Algonquins of Ontario | TAGGART GROUP OF COMPANIES | CAIVAN COMMUNITIES

TEWIN

Environmental Management Plan

Version: 20260415

April 2026

Submitted for City and Agency review

LAND ACKNOWLEDGMENT

Tewin is located on the ancestral and unceded territory of the Anishinabe Algonquin Nation. Algonquin peoples have lived on and cared for this land since time immemorial and continue to do so today.

The name “Tewin,” meaning “home” in the Algonquin language, reflects this deep and ongoing connection.

This land holds stories, responsibilities, and relationships that remain central to Algonquin life and identity.

The planning and design of Tewin have been guided by the knowledge, perspectives, and teachings shared by Algonquin community members and traditional knowledge keepers. Their contributions have shaped how the land is understood, honoured, and integrated into the vision for Tewin.

This acknowledgement reflects a lasting commitment to honouring Algonquin presence in Tewin - now and for generations to come.

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1 Introduction and Background

1.1 A Brief Description of Tewin

Tewin is planned to be a community in southeast Ottawa of approximately 40,000 plus people and thousands of job opportunities. It will be more compact and dense development than existing Ottawa suburbs, integrating new urban neighbourhoods with valuable natural spaces. Tewin aims to be an inclusive community, rooted in Algonquin wisdom and place keeping principles, and welcoming to all. The community will feature a diverse mix of land uses and promote active mobility, creating a complete, future-ready environment. The overall gross area for the area labelled as 'Tewin Secondary Plan Developable Area' on the map below and Schedule C17 is approximately 838 ha. The Tewin Project Team and the City of Ottawa have committed to exploring suitable

options, alternatives, and standards to enable Tewin to become a model of best practices in sustainable and inclusive community design in the North American context.

1.2 Purpose of the EMP

Community Design Plan (CDP): This Environmental Management Plan has been prepared as a component of the Community Design Plan and ultimate Secondary Plan for the Tewin Lands. The CDP will establish a community-wide land-use framework for the Tewin Lands that reflects the principles, objectives and policies for community development as directed by the Official Plan. The purpose of a CDP is to provide a level of direction between Official Plan policy and future development approval that will be considered under the Planning Act to enable development to occur incrementally over time in an optimum and coordinated manner. The CDP sets the overall vision, land use plan context and implementation guidelines as a guide to the preparation and review of future applications for development.

Environmental Management Plan (EMP): The purpose of the Environmental Management Plan is to provide information on the existing natural features, resources and infrastructure within and related to the Study Area, to use that information to (in no specific order of priority):

- Identify and avoid or mitigate natural hazards and manage risks;
- Ensure natural features and functions are protected from the potential effects of development and associated infrastructure;
- Establish considerations for development of the Community Design Plan;
- Contribute to the evaluation of different infrastructure options for the proposed community, considering the integrity and sustainability of natural features and functions;
- Determine if any watershed boundaries would benefit from adjustments;
- Identify opportunities to protect, enhance, or restore the natural features and functions that make up the natural system on and adjacent to the site.
- Ensure the stormwater management strategy allows for future innovation, considers climate change, and supports the long-term sustainability of the natural system.
- Establish the approval process and requirement for subsequent Planning Act approvals.

The Tewin Environmental Management Plan has been oriented as an objective-based plan. Its primary objective is to identify, evaluate, and mitigate the potential impacts of development on the natural environment and its ecological functions at the local planning stage.

The EMP considers how the Tewin Lands function in the broader natural heritage context and provides area-specific direction to support a sustainable natural heritage system and restore natural heritage elements on the site. It also addresses upstream and downstream areas where natural hazards or drainage need require consideration.

The EMP lays out the foundation for the future neighbourhood by defining the development constraints and limits, drainage patterns, and establishing mitigation recommendations, and measures for subsequent stages of the development.

The MSS incorporates the findings of the EMP to evaluate alternative solutions and infrastructure alignments. The MSS presents a preferred servicing infrastructure strategy and outlines future requirements for permitting.

The Tewin EMP has been prepared in accordance with the targeted outcomes established by the Tewin Intent (TI), One Planet Living (OPL) framework, the Official Plan (OP), and will be required as part of future development application processes to respond to any new information brought forth through other studies during the long term build out of the development lands.

1.3 What Makes Tewin Different

Size: The Community Design plan will cover all the Tewin Study Area which is approximately 838 gross hectares as mapped in the Official Plan and is generally bordered by Leitrim Road to the north, Farmers Way to the east, Thunder Road to the south, and Anderson Road and Ramsayville Road to the west. Within the Secondary Plan, Tewin has a net developable area of 445.35 hectares. As shown in **Figure 1**, existing land use is predominantly designated as Rural Countryside, Parks and Open Space, with small areas of Rural Residential. Based on the size and scale of Tewin, it will be built out in phases, over decades.

Building from the ground up: Tewin is not an expansion area growing out from the edge of existing suburbia. Rather, Tewin benefits from the strong transportation links at the Highway 417 and the Anderson Road, and Boundary Road interchanges. The land has evolved from a natural landscape cared for by Indigenous peoples, through early immigrant settler agricultural activities to a rural area with local rural landowners, and surrounding undeveloped areas, some of which are re-naturalizing landscape.

The Tewin Intent: The Algonquins of Ontario are major landowners within the transformational Tewin project. The foundation is therefore anchored in Algonquin values and wisdom and the 'Tewin Intent' has been established to set out strategic intentions to plan, design and develop the Tewin community differently than any of the other new Ottawa communities to date. The 'Tewin Intent' is presented in the introductions to the Existing Conditions Reports. The CDP elaborates on the principles of the Tewin Intent and describes how it has been implemented throughout the Plan.

One Planet Living: The One Planet Living framework is a globally recognized sustainability framework which seeks to deliver comprehensive and embedded sustainability and resilience. One Planet Living is a vision of a world where all people live happy and healthy lives within the ecological limits of our one planet. Comprised of 10 holistic principles that address all aspects of environmental, social and economic sustainability, the One Planet Living framework is well aligned with Algonquin values, teachings and aspirations.

The One Planet Living framework is being used to plan and communicate sustainability initiatives at Tewin that span from early community design choices, such as "sustainable by design" principles elaborated on in the CDP to building materials and energy supply and use that will be explored and detailed as the community advances towards future development applications.

1.4 How this EMP was Built

The EMP was formulated based on input through public and working group consultation, discussions with municipal and Conservation Authority staff, and the development of existing conditions technical reports prepared by a range of specialized consultants who have been studying the physical environment and collecting and analysing existing data on the Tewin Lands to best support community design, servicing strategies and the future development of Tewin. A series of technical Existing Conditions Reports (ECRs) were prepared early in the study process to identify key constraints and opportunities based on detailed information about the physical, social, and environmental conditions of the lands. These studies are included in Appendix I and E:

- Existing Conditions and Preliminary Opportunities Summary Report, December 2024 (Urban Strategies)
- Natural Heritage ECR, April 2024 (Kilgour & Associates)
- Water Budget Analysis ECR, October 2024 (JFSA Canada Inc.)
- Feature Specific Water Budget Analysis ECR, June 2025 (JFSA Canada Inc.)
- Cumulative Hydrologic Impact Assessment ECR, April 2024 (JFSA Canada Inc.)
- Tewin Field Monitoring Report, April 2025 (JFSA Canada Inc.)
- Bear Brook and Ramsay Creek Fluvial Geomorphology Study ECR, December 2024 (GEO Morphix)
- Background Review and Drainage Characterization of Ramsay Creek, April 2025 (GEO Morphix)
- Hydrogeological Study ECR, March 2025 (Dillon Consulting)
- Geotechnical Study ECR, September 2024 (Paterson Group)

Additional studies have been undertaken to inform proposed condition design considerations. These studies are included in the Appendices E, F & H and include:

- Post-Development Water Budget Analysis, July 2025 (JFSA Canada Inc.)
- Tewin and Mer Blue Bog, February 2022, (JFSA Canada Inc.)
- Updated Tewin and South Bear Brook Provincially Significant Wetlands, March 2026 (JFSA Canada Inc.)
- Review of Hydrogeological Conditions – Proposed Tewin Development, Mer Bleue Bog, and South Bear Brook Wetland, March 2025 (Dillon Consulting)
- Updated Bear Brook Erosion Threshold and Exceedance Assessment, March 2026 (GEO Morphix)
- Updated Ramsay Creek Erosion Threshold and Exceedance Assessment, March 2026 (GEO Morphix)
- Updated Post-Development Ground Water Model Results, March 2026 (Dillon Consulting)
- Tree Canopy Coverage Memo, March 2026 (NAK Design Strategies)
- Ramsay Creek Preliminary SWM Design, March 2026 (JFSA Canada Inc.)
- Groundwater Monitoring Program 2025, March 2026 (Dillon Consulting)
- Bear Brook Climate Change / Stress Test Assessment Memo, March 2026 (GEO Morphix)

- Ramsay Creek Climate Change / Stress Test Assessment Memo, March 2026 (GEO Morphix)
- Bear Brook Continuous Model to Support Downstream Erosion Analysis, April 2026 (JFSA Canada Inc.)
- 350-Year Climate Resilience Post-Development Test, April 2026 (JFSA Canada Inc.)
- Cumulative Impact Assessment of Additional Development Within the Bear Brook Watershed, April 2026 (JFSA Canada Inc.)

