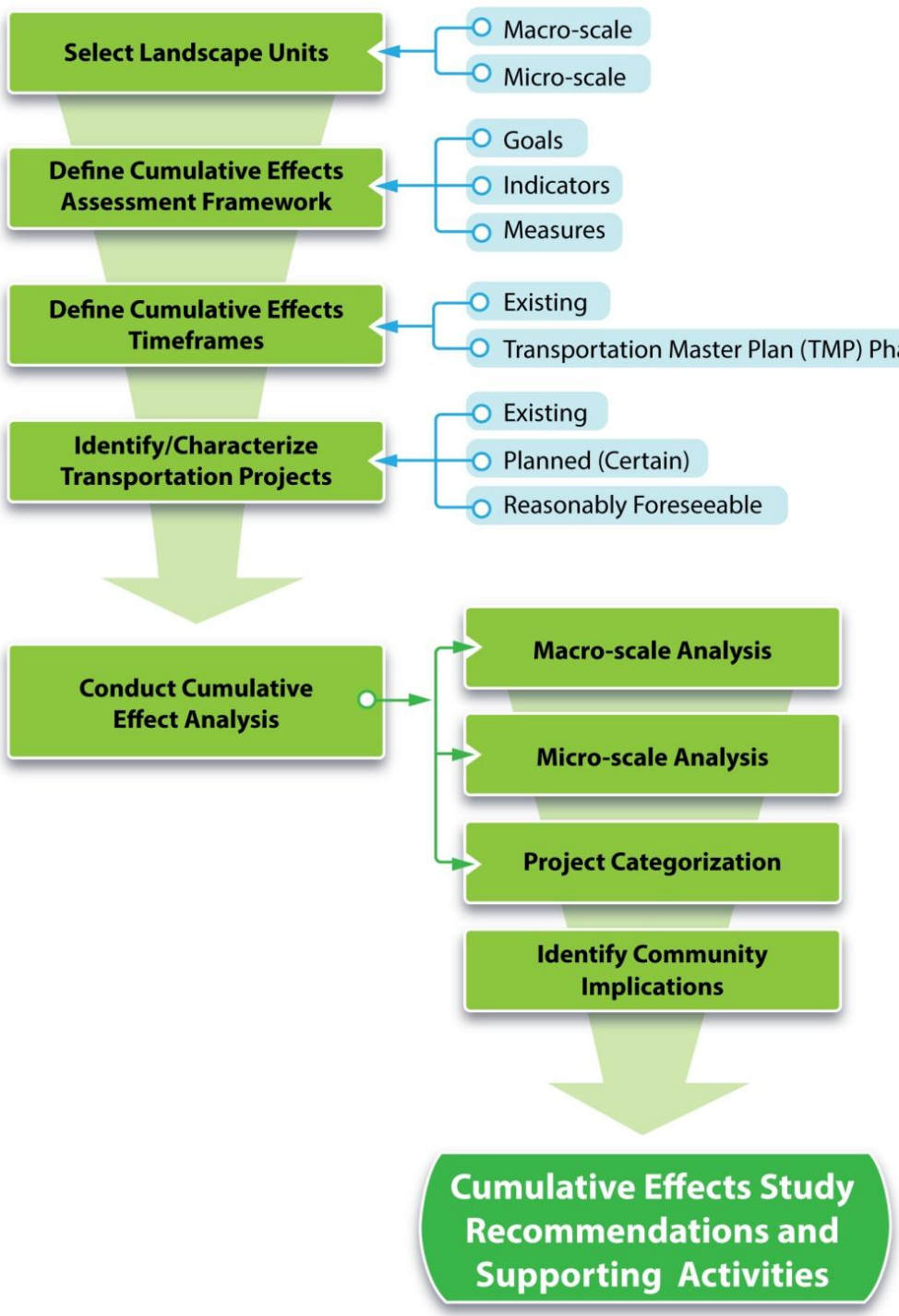
- Identify transportation proposals to be included in the Greenbelt Master Plan review.
- Establish a framework to guide the City and the NCC in future Environmental Assessments.
- Examine road transportation and transit infrastructure proposals through a sustainability lens to maintain and enhance the conservation of the Greenbelt.
- Examine how transportation infrastructures could be managed while seeking to minimize further encroachment and landscape fragmentation of the Greenbelt.

Study Process

- Assess cumulative effects of existing, planned and reasonably foreseeable transportation projects on Greenbelt lands.