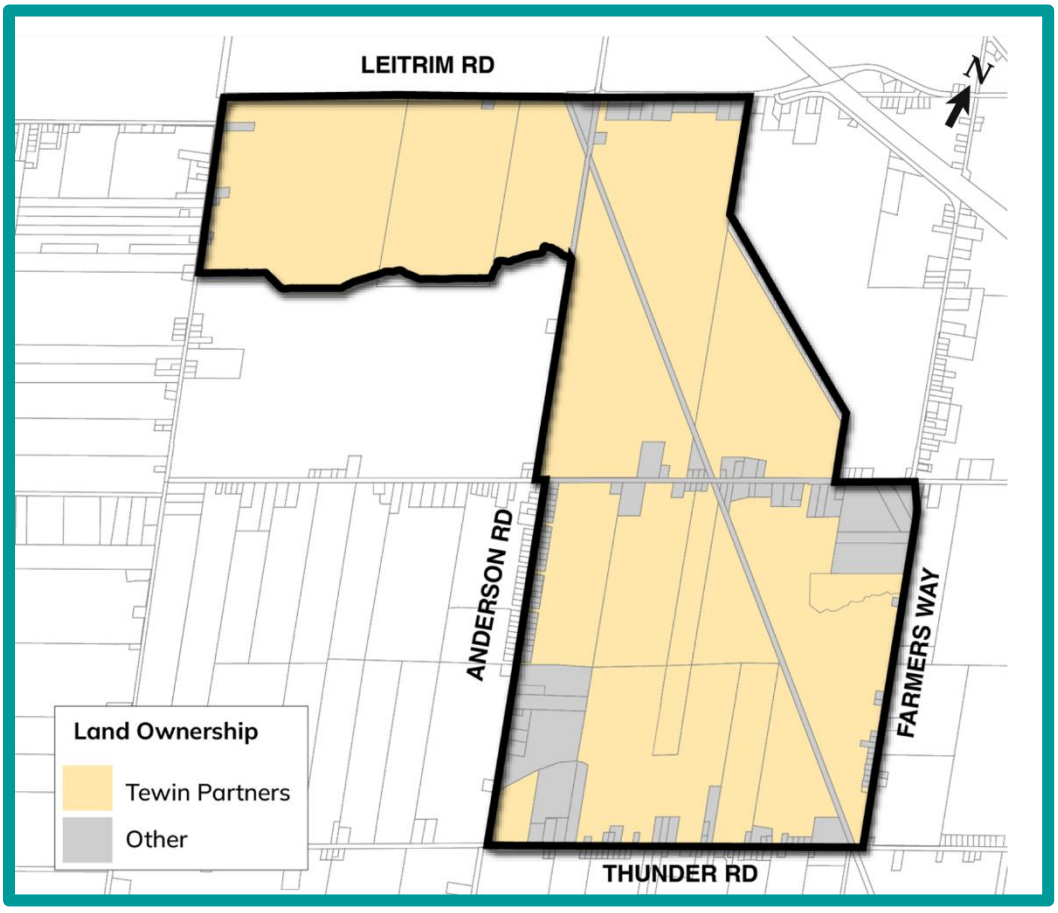
1.5 Public and Technical Consultation

Consultation and engagement have been integrated throughout the Tewin project in a variety of formats, including community open houses, Community Advisory Committee meetings, Environmental Groups meetings, targeted workshops, site visits, and online engagement. The sharing of content for feedback was generally sequenced from internal technical meetings, technical stakeholder agencies, City of Ottawa staff, the Tewin Community Advisory Committee to the broader public at open houses. However, given the integrated planning process, additional targeted stakeholder and meetings with City staff occurred as needed. Details of the consultation process are contained in the Consultation Summary Report, under separate cover. This EMP will form part of the agency and project public record. The EMP will be published as a supporting study to the CDP and future Secondary Plan.

1.6 Landowner Group Participants and Responsibilities

The Tewin proponents consist of the Algonquins of Ontario, Taggart Group, and Caivan. The lands are being studied and planned collectively as a single contiguous area. This removes a layer of complexity and allows for a greater attention to the locational attributes and cross-boundary systems. The technical consultants involved with the project are tasked with studying all lands within the Tewin Lands, including parcels that are not owned by Tewin partners. Lands owned by the Tewin partners are shown in **Figure 1**.

Figure 1: Lands owned by the Tewin Partners in yellow. (source: Urban Strategies)



1.7 Study Area Description

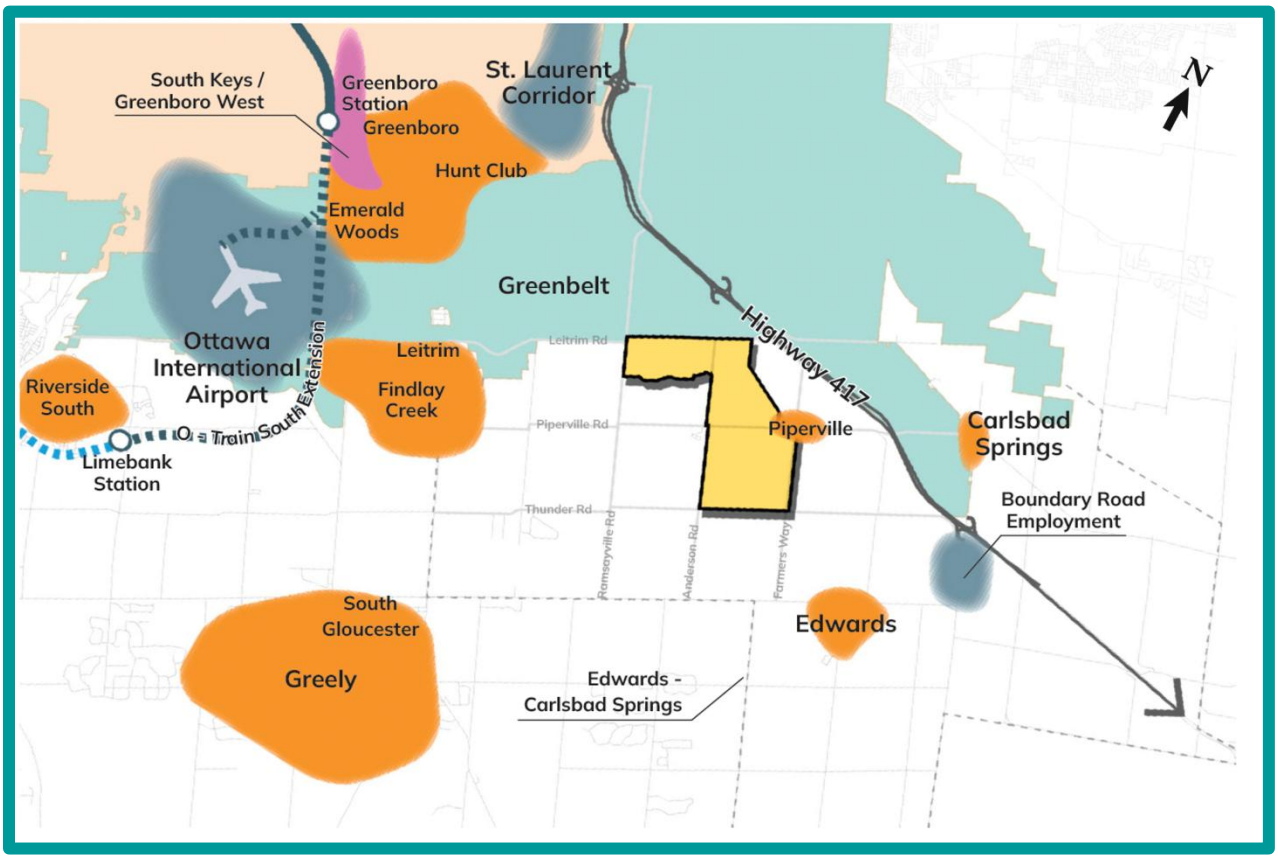
This section provides a general contextual review of the broader study area including lands adjacent to the EMP area as well as a more detailed summary of the conditions within the Tewin development lands.

1.7.1 Major Constructed Features

The Tewin Lands are in southeast Ottawa on the southern side of the Greenbelt near the Highway 417 and Anderson Road interchange. Initially identified in the 1970s as a potential fourth growth area outside of the Greenbelt, in addition to Kanata, Barrhaven and Orleans, the Tewin Lands were more recently defined through preliminary analysis undertaken by the City of Ottawa and subsequently approved by City Council as the preferred location for the new community to be known as Tewin. **Figure 2** illustrates the broader context of the Tewin Lands within southeast Ottawa. The Tewin Lands are bordered by:

- Leitrim Road to the north: undeveloped forested lands, agricultural lands;
- Farmers Way and Highway 417 to the east: undeveloped forested lands, agricultural lands, and rural residential properties;
- Thunder Road to the south: undeveloped forested lands, agricultural lands, and rural residential properties; and,
- Anderson Road, Ramsayville Road to the west: agricultural lands, rural residential properties, and undeveloped forested lands.

Figure 2: Tewin Lands in yellow, shown within the broader southeast Ottawa context (source: Urban Strategies)



The Ottawa Neighbourhood Study (ONS) identifies the Tewin Lands as being within a larger area known as Edwards - Carlsbad Springs that also includes a number of existing communities and villages, including Edwards to the south, Piperville to the east, and Carlsbad Springs further east beyond the 417.

Approximately four kilometres west of the Tewin Lands is the Leitrim community, as well as the newer, growing community of Findlay Creek. In addition to Tewin, future urban expansion areas have been designated in the Official Plan in Leitrim, and Riverside South communities. South of Findlay Creek are the communities of South Gloucester and Greely. North of the Greenbelt are the established neighbourhoods of Hunt Club and Greenboro.

The site is surrounded by a number of existing and emerging employment areas, including the airport to the northwest, the St. Laurent corridor to the north, and the Boundary Road employment area to the east which includes a recently constructed Amazon logistics facility.

Two right-of-way corridors exist within the Tewin Lands, both running in diagonal directions. A decommissioned rail corridor (now Bell corridor) traverses through the middle of the site, while a hydro corridor is located along the eastern edge.

Generally, the existing landscape includes recreation, limited agriculture, rural residential and forested or otherwise natural areas, as well as a golf course, other open spaces, and right-of-way corridors. An overview of the existing land uses is presented in **Figure 3**. There are no lands designated Agricultural Resource Area within the Study Area. This area avoids the large Natural Heritage System Core Area as identified in the OP, to the east of the Tewin Lands, shown in **Figure 4**.

Much of the lands are undeveloped today, although there are clusters of residential properties, businesses and services located primarily along the main corridors. Many of these existing residential and commercial uses are associated with the Piperville community.