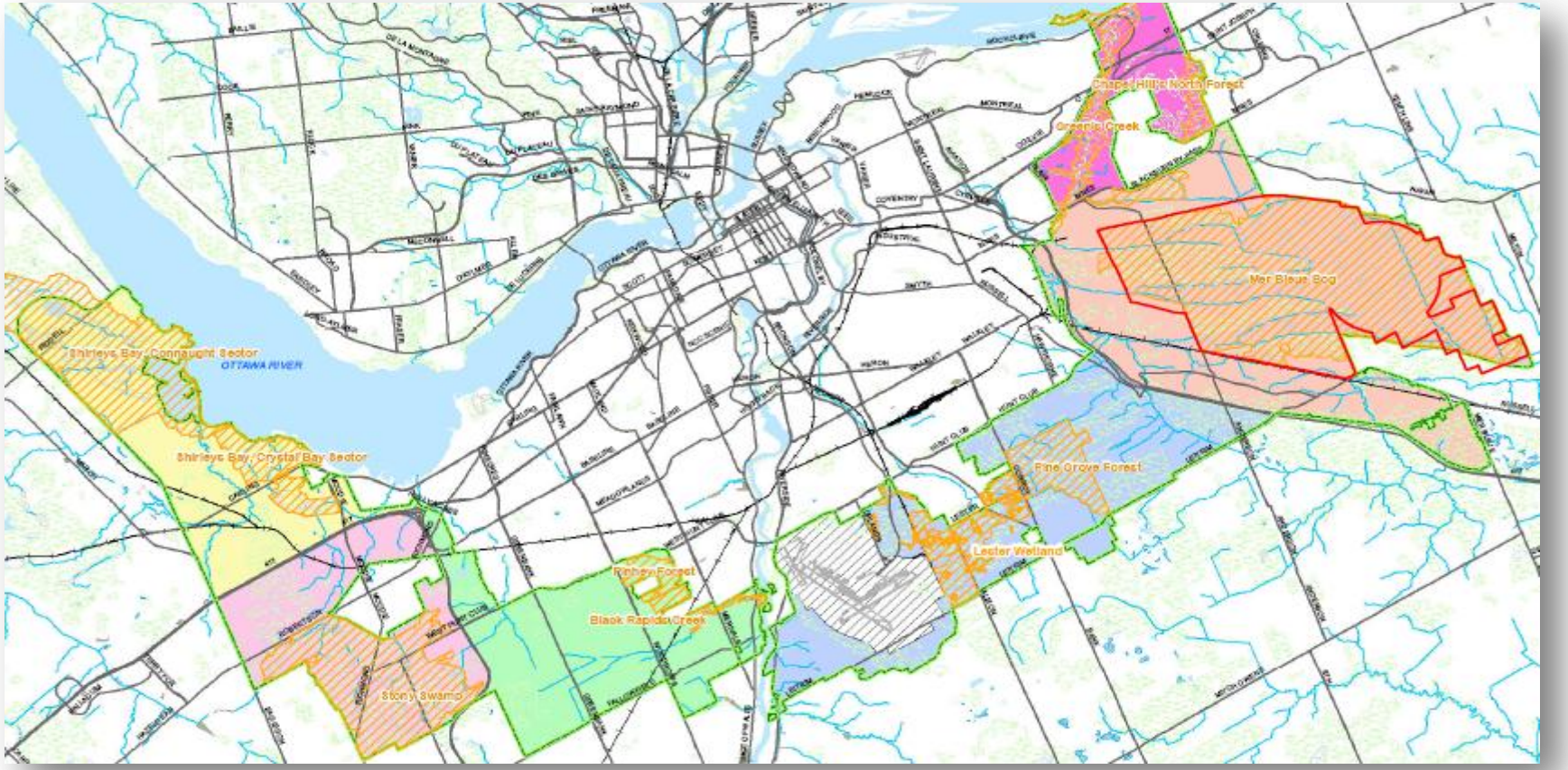
- Examine road transportation and transit infrastructure proposals through a sustainability lens to maintain and enhance conservation of the Greenbelt
- Examine how transportation infrastructure could be managed while seeking to minimize encroachment and landscape fragmentation of the Greenbelt
- Establish integrated planning framework to guide the NCC in their Greenbelt Master Plan Review

Study Methodology



Landscape Management Units

Overall Greenbelt Planning Zone and
Six (6) Landscape Management Units (LMU)



Sub-areas within the LMUs

- **Ten (10) Core Natural Areas (CNAs)**
  - Shirley's Bay
  - Stony Swamp
  - Black Rapids Creek
  - Mer Bleue
  - Chapel Hill's North Forest
  - Crystal Bay Forest
  - Pinhey Forest
  - Pine Grove Forest
  - Green's Creek
  - Lester Wetlands
- **Agricultural / Cultivated Landscapes**
- **Natural Area Links**
- **Non-VEC Woodlots**
- **Non-VEC Wetlands**

Cumulative Effects Assessment Framework

***Goals* (4) –** What we are trying to achieve

***Indicators (13)* –** What we are trying to measure

***Measures (19)* –** How we will quantify the effect

Cumulative Effects Assessment Framework

Goals	Indicators	Examples of Measures
1. Preservation of Ecological Form	▪ Area ▪ Shape ▪ Edge	✓ Change in Area (ha) ✓ Area/boundary ratio ✓ Length of new edge created (km)
2. Preservation and/or Enhancement of Ecological Functions	▪ Connectivity ▪ Diversity (flora and fauna) ▪ Resiliency	✓ New crossings (#) ✓ Habitat connections severed (#) ✓ Habitat types affected in KBAs (#) ✓ Road density (length of road/km^2)
3. Maintenance and/or Enhancement of Ecological Services	▪ Surface Drainage ▪ Groundwater Resources ▪ Soil Capability	✓ Stream crossings (#) ✓ Area of hard surface (ha) ✓ Area of Class 1-3 soils (ha)
4. Preservation of Community Benefits	▪ Recreation and Culture ▪ Visual Aesthetics ▪ Greenbelt Experience ▪ Agriculture	✓ New trail crossings (#) ✓ High-ranked heritage farm impacts ✓ Viewpoints impaired (#) ✓ Vehicle/person movements through a landscape unit (#) ✓ Farm parcels severed (#)

Feedback from Agency Workshop

- Refined indicators and measures in analytical framework
- Vocabulary and definitions improved, measures added/revised
- Provided data needed for analysis
- New "connectivity, archaeological, and greenbelt experience" measures
- New quantitative measure for "shape" (i.e. area to boundary ratio)
- Use of vehicle movements as a measure of effects on "resilience" and "greenbelt experience" indicators
- Defined "air quality / carbon sink" indicator and measure
- Considered new Rideau River crossings

Feedback from GBMP Review PAC

- Questioned TMP rationale for new transportation infrastructure in Greenbelt
- Supported and suggested additional indicators (*connectivity, air quality, groundwater*)
- Emphasized vulnerability of the Greenbelt
- Cumulative effects management measures (*restoring connectivity through infrastructure design modifications*)
- Requested presentation of study conclusions and recommendations