Figure 3: Existing Land Uses (source: Urban Strategies)

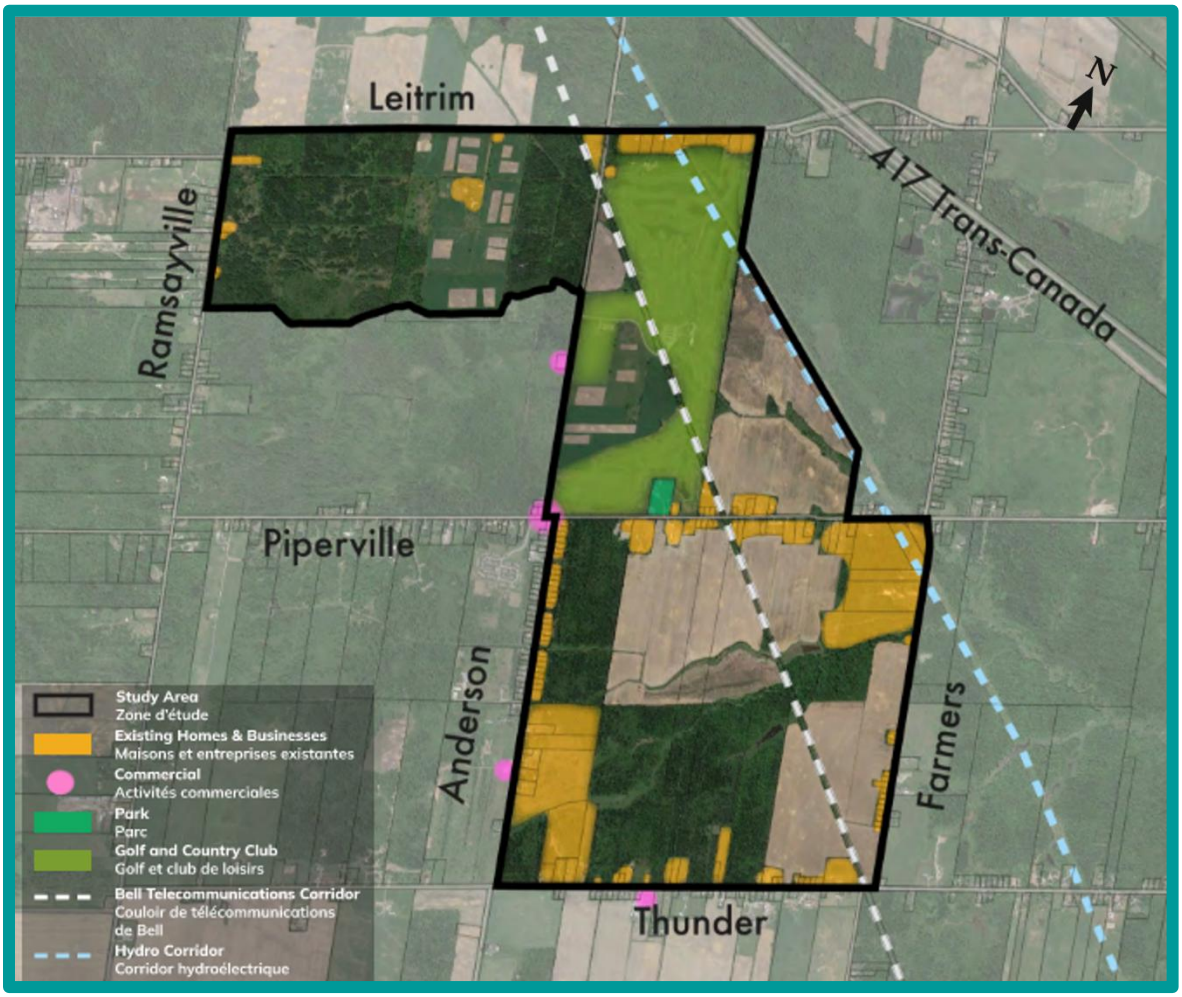
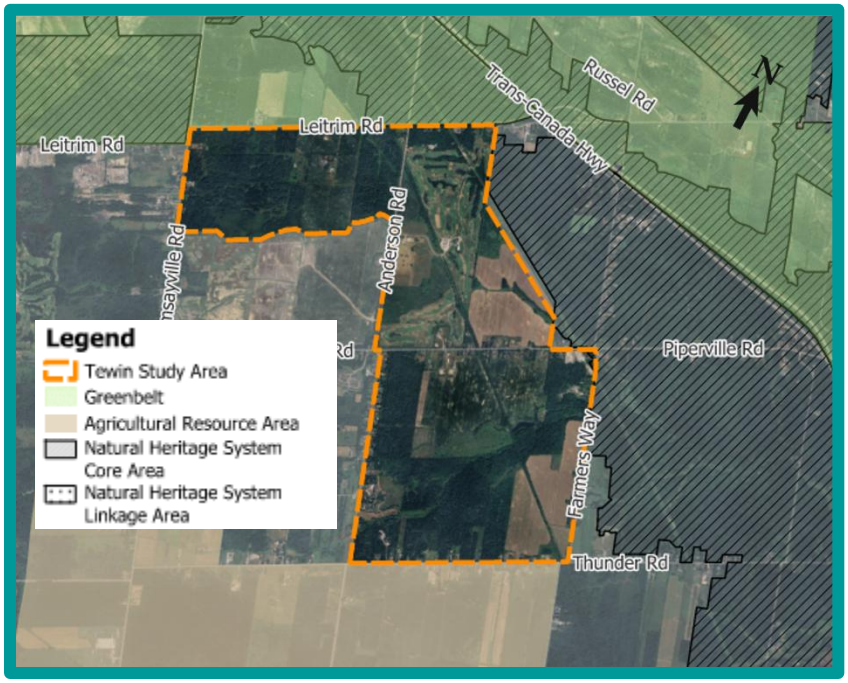


Figure 4: Relationship to Natural System Core Area (source: Urban Strategies)



1.7.2 Natural Heritage Features

The Tewin Lands are characterized primarily by forested areas, agricultural fields, areas of wetland cover, and a golf course, with some rural residential and commercial properties around the periphery. The area falls within the Bear Brook and Ramsay Creek subwatersheds and contains wetlands, municipal drains, and areas of floodplain. A detailed review of natural features and species is provided in the Existing Conditions Section 3.

Per the 2022 City of Ottawa Official Plan definitions, the following elements are considered natural heritage features:

a) Significant Wetlands;
b) Habitat for endangered and threatened species (Species at Risk);
c) Significant Woodlands;
d) Significant Valleylands
e) Significant Wildlife Habitat;
f) Areas of Natural and Scientific Interest (ANSI);
g) Urban Natural Features (UNF);
h) Natural Environment Areas (NEA);
i) Natural Linkage Features and Corridors;
j) Groundwater Features;
k) Surface Water Features (including fish habitat); and
l) Landform Features.

The classification/identification of the remainder of these natural heritage features is based, in large part, on the consideration of land cover. Within Tewin, 38 distinct Ecological Land Classification (ELC) units (ecosites, vegetation types, or other) encompassing both terrestrial (upland) and wetland communities have been identified within the Tewin Lands. Twenty-five of these ELC units are terrestrial and thirteen are wetland classifications. Some terrestrial ecosites, however, were more accurately characterized as "transitional", rather than being fully described as either terrestrial or wetland. These were primarily tree plantations that were naturalizing towards a wetland state.

1.7.2.1 Provincially Significant Wetland

The Tewin Lands include areas of wetlands, including treed swamps, thicket swamps, and marshes. While no wetland features on or directly adjacent to the site constitute Provincially Significant Wetland, the South Bear Brook Wetland (east of the Tewin Lands) has recently been evaluated by the City of Ottawa and found to be significant. The western boundary of the South Bear Brook PSW is located ~ 500m east (and downstream) of the Tewin Lands.

1.7.2.2 Species at Risk

Six listed species at risk (SAR) birds were detected during morning surveys. Eastern Wood-pewee is relatively widespread across suitable habitats in the Tewin Lands. Bobolink and Eastern Meadowlark were observed on the golf course and the adjacent farm field. Wood Thrush was detected in the forest along the southern edge of the Tewin Lands. Grasshopper Sparrow was also relatively rare within the area, with a single observation on the golf course. Barn Swallow was consistently observed over the farm field east of the golf course, though this species was recently downlisted from Threatened to Special Concern under the Endangered Species Act.

A total of four anuran species, none classified as Species at Risk, were observed during evening aural surveys.

Fish community assessments on Bear Brook that were conducted in 2022, and previously, by the South Nation Conservation Authority, found no invasive fish species nor fish species that are currently listed under the *Endangered Species Act* or the *Species at Risk Act*. Only one "sport fish" species (Rock Bass) was captured within or downstream of the Tewin Lands. No invasive fish species or fish species that are currently listed under the *Endangered Species Act* or the *Species At Risk Act* have been observed in Ramsay Creek. White Suckers were the only "sport fish" captured.

In consideration of listed plant species, several small clusters of Black Ash do occur across the Tewin site, but no Butternuts have been detected to date. The forest types present in the area would not generally be supportive of American Ginseng.

1.7.2.3 Significant Woodland

For Significant Woodland, the 2022 City of Ottawa Official Plan designates woodland areas 0.8 ha in size or larger that are 60 years of age and older at the time of evaluation as significant. While forest cover across most of the Tewin Lands generally consists of early successional regrown or plantations on former agricultural areas, ten features ranging in size from 0.83 ha to 10.35 ha are more than 60 years old.

1.7.2.4 Significant Wildlife Habitats

Across the Tewin Lands, various ecosite or land cover elements/features meet the definition of "candidate" significant wildlife habitat.