1. Preservation of Ecological Form

Indicators	Measures	Applicability
Area	Area affected (ha)	✓ All Landscape Units
Shape	Area to boundary ratio (ha/km)	✓ Core Natural Areas ✓ Supporting Ecological Features
Edge	Length of Edge (km)	✓ Core Natural Areas ✓ Supporting Ecological Features

2. Preservation / Enhancement of Ecological Function

Indicators	Measures	Applicability
Connectivity	▪ Transportation Crossings (#)	✓ All Landscape Units
	▪ Natural Area Linkages (NAL) Severed (#)	✓ Greenbelt/Landscape Mgt Units
	▪ NAL Weakened by Widening (#)	✓ Greenbelt/Landscape Mgt Units
	▪ Regional corridors severed (#)	✓ Greenbelt/Landscape Mgt Units ✓ Core Natural Areas
	▪ Regional corridors weakened by widening (#)	✓ Greenbelt/Landscape Mgt Units ✓ Core Natural Areas
Diversity	▪ Habitat Types / Communities Affected (#)	✓ Core Natural Areas

2. Preservation / Enhancement of Ecological Function

Indicators	Measures	Applicability
Resilience	▪ Road Density (length of road/ km^2)	✓ Greenbelt / Landscape Mgt. Units ✓ Core Natural Areas ✓ Natural Area Linkages ✓ Supporting Ecological Features
	▪ Vehicle volumes (#)	✓ Greenbelt / Landscape Mgt. Units ✓ Core Natural Areas ✓ Natural Area Linkages ✓ Supporting Ecological Features

3. Maintenance / Enhancement of Ecological Services

Indicators	Measures	Applicability
Surface Water	▪ Watercourse Crossings (#)	✓ Greenbelt / Landscape Mgt. Units ✓ Core Natural Areas ✓ Cultivated Lands ✓ Supporting Ecological Features
	▪ Crossing Widening (#)	✓ See Above
Groundwater	▪ Length along sensitive soils / groundwater protection areas (km)	✓ Greenbelt / Landscape Mgt. Units ✓ Cultivated Lands
	▪ Area of hard surface (ha)	✓ Greenbelt / Landscape Mgt. Units ✓ Core Natural Areas ✓ Cultivated Lands ✓ Supporting Ecological Features
Air Quality/ Carbon Sink	▪ Natural Area to Carbon Production Area ratio	✓ Greenbelt / Landscape Management Units

Note: Carbon production areas include cultivated landscapes, rural landscapes, buildable site area and infrastructure corridors.

4. Preservation of Community Benefits

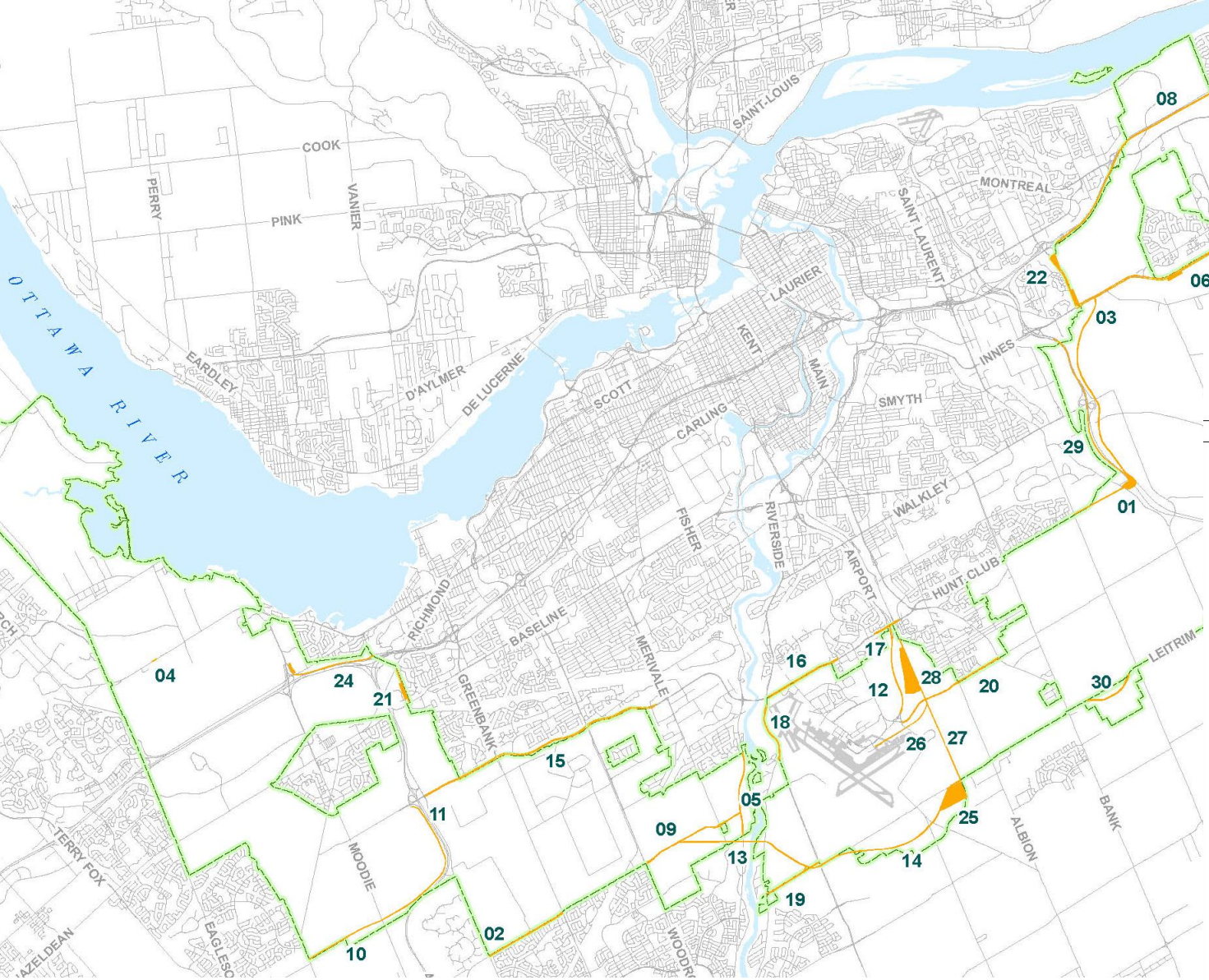
Indicators	Measures	Applicability
Recreation	▪ Pathway Crossings (#)	✓ Greenbelt / Landscape Mgt. Units
	▪ Widenings across Greenbelt Pathways (#)	✓ Greenbelt / Landscape Mgt. Units
	▪ Crossings/ Widenings across the Rideau River (#)	✓ Greenbelt / Landscape Mgt. Units
Greenbelt Experience	▪ Vehicle movements through Greenbelt feature (#)	✓ Greenbelt / Landscape Mgt. Units ✓ Core Natural Areas
	▪ Road density within Greenbelt feature (km/km^2)	✓ Greenbelt / Landscape Mgt. Units