Three potential habitats meet the MNRF's criteria for "confirmed" SWH, based on the results of the 2022 field studies, including:

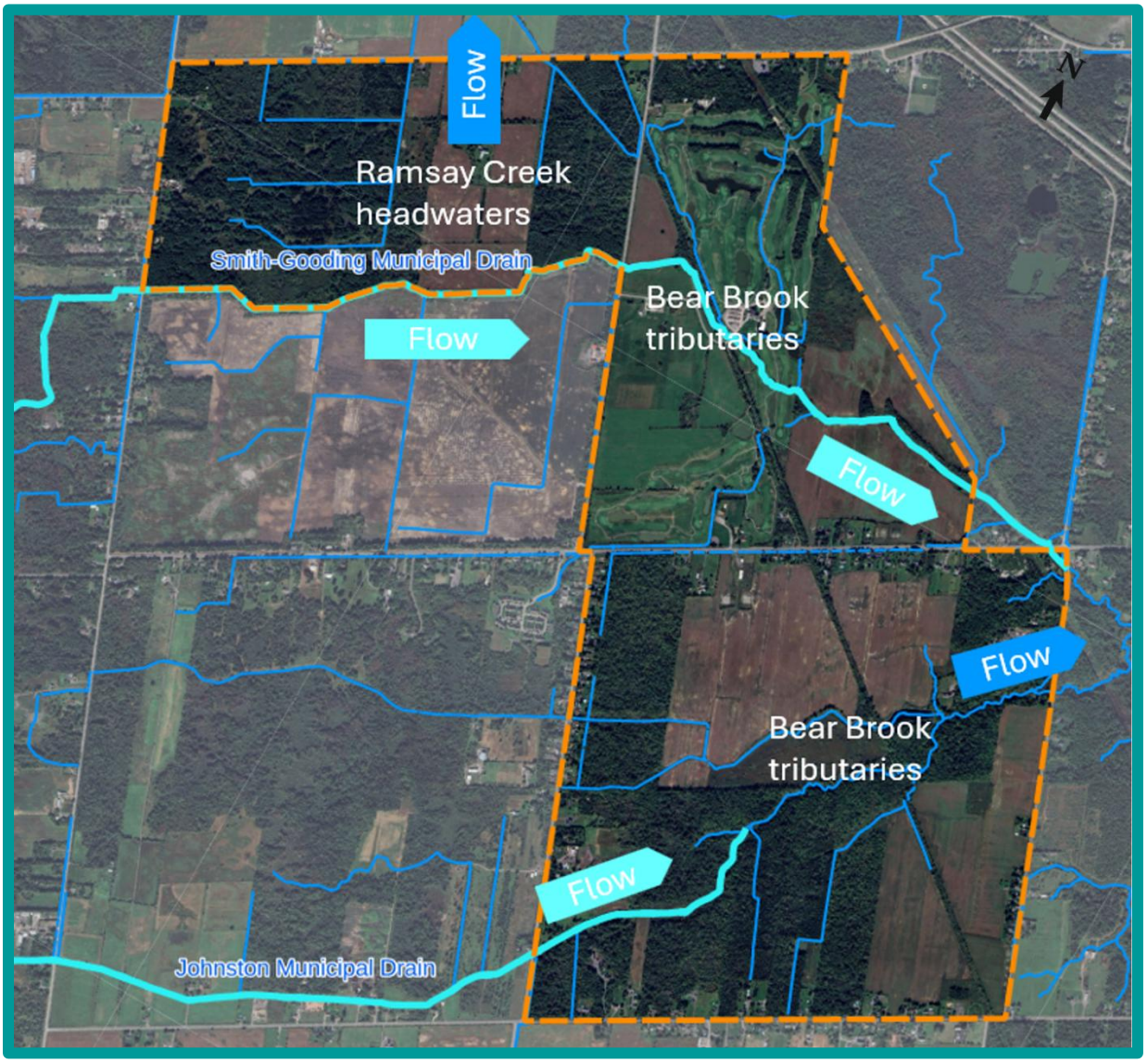
- A single wetland feature at the south end of the site as:
    - Wetland Amphibian Breeding Habitats
- Forested areas across the site broadly as:
    - Woodland Area-sensitive Breeding Bird Habitat
    - Areas for Special Concern and Rare Wildlife Species.

Forested ecosites on Tewin have some potential to support (are candidate) significant wildlife habitat. Waterfowl nesting areas would be limited to Municipal Drains and Natural Creeks on Tewin. These same water courses, plus the largest former farm ditches in the northwest corner of the site (but only when blocked by beaver dams), provide potential as the Turtle Overwintering Areas or Amphibian Movement Corridors. Turtle Nesting Area potential could arise in any open area on site but would generally be expected to be associated with open banks adjacent to the Municipal Drains and Natural Creeks.

1.7.2.5 Surface Water Features

The City of Ottawa defines Surface Water Features as including headwater drainage features, rivers, stream channels, drains, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands and associated riparian land. Within the Tewin area, surface water features include the uppermost reach of Ramsay Creek and sections of two municipal drains (Smith-Gooding Drain and Johnston Drain) that are tributaries to Bear Brook (as shown in **Figure 5**). A limited number of small natural watercourses serve as minor tributaries to the municipal drain on Tewin Lands east of Anderson Road. West of Anderson Road, however, i.e., in the northwest corner of Tewin, all watercourses other than the major drains or creeks are fully linearized, low-order, former farm drains or are erosion gullies adjacent to the former farm ditches. The linearized farm ditches were most likely dug to aid in drainage to support agricultural activity.

Figure 5: Existing Mapped Watercourses and Municipal Drains



1.7.2.6 Fish Habitat

Direct fish habitat identified within the Tewin area is limited to the major drains or creeks, and former farm ditches in the northwest site corner within which beaver dams led to water retention through the summer. Immediately downstream of these beaver-dammed reaches, however, i.e. on the north side of Leitrim Road, the channels were observed to fully dry by early spring and thus did not support fish communities.

1.7.3 Natural Hazards

1.7.3.1 Ramsay Creek floodplain mapping 100 & 350-year Flood

The Rideau Valley Conservation Authority (RVCA) is responsible for conducting hazard mapping studies on watercourses within the City of Ottawa and the RVCA area of jurisdiction. RVCA has acknowledged that in accordance with standard floodplain mapping studies and practices, the small catchment areas of the Ramsay Creek tributaries on the Tewin Lands would not merit inclusion in such an exercise. As such, no floodplains are associated with tributaries in the Ramsay Creek catchment area of Tewin.

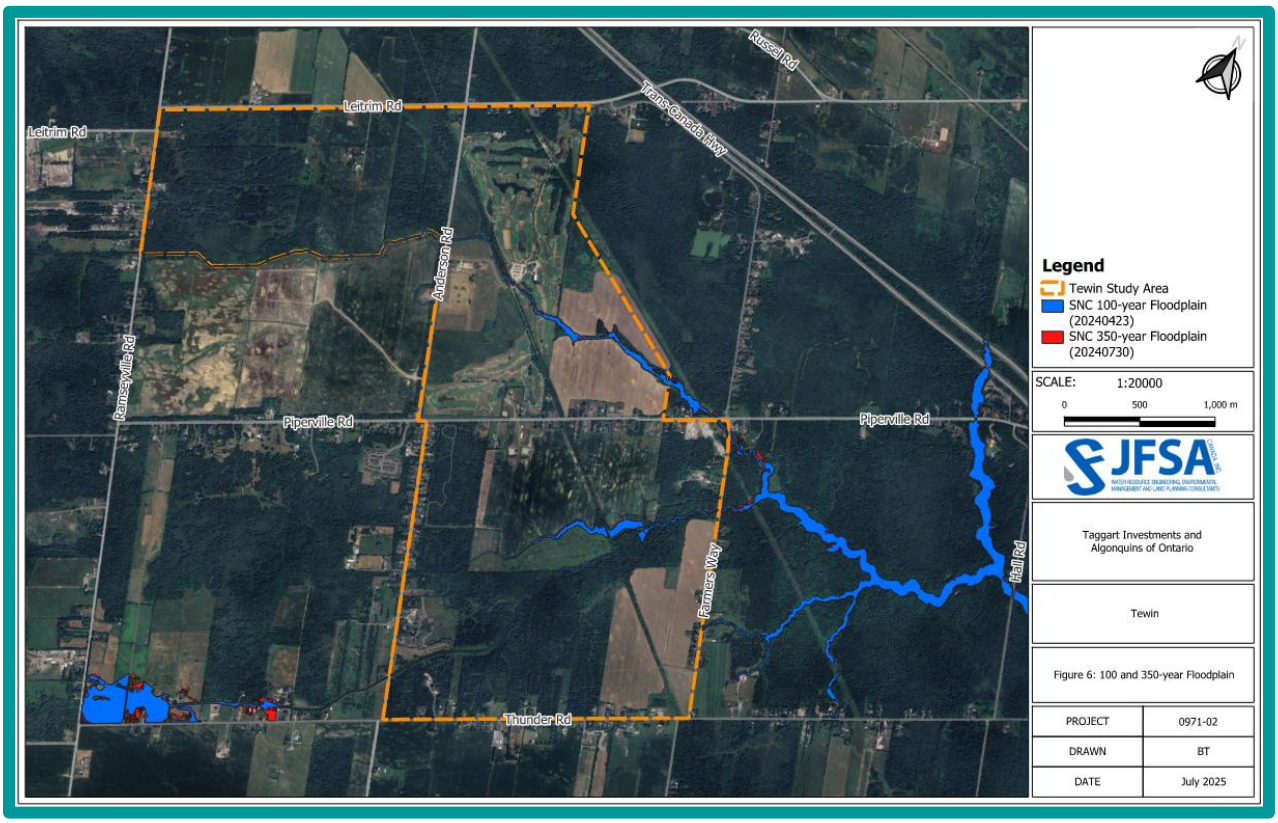
1.7.3.2 Bear Brook floodplain mapping 100 & 350-year flood

The Bear Brook floodplain was mapped in 2023 by South Nation Conservation in partnership with the City of Ottawa as part of an on-going floodplain mapping update program. Models and analysis developed by the Conservation Authority for regulatory 1:100-year floodplain mapping were prepared in accordance with provincial technical guidelines. These same models were used to generate the 1-in-350-year flood elevations, and the corresponding flood limits are mapped using detailed topographic data. The model was updated by SNC in 2025; however, no new floodplain mapping was undertaken.

Within the Tewin Lands, the variation between the 100-year flood plain and 350-year flood plain is quite minimal and is mostly consolidated along the Bear Brook where it passes through the Anderson Links golf course. Outside of the Tewin Lands, the 350-year floodplain extent is notably larger near the intersection of Ramsayville Road and Thunder Road. The floodplain extents near the intersection of Farmers Way and Piperville Road are also expanded slightly.

The floodplain is generally contained in channel throughout the Tewin Lands and presents limited constraints to the development area. The 100 and 350-year floodplain extents are shown in **Figure 6**.

Figure 6: 100 and 350-year Flood Plain



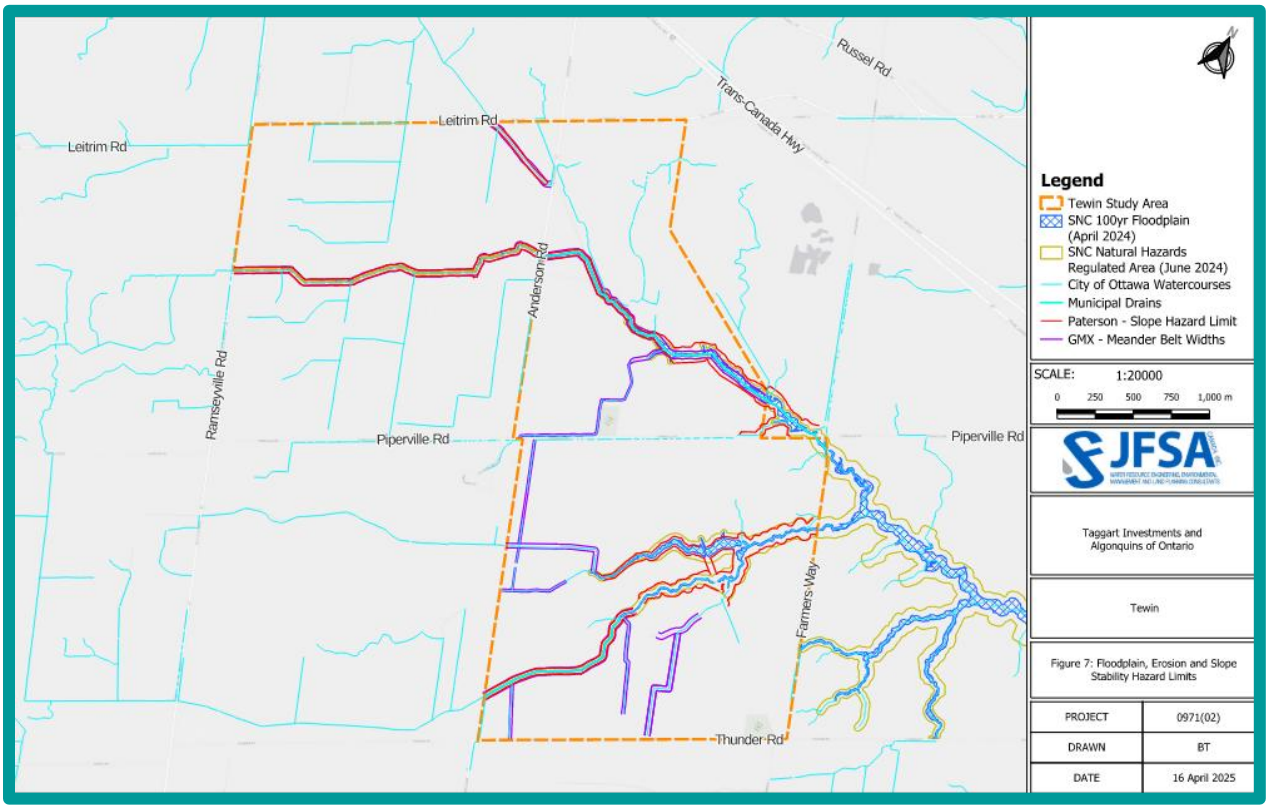
1.7.3.3 Geotechnical slope stability and meander belt width

Extensive survey work was undertaken along the watercourse corridors of the Tewin Lands to map the extent of stable slope and meander belt widths and identify the dominant hazard setbacks, as shown in **Figure 7**. Generally, where the watercourse slopes were identified to form unconfined systems, the erosion hazard limit and or the meander belt width dominates, whereas where the system is confined (incised and contained by higher slopes), the stable slope is the primary setback limit. These hazard lands shall be encompassed within the undeveloped ecological corridor of Tewin.

1.7.3.4 Landslides

Based on the preliminary landslide review undertaken as part of the site-specific geotechnical assessment undertaken for the Tewin Lands, no triggering retrogressive landslide risk concerns were identified.

Figure 7: Flood Plain, Erosion and Slope Stability Hazard Limits

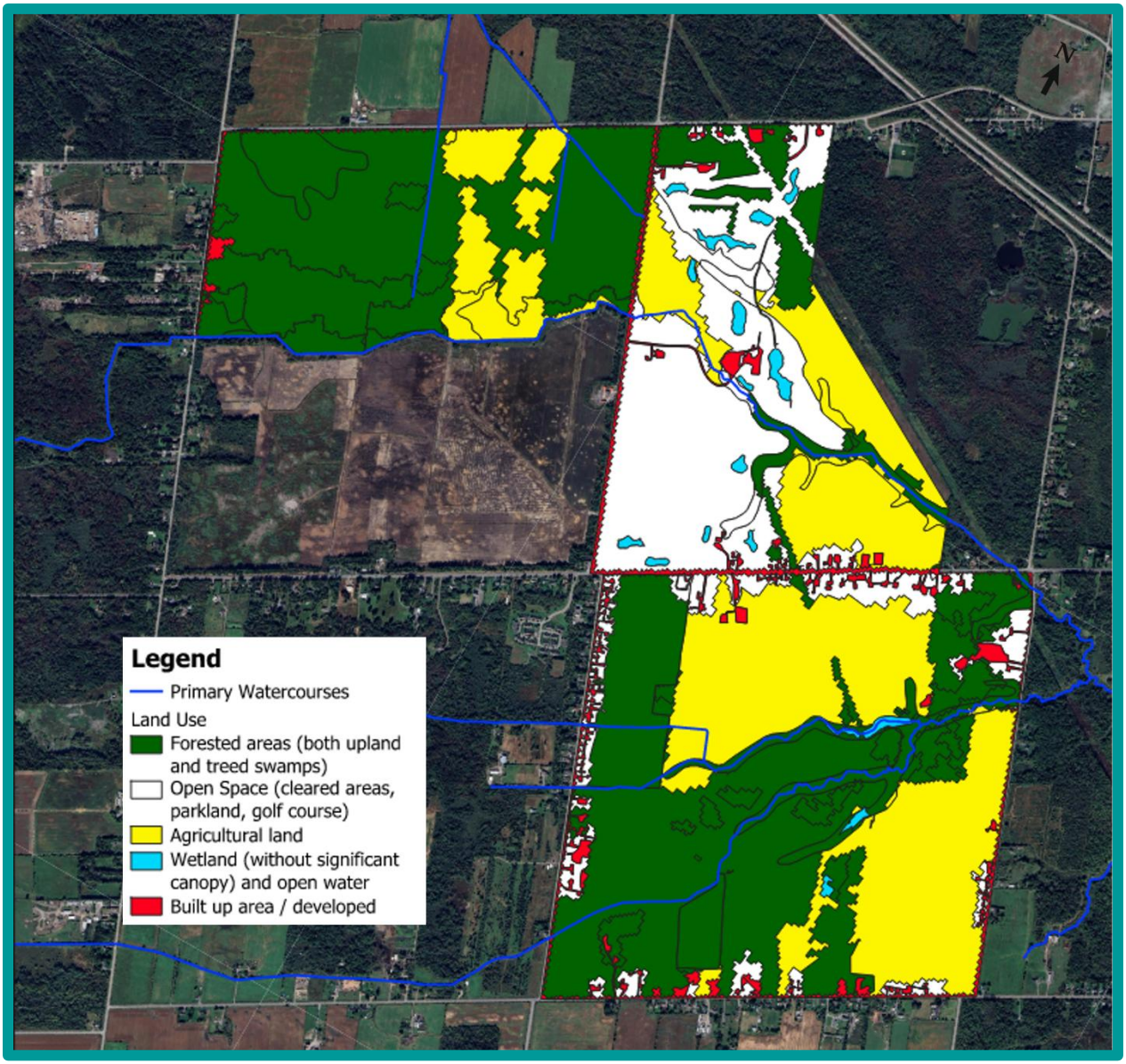


1.7.4 Existing Land Cover

Figure 8 Illustrates the existing land cover. General land cover within the Tewin Lands is divided between:

- Forested Areas (both upland and treed swamps): 47%
- Open Space (residential cleared areas, parkland and golf course): 19%
- Agricultural Land: 29%
- Wetland (without significant canopy) and watercourses: 1%
- Built up / Developed: 4%

Figure 8: Existing Land Cover



1.7.5 Historical Land Uses and Anthropogenic Activity.

There is extensive Indigenous history in the Ottawa Valley region. Early settlement in the Ottawa Valley likely occurred during the recession of the Champlain Sea when vegetation and wildlife began to develop. Human occupation is documented in the Ottawa Valley due to archaeological discoveries, identifying hunter-gatherer inhabitants during the Archaic Period. The Algonquins have had historical hunting territories in the Ottawa Valley until Euro-Canadian encroachment and settlement with the increase of lumbering. Historical research indicates that the existing watercourses of Ramsay Creek and Bear Brook which pass through the site were likely altered for agricultural purposes during the 19th Century as Euro-Canadians deforested and drained the land.

Between 1976 and 1991, land use remained predominantly agricultural, many previously cultivated fields surrounding the site also transitioned to treed areas. In the early 2000's, a major area change came from the development of Anderson Links Golf Course located on previously farmed land in the northeastern corner of the site. A series of constructed ponds were incorporated with the Bear Brook subwatershed area, and some larger beaver ponds resulted in changes in channel planform due to backwatering. Aside from the golf course, there was little change to the site between 1999 and today.