4. Preservation of Community Benefits

Indicators	Measures	Applicability
Archaeological Features	▪ Crossing/widening in areas of high or medium archaeological potential (#)	✓ Greenbelt / Landscape Mgt. Units
Agriculture	▪ Leased farm parcels severed (#)	✓ Greenbelt / Landscape Mgt. Units ✓ Cultivated Lands
	▪ Area of Class 1-3 soils (ha)	✓ Greenbelt / Landscape Mgt. Units ✓ Cultivated Lands

Transportation Projects Considered

- Existing transportation infrastructure adjacent to or through the Greenbelt defined:
  - 50 road segments including 3 provincial freeways (local roads not incl)
  - 2 park and ride lots
  - one bus roadway (BRT corridor) and one station
  - 2 locations with bus lanes on road shoulders
- Future transportation infrastructure in Greenbelt defined as "planned certain" (if an EA process completed) and "planned reasonably foreseeable":
  - 22 road projects including 1 provincial project and 1 federal project
  - 2 park and ride lots
  - 2 LRT corridors and one LRT yard
  - 3 BRT corridors, 6 transit stations
- Several projects not in the 2008 TMP were included because they became priorities after its completion



Legend

- Road & Transit Projects
- Greenbelt Planning Zone (1996)

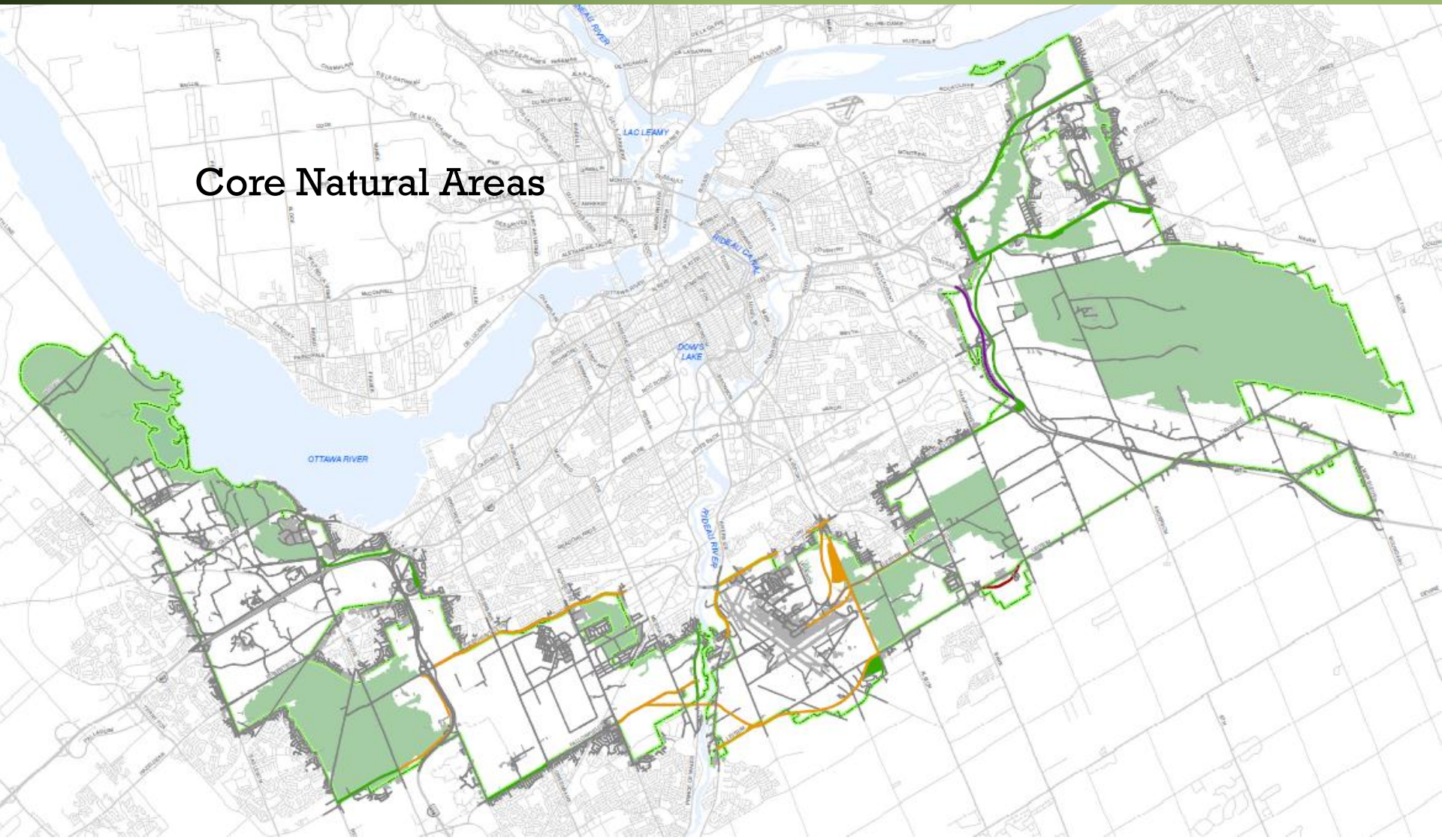
#	Project
01	Hunt Club Ext (Hawthorne-417)
02	Fallowfield (Greenbank W)
03	Hunt Club-Innes Connection
04	Carling under Rail E of Kanata
05	Prince of Wales
06	Blackburn Hamlet Bypass
07	Blackburn Hamlet Bypass (Extension)
08	OR 174
09	Fallowfield (Woodroffe E)
10	Hope Side Rd Ext. Rich-Moodie
11	Hope Side Rd Ext. Moodie-416
12	Airport Parkway
13	New Crossing Rideau River
14	Leitrim realignment (Airport)
15	Hunt Club
16	Hunt Club from 4 to 6 lanes
17	Hunt Club from 4 to 6 lanes
18	Riverside
19	Leitrim (from River to NS LRT)
20	Lester (Airport to Albion to Bank)
21	Transitway Bayshore-Baseline
22	Cumberland Transitway
23	Navan/Chapel Hill
24	Moodie to Bayshore BRT link
25	Leitrim (Station / Yard / Lot)
26	Airport Connection
27	NS LRT north of Lester
28	NS LRT Yard
29	Hwy 417 (Hunt Club Ext W)
30	Leitrim (at CFS Leitrim)