2 Policy, Planning and Technical Documents

Review of applicable policy documents and plans

At the time this EMP was prepared, the 2024 Provincial Planning Statement and 2022 City of Ottawa Official Plan were the governing documents. An overview of these policies is provided below, with additional policy analysis presented in ***Appendix B***. Due to the long build-out and phasing expected in the Tewin lands, these are expected to evolve over time and are not provided in detail.

2.1 Algonquin Values

As major landowners, the Algonquins of Ontario (AOO) are an essential partner in the Tewin project. AOO values, teachings and design principles underpin the planning and community design of Tewin. Guided by Algonquin teachings and values, Tewin will be a place that is inclusive, healthy, respectful, sustainable and connected to the earth.

Early engagement with AOO leaders and knowledge keepers included a Site Visit and Talking Circle in September 2022. Several key ideas for community design arose from these discussions, including strengthening the Algonquin identity and presence through cultural representation, economic opportunity and partnerships; focusing on natural systems and integrated and holistic solutions to address planning, infrastructure and sustainability challenges; and weaving water throughout the community to encourage stewardship, relationships with the natural environment, and sustainable stormwater management.

Based on the site visit and Talking Circle, and through ongoing dialogue and discussions, the following six AOO priorities and objectives have been identified for Tewin:

1. Conservation and Access to Nature
   - Conserve and enhance valuable landscapes
   - Provide natural areas for kids to play and learn
   - Integrate educational opportunities
2. Green Space Connectivity
   - Incorporate trails into the natural system
   - Provide opportunities to connect the Tewin open space network to the Greenbelt
3. Water
   - Weave water throughout the community
   - Showcase water and its natural systems
4. Trees, Plants and Species
   - Plant for succession over seven generations
   - Move away from overly manicured spaces
5. Sustainable and Integrated Development
   - Focus on natural systems rather than individual features
   - Integrate a holistic approach to development
6. Reconciliation, Healing and Inclusiveness
   - Strengthen the Algonquin identity and presence
   - Design the community so that it is open and hospitable to all

- Include places for ceremony and healing

2.2 Provincial Planning Statement

At the time this EMP was prepared, the 2024 Provincial Planning Statement was the governing document. An overview of this policy is provided below, with additional policy analysis presented in ***Appendix B***. Due to the long build-out and phasing expected in the Tewin lands, these are expected to evolve over time and are not provided in detail.

The 2024 Provincial Policy Statement (PPS) provides policy direction on land planning and development matters of provincial interest. Authority of the PPS comes from Section 2 of the Planning Act. All decisions affecting planning matters within the Province of Ontario are required to be "consistent with" policies from the PPS, such as:

- building more housing where it's needed
- making land available for development
- creating opportunities for economic development and job creation
- planning for the appropriate transportation, water, sewer and other infrastructure necessary to accommodate current and future needs
- protecting the environment and important resources including farmland, water, archaeology, cultural heritage, mineral aggregates and petroleum
- engaging with Indigenous communities to facilitate knowledge-sharing, inform decision-making in land use planning and protect Aboriginal and treaty rights
- protecting people, property and community resources by directing development away from natural or human-made hazards, such as flood prone areas

2.3 City of Ottawa Official Plan

The City of Ottawa Official Plan provides the City's visions and objectives for urban growth to the year 2046 and outlines the policies to implement them. At the time this EMP was prepared, the 2022 City of Ottawa Official Plan was the governing documents. An overview of the policies is provided below, with additional policy analysis presented in ***Appendix B***. Due to the long build-out and phasing expected in the Tewin lands, these are expected to evolve over time and are not provided in detail.

The Official Plan identifies five key objectives, known as the Big Moves, to guide the City's strategic directions relating to growth, mobility, urban design, resiliency and the economy. A portion of growth is planned as intensification and a portion as greenfield, like Tewin, carefully balancing land consumption with housing needs. To ensure that growth remains environmentally sustainable, environmental, climate and health resiliency and energy are embedded into the City's planning framework.

2.3.1 Section 3 – Growth Management Framework

Section 3 – Growth Management Framework – outlines the projected growth in the City and the framework to manage this growth with a focus on designated urban areas and villages.

2.3.2 Section 4- City Wide Policies

Section 4 – City Wide Policies – describe the set of broad-scale policies to promote sustainable and attractive growth.

2.3.3 Section 5 - Transects

Section 5 – Transects – categorizes the lands within the City's boundaries into six concentric policy areas with varying levels of existing and planned urban density. Tewin is within the Suburban Transect and will be structured on a fine-grained, fully connected street network that reflects Algonquin placekeeping and design principles.

2.3.4 Schedule C17 Overlay

The Tewin area is identified as Category 2 lands on Schedule C17 of the Official Plan and is contained within the Future Neighbourhood Overlay. This Overlay is intended to guide development activities occurring within these areas to support the formation of complete neighbourhoods.

It is also recognized that despite the preliminary location for Tewin being shown on Schedule C17, the exact boundary will be adjusted and/or finalized through the approval of the Community Design Plan and applicable studies.

2.3.5 Annex 10

A Tewin-specific Annex is included in the new Official Plan (Annex 10 – Tewin Community Design Planning Process and Studies, the “Tewin Annex”), which recognizes the iterative manner through which the elements of the project will progress, allowing for the community design process to respond to and inform the broader studies the City will undertake for lands including and beyond Tewin. The final plans required by the Tewin Annex include the Environmental Management Plan.

2.3.6 Section 7 – Greenspace Designation

Section 7 – Greenspace – identifies and provides policy direction for public parks, other public realm spaces and natural lands that provide essential ecosystem services by supporting biodiversity, climate resilience, recreation and healthy living. The Tewin Lands are not included within the Urban Greenspace Designation.

2.4 Infrastructure Master Plan 2024

The City of Ottawa’s Infrastructure Master Plan (IMP) is the City’s strategic blueprint that supports the City’s Official Plan and sets growth-related policies, objectives, and priorities for municipal water resources infrastructure. The focus of the IMP is on the City’s drinking water supply, wastewater collection, and stormwater management infrastructure.

New Urban Expansion Areas include the Tewin Lands. At 445 hectares, Tewin represents the largest Urban Expansion Area. Three sections specific to Tewin are provided below.

2.4.1 Section 3.2.3.4 Tewin Community

The IMP notes the planning and implementation of the water supply system and wastewater collection system will be a coordinated effort between the City and Tewin. The city will be responsible for the planning of all off-site works, which will connect to the internal water and wastewater networks planned and constructed within Tewin. It should be noted that the unit and population estimates are based on below the minimum 36 units per net hectares required by the Official Plan and are expected to be refined through the CDP/Secondary Plan and supporting studies.

At the time of this EMP, offsite water and wastewater projects are being initiated under a separate Municipal Class EA process. Planning for stormwater drainage in the Bear Brook and Ramsay Creek watershed of the Tewin lands is expected to be influenced by the Bear Brook Watershed and South Bear Brook Subwatershed Plan or other studies with accepted findings. Related consideration/initiation of Drainage Act processes to address the issue of legal and sufficient outlet requirements for Tewin, and upstream and downstream landowners associated with downstream Municipal Drains will be coordinated as part of a separate established Drainage Act coordination process.

2.4.2 Section 4.3.8 Legal Stormwater Outlets

The IMP states that statutory approvals are required to establish stormwater outlets for proposed development areas that are both legal and sufficient. It accepts two primary forms of legal stormwater outlets: i) natural watercourses; and ii) petition drains, or other drains (commonly referred to as municipal drains). Section 8.2.7 indicates that the Tewin EMP must identify where legal stormwater outlets are required and the functional design of any work required to achieve sufficient outlet.

The NCC has indicated that securing drainage through watercourses in the Greenbelt may be addressed through easements rather than establishing municipal drainage works under the Drainage Act.

2.4.3 Section 4.3.11 LIDS

The IMP and OP provide direction on LIDs that is in alignment with the provincial direction, acknowledging the lack of established local or provincial guidelines. Low Impact Development (LID) is a stormwater management strategy that seeks to mitigate the impacts of increased runoff and stormwater pollution by managing runoff as close to its source as possible.

2.4.4 Section 8.1.4 Master Study Requirements

This section states a comprehensive Bear Brook Watershed Study is required to assess hydrology, hydraulics, and water balance, and to identify solutions to manage cumulative drainage impacts from Tewin and surrounding urban expansion areas. This study must be completed before stormwater servicing for the Tewin community can be finalized and will also consider potential

future urban growth west and south of Tewin. A City-led South Bear Brook Subwatershed Study will build on the watershed study to evaluate natural heritage features, drainage conditions, and the impacts of the Tewin development, with its recommendations guiding land use and infrastructure planning. Although a full subwatershed study is not required for Ramsay Creek, cumulative impacts and mitigation measures must be addressed through the Tewin Environmental Management Plan (EMP). An EMP and Master Servicing Study (MSS) are required to support the Tewin Secondary Plan, and all development applications must align with and demonstrate compliance with these approved servicing and environmental plans.

2.4.5 Section 8.2.7 Stormwater Infrastructure Planning and Design Approvals

The IMP indicates stormwater infrastructure planning and design for the Tewin community is informed by the completion of broader watershed and subwatershed work in the Bear Brook system, which addresses existing drainage and flooding challenges in the area. These studies examine hydrology, hydraulics, and cumulative impacts from Tewin and surrounding communities to help shape appropriate stormwater management approaches and identify mitigation measures. The South Bear Brook Subwatershed Study provides more localized guidance on natural heritage features, drainage conditions, and stormwater criteria to support land use and infrastructure planning within Tewin. While a full subwatershed study is not proposed for Ramsay Creek, cumulative effects and mitigation strategies for this area are addressed through the Environmental Management Plan (EMP). Together with the Master Servicing Study and any required Drainage Act processes, these efforts support the identification of suitable stormwater outlets and coordinated implementation of drainage works for the community.

2.5 Climate Change Master Plan

The vision of the Climate Change Master Plan is to take unprecedented, collective action that transitions Ottawa to a clean, renewable and resilient city by 2050.

Climate change projections for the National Capital Region were published in June 2020 and apply advanced climate modeling to predict changes in temperature, precipitation, wind, and extreme weather until the year 2100. These projections are considered in the planning of IMP infrastructure to confirm water systems perform in future climate conditions, including higher and more variable precipitation and more extreme weather.

2.6 South-East Ottawa Transportation Network Study

The South-East Ottawa Transportation Network Study (SEOTNS) was undertaken to understand existing transportation conditions and regional travel patterns affecting Tewin, Riverside South, and Findlay Creek, in order to inform the Tewin Secondary Plan. Its purpose is to identify current transportation needs, gaps, and opportunities so future transportation solutions can be planned at both the regional and community levels. The study found that Tewin, as a greenfield site, has no existing travel data, but analysis of Highway 417 shows it currently operates below capacity and will be a key regional connection. Overall, the findings highlight the opportunity for Tewin's planned 15-minute community design and integrated mobility strategies to significantly reduce auto dependence compared to surrounding suburban areas.

2.7 National Capital Commission

The National Capital Commission's Greenbelt Master Plan (GBMP) describes the purpose of the Greenbelt and outlines the values that should inform any planning decisions made pertaining to the Greenbelt. The Tewin lands are located directly adjacent to the Greenbelt lands on the north and east boundaries. Due to the proximity and connection of the drainage network and infrastructure through these lands, certain policies within the GBMP must be addressed. The Plan sets infrastructure policies that pertain to the IMP, including additional requirements for new linear (pipe) and vertical (facility) infrastructure and roads which are located inside the Greenbelt but service land outside the Greenbelt. Requirements include environmental impact mitigation, alignment justification and rationale, and the use of best practices to prevent impacts upon streams, soils, water, vegetation, overall natural systems, land use and visual quality.

2.8 Conservation Authority

The Tewin Lands are within the jurisdiction of the South Nation Conservation and the Rideau Valley Conservation Authority due to the location of the watershed divide between Ramsay Creek and Bear Brook.

The province delegates responsibility for natural hazards management, which includes providing comments to municipalities under O. Reg. 686/21, specifically subsections 6 and 7, on Planning Act applications and other development-related applications as they relate to risks from floodplains, hazardous slopes, unstable soils and erosion. Comments are provided from several perspectives: watershed-based resource management, planning advisory service, technical advisory service and regulatory responsibilities. The development of the Tewin lands will be subject to review relating to applications under eth planning Act and activities that may occur within eth regulated area.

Ontario Regulation 41/24 applies to lands within the following areas as outlined in the Act, described within section 2 of the Regulation:

- Hazardous lands
- Wetlands
- River or stream valleys
- Other areas, including areas within 30 metres of a wetland

Regulatory responsibilities under Section 28 of the Conservation Authorities Act ensure defined development activities:

(a) are not likely to affect the control of flooding, erosion, dynamic beaches or unstable soil or bedrock;

(b) are not likely to create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property; and

(c) meet any other requirements that may be prescribed by the regulations.

2.9 Source Protection Plans

Two source protection plans that cover this area: the Mississippi-Rideau Source Protection Plan and the Source Protection Plan for the Raisin-South Nation Source Protection Region. A review of Rideau Valley Conservation Authority (RVCA) and South Nation Conservation (SNC) mapping confirms that there are Intake Protection Zones or Wellhead Protection Areas within or near the Tewin Lands. Highly Vulnerable Aquifers and Significant Groundwater Recharge Areas are mapped at a macro scale in the Tewin Lands development area. Generally, this means development must not adversely affect groundwater quality or recharge functions.

There are no new intake or wellhead protection areas triggered by the Tewin development as all services will be provided by extension of the existing central infrastructure.

2.10 Bear Brook Watershed Study (BBWSS)

As of the date this EMP was prepared, the Bear Brook Watershed Study was underway, led by South Nation Conservation.

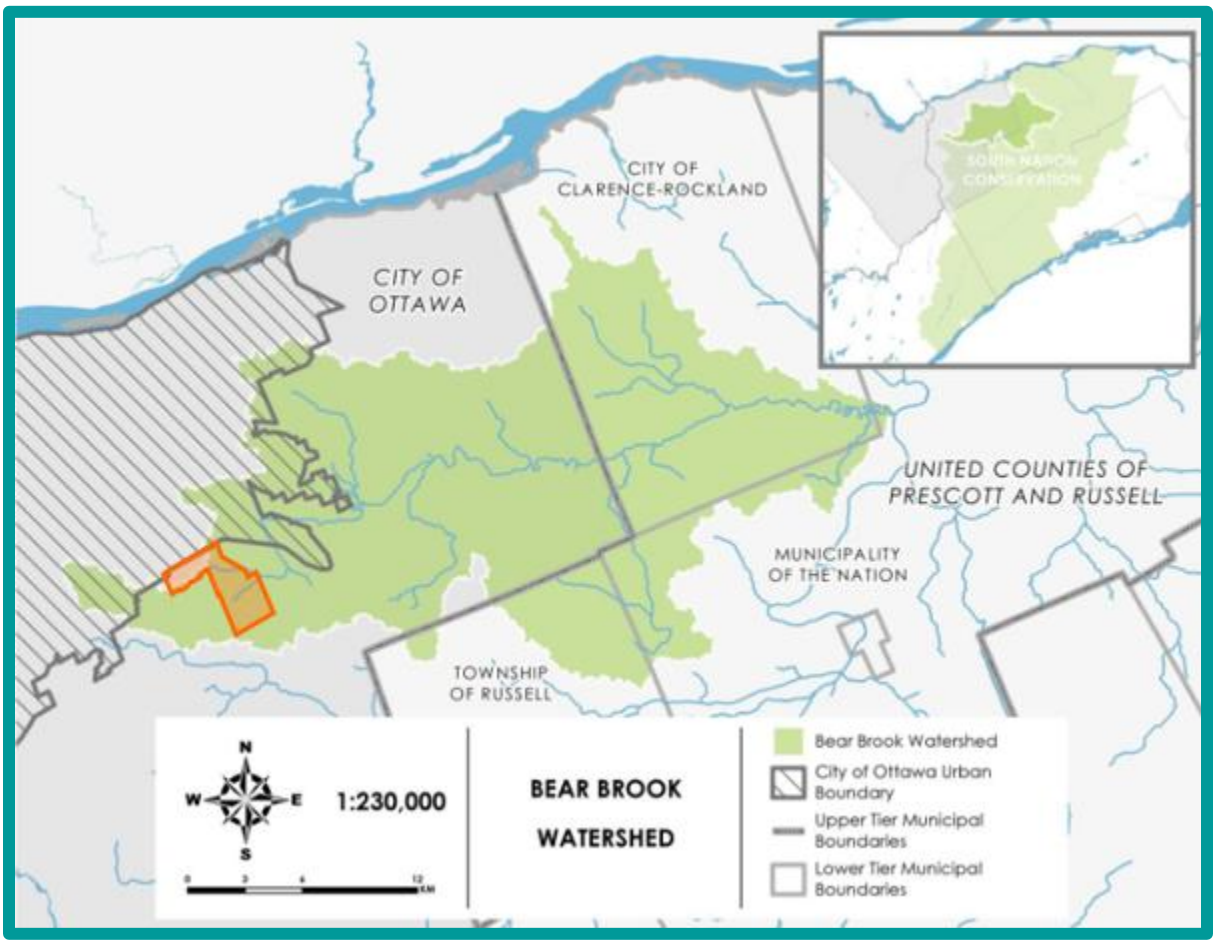
A need for a comprehensive understanding of the Bear Brook watershed surface water drainage was established in the Annex 10 of the Official Plan indicating cumulative impact of Tewin and other future development within the headwaters of the Bear Brook watershed must be evaluated prior to the planning of stormwater servicing for the community can proceed. Existing capacity and flooding issues on Bear Brook reported by the Drainage Unit and SNC have been reported.

The watershed study will assess the hydrology, hydraulics and water balance of the watershed and identify a functional solution to accommodate and mitigate the cumulative impacts of drainage downstream of the Tewin Community, the East Urban Community, and the South Orleans Urban Expansion Area. It will also consider possible future urban expansion west and south of Tewin. It is the expectation that the Tewin process and watershed study will be using the same shared base information so the conclusions should generally align, and that adjustments will be made, if necessary, as studies and future development applications progress. The identification and resolutions to any divergence in findings identified by the watershed study are expected to be coordinated and resolved through a concurrent and cooperative process between Tewin, South Nation Conservation and the City of Ottawa. **Figure 9** shows the Tewin Lands in relation to the Bear Brook Watershed.

The Bear Brook Watershed Study includes the following:

- Bear Brook Watershed Study Flood Mitigation Class EA and Preliminary Design Study
- Bear Brook Watershed Study Flood Risk Environmental Study Report (to be utilized for Bear Municipal Drain)
- Bear Brook Watershed Study: Existing Conditions including SWM, Floodplain, Water Budget, PSW analysis, Natural Hazards
- Water Budget Models and Simulations for design storms (Aquanty) and Sensitivity Analysis on urban expansion lands to 2051 to be consistent with all corresponding expansion areas and master plans.
- Bear Brook Watershed Study Scenario Planning, Phase 2 including analysis on Piperville Drain into South Bear Brook Subwatershed

Figure 9: Bear Brook Watershed (source: SNC)



The secondary plan shall acknowledge this process and establishes that should the EMP and associated MSS not reflect applicable recommendations from the Watershed or Subwatershed Study, they shall be updated accordingly. No final approvals of Plans of Subdivision, Site Plan Control and Zoning By-laws may proceed until such time as the Bear Brook Watershed Study and/or South Bear Brook Subwatershed Plan are sufficiently advanced to further inform and refine, as necessary, the stormwater management strategy for the Tewin Plan Area. The following policies are provided in the secondary plan:

1. Notwithstanding Section 4.7.1. of the Official Plan, a master servicing study and/or an environmental management plan shall be updated at the time of a development application where:
2. A watershed or subwatershed study has been approved, if required;
3. There is a major change that would require revisions to the master servicing study and/or environmental management plan;

4. There are proposed changes to planned infrastructure needed to service an area or subdivision(s) which would have a significant impact on the infrastructure needs of another area(s) or subdivision(s) within the Secondary Plan; or
5. The applicable Class Environmental Assessment approval has expired.