Transportation Projects Identified within the Greenbelt

Cumulative Effects Analysis

- For each indicator and measure, a GIS layer was used to assess the impacts of existing and future transportation infrastructure
- The quantitative results were reviewed to identify those projects that contributed most to cumulative effects and where in the Greenbelt those effects were occurring
- Some examples are presented
- For each measure and indicator, individual project(s) with the greatest contribution to cumulative effects over the planning period were identified

Core Natural Areas



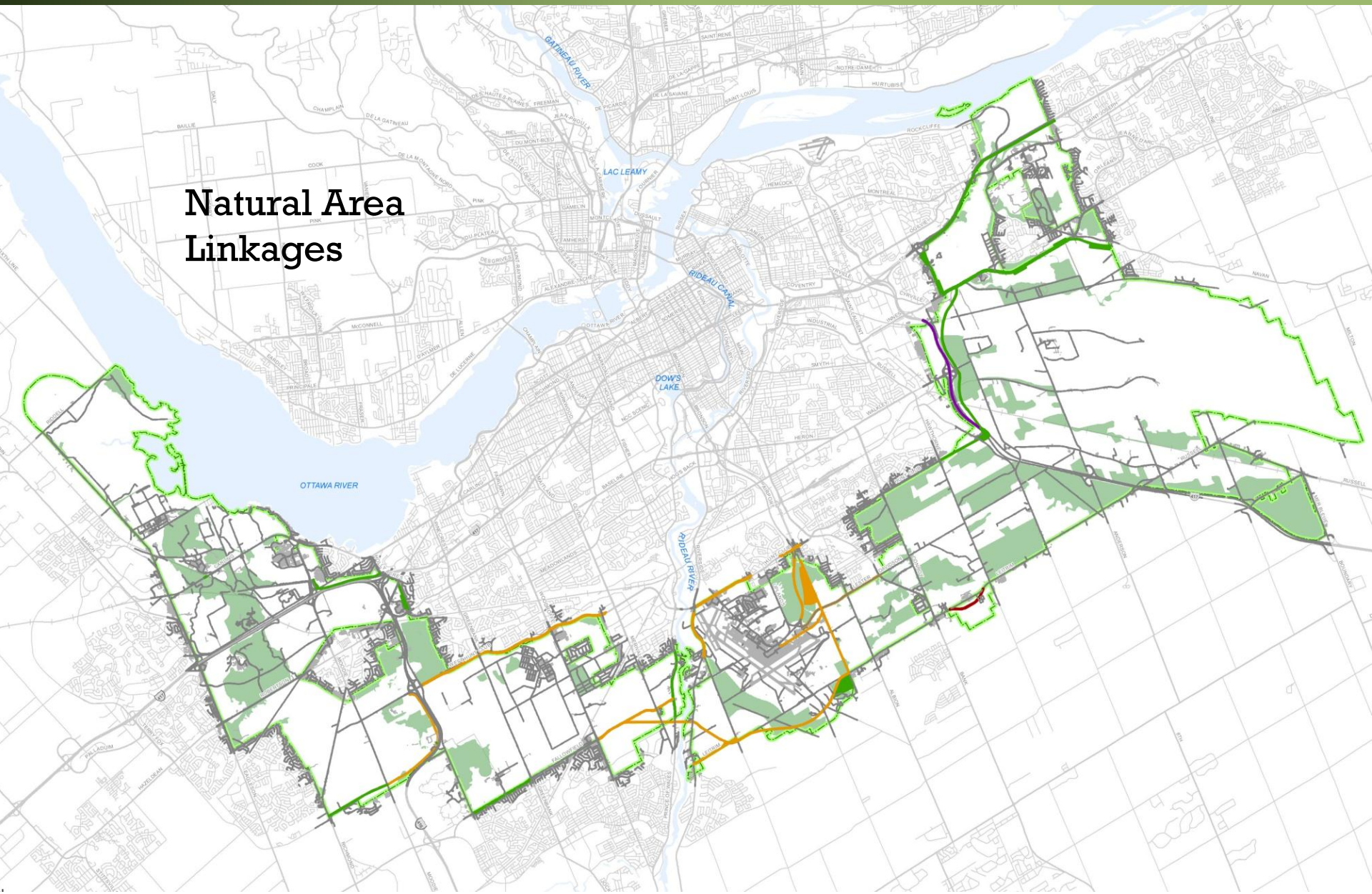
Macro Analysis for CNAs

Goal	Indicator	Measure	Existing Infrastructure	Cumulative Effects on all CNAs (2031)	Change (2031)
Preservation of Ecological Form	Area	Area affected (ha)	*29.2*	*34.9*	***20%***
	Shape	Area to boundary ratio	*0.3*	*0.3*	***0***
	Edge	Length of Edge (km)	*113.8*	*123.1*	***8%***
Preservation and/or Enhancement of Ecological Function	Connectivity	Crossings by transportation infrastructure (#)	*13*	*15*	***2 new***
		Regional corridors severed (# of Greenbelt connections with Regional Corridors severed)	*5*	*9*	***4 new***
		Regional corridors weakened by widening (# of Greenbelt connections with Regional Corridors weakened)	*0*	*2*	***2 new widenings***
	Diversity	Habitat types/communities affected (#)	*8*	*9*	***13%***
	Resilience	Road density (length of road / km^2)	*0.5*	*0.6*	***20%***
		Vehicle movements (#)	*21050*	*25680*	***22%***
Maintenance and/or Enhancement of Ecological Services	Surface water (i.e., quantity, flow and quality)	Watercourse crossings (#)	*6*	*6*	***0***
		Watercourse crossing widening (#)	*0*	*0*	***1 new***
	Groundwater (i.e., quantity, flow and quality)	Area of hard surface (ha) within sensitive soils	*17.1*	*20.1*	***18%***
Preservation of Community Benefits	Greenbelt Experience	Vehicle movements through a Greenbelt feature (#)	*21050*	*25680*	***22%***

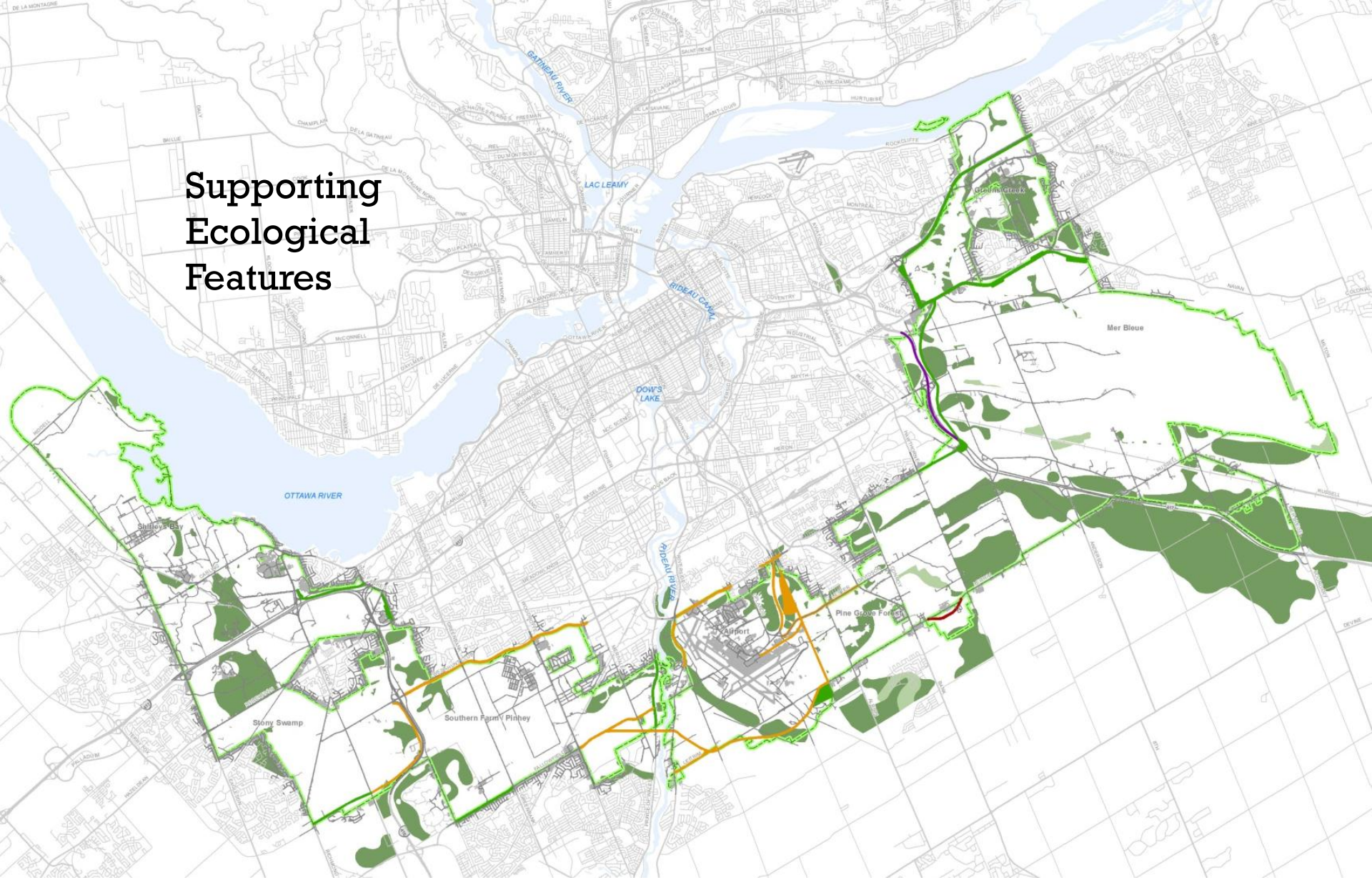
Summary of Results for CNAs

Goal	Indicator	Measure	Core Natural Areas (CNAs)			
			Stony Swamp	Black Rapids Creek	Green's Creek	Lester Wetlands
Preservation of Ecological Form	Area	Area affected (ha)				
	Shape	Area to boundary ratio				
	Edge	Length of Edge (km)				
Preservation and/or Enhancement of Ecological Function	*Connectivity*	Crossings by transportation infrastructure (#)				
		Regional corridors severed (# of severances of Greenbelt connections with Regional Corridors)				
		Regional corridors weakened by widening (# of Greenbelt connections with Regional Corridors weakened)				
	Diversity	Habitat types/communities affected (#)				
	Resilience	Road density (length of road / km^2)				
		Vehicle movements (#)				
Maintenance and/or Enhancement of Ecological Services	*Surface water (i.e., quantity, flow and quality)*	Watercourse crossings (#)				
		Watercourse crossing widening (#)				
	Groundwater (i.e., quantity, flow and quality)	Area of hard surface (ha) within sensitive soils				
	Greenbelt Experience	Vehicle movements through a Greenbelt feature (#)				

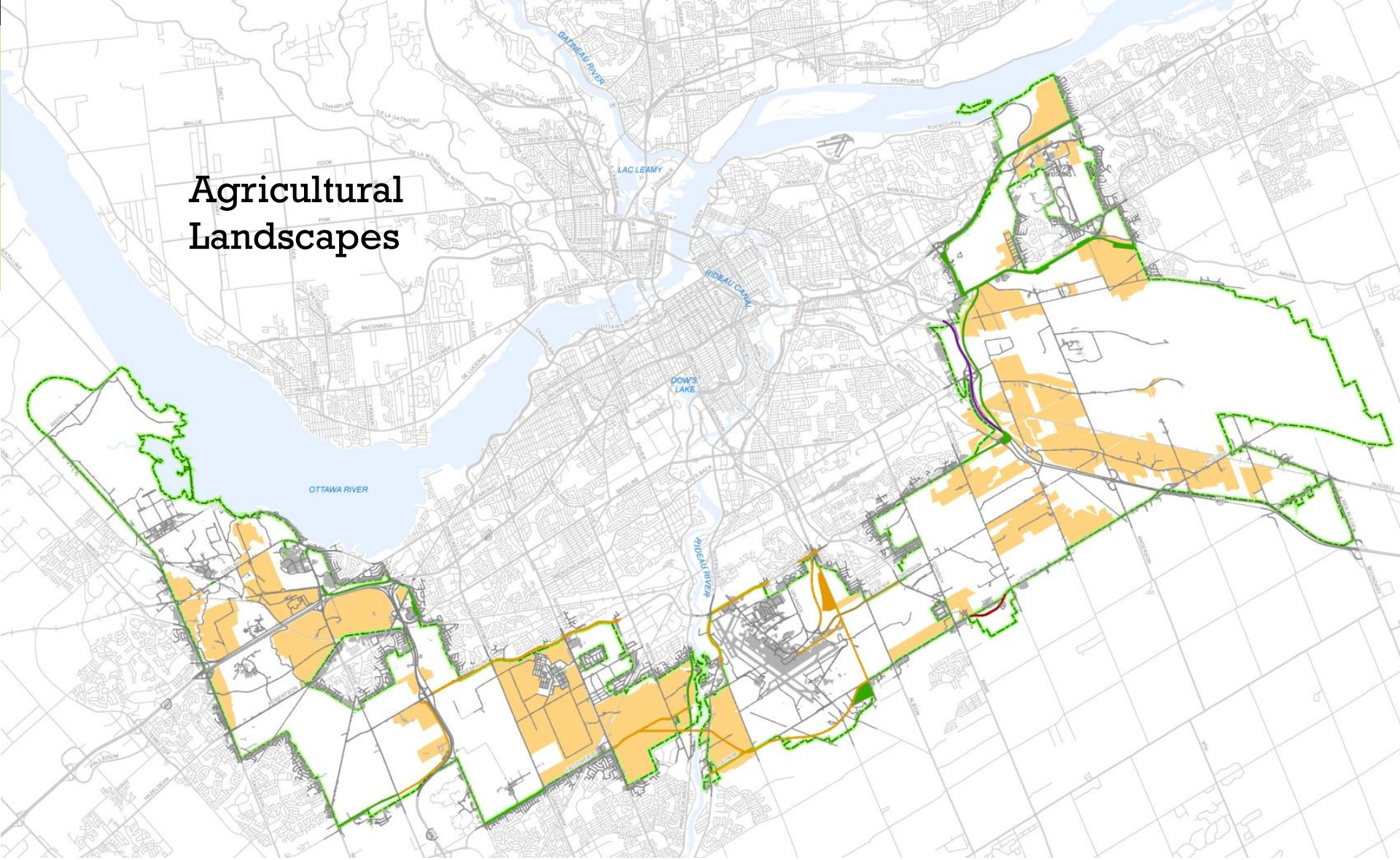
Natural Area Linkages



Supporting Ecological Features



Agricultural Landscapes



CEA Results

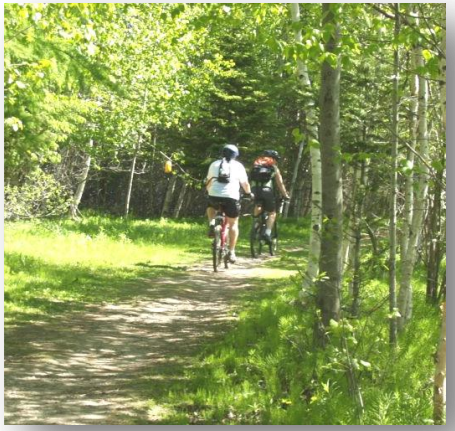
- Following the analysis, transportation infrastructure projects were identified that:
  - have the potential to result in a *direct loss of area within a Core Natural Area*
  - have the potential to result in *new severances to a Natural Area Linkage and/or a connection to a regional corridor*, and/or
  - are considered to be *"high" contributing projects to the overall cumulative effects* on the Greenbelt

Study Findings

- Highlighted cumulative effects:
  - ✓ 35 ha in CNAs (out of 7880 ha)
  - ✓ 102.5 ha in NALs (out of 4470 ha)
  - ✓ 43.2 ha of Supporting Ecological Features (out of 3405 ha)
  - ✓ 47.7 ha of Cultivated Landscape (out of 4410 ha)
- 8 projects have effects in 4 CNAs (Stony Swamp, Greens Creek, Lester Wetland and Black Rapids Creek)
  - ✓ Stony Swamp has greatest potential impacts of the CNAs
- 14 projects have effects in NALs and Greenbelt regional corridors, including 8 projects with new severances

Study Conclusions

- 14 Projects that impact CNAs, NALs or had the largest effect for each measure were assigned as Category 1:
  - ✓ Hunt Club Extension (Hawthorne to 417)
  - ✓ Hunt Club-Innes-Walkley Connection
  - ✓ Prince of Wales Widening
  - ✓ Blackburn Hamlet Bypass Widening
  - ✓ OR 174 Widening
  - ✓ Hope Side Road (Richmond – Moodie)
  - ✓ Hope Side Road (Moodie – Hwy 416)
  - ✓ New Crossing Rideau River (Fallowfield to Leitrim)
  - ✓ Leitrim realignment (South of Airport)
  - ✓ Lester widening (Airport to Bank)
  - ✓ Cumberland Transitway
  - ✓ Leitrim Park & Ride
  - ✓ NS LRT
  - ✓ NS LRT yard
- The 16 other projects were assigned as Category 2



Transportation Rationale & Status

- Review of Category 1 and 2 projects to assess the suitability of the assigned category:
  - ✓ All projects help solve transportation deficiencies to serve projected population and employment growth to 2031
  - ✓ South, East and West Urban Communities outside the Greenbelt are growing
  - ✓ Transit projects alone will not be adequate
  - ✓ Some projects are expected to be contained within their existing right-of-way
  - ✓ EAs have been completed for some projects, and have agreed on the requirements for the projects to proceed

Study Recommendations

1. NCC to list all TMP transp. projects in GBMP, identifying Category 1 and 2 projects
2. NCC and City to review/revise the categories resulting from the GIS analysis
3. For final Category 1 projects, City and NCC to develop strategies to avoid/minimize cumulative effects based on a set of guiding principles:
   - Promote environmentally-friendly road routing, design and operation; explicitly consider contributions to transportation needs, the economy, human health and quality of life as well as the City's sustainability and affordability framework
   - Prevent fragmentation and improve landscape connectivity. Fully consider Greenbelt landscape connectivity during transportation infrastructure planning
   - Follow the precautionary principle. Demonstrate that functional connectivity is maintained during EA studies with realistic mitigation measures. Consider avoidance, minimization, and compensation in a priority order for mitigation
   - Compensate for residual effects, ideally in or adjacent to the affected area. Focus restoration on the same ecosystem type. Verify the effectiveness of mitigation measures through post project monitoring
   - Encourage cross-disciplinary dialogue to raise mutual awareness of each other's expertise, needs and challenges
4. City and NCC to develop/use the current GIS-based cumulative effects analysis tool

Memorandum of Understanding

- Based on the Memorandum of Understanding prepared between the City and the NCC, five Category 1 projects were identified as not acceptable as currently defined and requiring special avoidance measures such as realignment or relocation:
  - Hope Side Road extension (Richmond Road to Moodie Drive and
  - Hope Side Road extension (Moodie Drive to West Hunt Club at Hwy 416)
  - Leitrim Road realignment south of the airport
  - Leitrim Road Park and Ride lot
  - NS LRT Maintenance and Storage Yard
- Example: Richmond Road/West Hunt Club Road widenings (to be included in the NCC's Greenbelt Master Plan) could replace Hope Side Road projects.

CE Assessment Approach Benefits

- Collaborative planning approach between NCC and City.
- Reasonable avoidance and minimization of impacts.
- Engagement of project stakeholders in planning process.
- Building common priority set of values.
- Effective GIS tool for data management and analysis.
- Supports NCC and City goals for sustainable and responsible land use and transportation planning.
- Improved environmental and transportation outcomes.

Lessons Learned

- This study set a new precedent for working as a group on transportation issues in the Greenbelt. Provided parties with new understanding and perspective on unintended consequences and challenges.
- The City and the NCC worked together, considering input from other stakeholders to develop the framework marrying transportation planning and nature conservation planning
- Need to disseminate knowledge and understanding of the study results and tool so that City and NCC staff recognize when a proposed project is not included in the current list and when the data and tool should be updated
- GIS layers need updating to accurately reflect existing and proposed conditions. Data needs to be provided to the keeper of the GIS tool.

Questions?