2.11 South Bear Brook Subwatershed Study (SBB SWSS)

As of the date this EMP was prepared, various components of the South Bear Brook Subwatershed Study are underway, led by the City of Ottawa. It is the expectation that the Tewin process and subwatershed study will be using the same shared base information so the conclusions from duplicative studies should generally align, and that adjustments will be made, if necessary, as studies and future development applications progress. The identification and resolutions to any divergence in findings identified by the subwatershed study are expected to be correlated and resolved through a concurrent and cooperative process between Tewin, South Nation Conservation and the City of Ottawa. **Figure 10** shows the Tewin Lands in relation to the South Bear Brook Subwatershed.

The South Bear Brook Subwatershed Study includes the following:

- Creek Lowering Assessment
- Drainage Improvements
- Hydrology and hydraulic analysis
- Water Balance
- Comprehensive pre-development or baseline water balance report
- Reach Delineation Mapping
- Evaluation of At-Risk Areas/Constraints

Figure 10: South Bear Brook Subwatershed (Source: City of Ottawa)

2.11.1 Bear Brook Subwatershed Report Card 2016

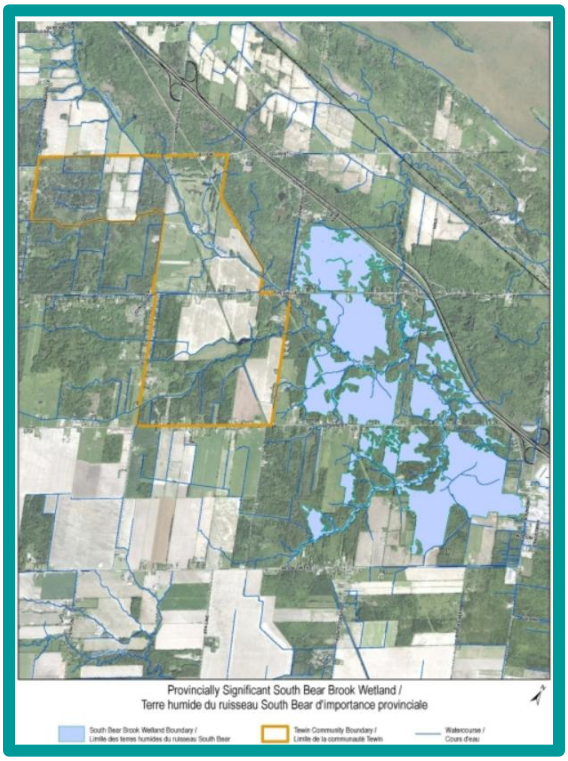
The report card contains recommendations to help prioritize stewardship activities and support development review. Relevant considerations are tree planting for windbreaks, control erosion and reforestation of idle land, maintenance and enhancement of wetland cover, and support of important linkages to natural heritage features.

2.11.2 Wetland Study (Parsons)

The City of Ottawa commissioned a Wetland Evaluation in 2022 based on the Ontario Wetland Evaluation System methodology to identify any Provincially Significant Wetlands in the vicinity of Tewin.

The South Bear Brook Wetland with a total size of 561 hectares received a total score of 754 qualifying it to be designated as a Provincially Significant Wetland (PSW). The complete wetland evaluation and mapping was submitted to the Ministry of Natural Resources in December 2023, and the Province of Ontario updated the wetland's status to provincially significant in January 2024. An Official Plan Amendment has since been approved, identifying the PSW in the City's Official Plan. An overview of the PSW is shown in **Figure 11**.

Figure 11: South Bear Brook PSW (source: City of Ottawa)



2.11.3 Bear Brook Flood Plain Mapping Study

The South Nation Conservation (SNC) is responsible for conducting hazard mapping studies on watercourses within the City of Ottawa and the SNC area of jurisdiction. At the time the EMP for Tewin was prepared, South Nation had completed an update to their floodplain model in 2025, however no changes were made to the accompanying mapping prepared in 2022. The Tewin lands have used the existing mapping to delineate the floodplain boundaries of Bear Brook across the

Tewin development lands, and should the mapping change, the generous ecological corridor is expected to accommodate any adjustments.

2.11.4 Ramsay Creek Flood Plain Mapping

The Rideau Valley Conservation Authority (RVCA) is responsible for conducting hazard mapping studies on watercourses within the City of Ottawa and the RVCA area of jurisdiction. At the time the EMP for Tewin was prepared, Ramsay Creek is not part of their published 5-year work plan. However, in accordance with standard flood plain mapping studies and practices, RVCA has confirmed the small catchment areas of the Ramsay Creek tributaries on the Tewin Lands would not merit inclusion in such an exercise. The hydrology and hydraulics of Ramsay Creek have been studied and shared with the RVCA. Proposed alterations and enhancement to the existing tributaries on the site will ensure no development will be exposed to flood plain risks within the Tewin lands.

2.11.5 Ramsay Creek 2019 Catchment Report

The catchment report prepared by the RVCA evaluates the health and conditions of Ramsay Creek to support informed decisions about managing and protecting the water resource. Recommended restoration opportunities include channel modification and bank stabilization to address erosion, as well as enhancing riparian buffers for water quality improvement.

2.11.6 Local Drainage Act Studies

The following Engineering Reports cover watercourses designed as municipal drains under the Drainage Act that are relevant to the Tewin lands.

- Smith Gooding Municipal Drain and Branches, 1973 prepared by R.M. Kostucj & Assoc. Ltd.
- Bear River Municipal Drain, 1990 prepared by McNeely Engineering Ltd.
- Bear River Municipal Drain, 1974 prepared by McNeely, LeCompt & Assoc. Ltd.
- Johnston Municipal Drain, 1979 prepared by McCormick, Rankin & Assoc. Ltd.

2.12 Regulatory Approvals

2.12.1 Federal Impact Assessment Act

The Federal Impact Assessment Act (replaced CEAA) came into force in August 2019 to ensure the assessment of "federal matters". The scope of federal interests continues to be refined, but as of the writing of this EMP, may include Indigenous matters, Federal lands - including National Capital Commission lands, endangered species, migratory birds and navigable waters.

2.12.2 Department of Fisheries and Oceans (DFO) – Fisheries Act Regulations

Works which may temporarily or permanently cause the death of fish, or the harmful alteration, disruption or destruction of fish habitat must comply with relevant provisions under the *Fisheries Act* and the *Species at Risk Act*. A Request for Review shall be submitted where required to DFO which will review and advise whether the proposed works, undertakings and activities may impact fish and fish habitat.

The project proponents are responsible for:

- understanding the risks to fish and fish habitat associated with the project
- taking measures to avoid and mitigate risks to fish and fish habitat
- requesting an authorization from the Minister and abiding by the conditions of authorization when it is not possible to avoid and mitigate risks to fish and fish habitat

If the death of fish or the harmful alteration, disruption or destruction of fish habitat will likely result from a project, an authorization from the Minister of Fisheries, Oceans and the Canadian Coast Guard as per Paragraph 34.4(2)(b) or 35(2)(b) of the Fisheries Act Regulations must be obtained to support the work. The Fisheries Act Authorization would establish and detail the specific measures to be employed relative to that component of site development required to ensure a net benefit to fish and fish habitat in the broader area.

2.12.3 National Capital Commission: Federal Land Use, Design and Transaction Approval, or FLUDTA

Under the National Capital Act, the NCC's regulatory federal approval authority requires that all individuals and federal organizations (including the NCC itself) obtain NCC federal approval before undertaking projects, if:

- the project is located in the National Capital Region; and
- the project affects federal lands and/or federal buildings; or
- the project is on non-federal land, but the proponent is a federal organization.

Due to the adjacency of the Tewin Lands to the NCC-owned greenbelt, there is potential for mutually beneficial works to extend onto federal property.

2.12.4 Ontario Ministry of the Environment, Conservation and Parks

2.12.4.1 –Environmental Protection Act and Ontario Water Resources Act: Environmental Compliance Approvals

Emissions and discharges related to air, noise, waste and sewage caused during construction activities or through operation of facilities may require an Environmental Compliance Approval (ECA) to allow operations at a facility or on a site with environmental controls that protect human health and the natural environment.

An ECA must be acquired before construction, operation or upgrades to a facility or site.

These activities are described under the *Environmental Protection Act, 1990* (EPA) and *Ontario Water Resources Act, 1990* (OWRA):

- Section 9 of the EPA requires an ECA for activities with emissions related to air, noise and/or vibrations
- Section 27 of the EPA requires an ECA for the transportation, management and/or disposal of certain types of waste
- Section 53 of the OWRA requires an ECA for a sewage works
- Consolidated Linear Infrastructure (CLI) ECA for Municipal Sewage Collection Systems and Municipal Stormwater Management System is a single environmental permission for all the sewage works components of a municipal sewage collection system or a municipal stormwater management system.

2.12.4.2 Ontario Ministry of the Environment –Ontario Water Resources Act and Ontario Regulation 387/04 (Water Taking and Transfer): Permit to Take Water

A permit is required if it is expected that 50,000 litres or more of water in a day shall be removed from the environment including a lake, stream, river, pond or groundwater.

2.12.4.3 Ontario Ministry of the Environment – On-site and Excess Soil Management Ontario Regulation 406/19

Ontario's Excess Soil Regulation establishes rules for when excess soil is considered waste and when it can be reused safely. It applies to greenfield development lands by setting rules for managing excavated soil from construction projects. Since greenfield sites are undeveloped, they often generate large amounts of excess soil when prepared for construction. The regulation encourages local reuse of soil to minimize transportation costs and environmental impact. Developers must assess soil quality, track its movement, and ensure it meets environmental standards before reuse. Larger projects (over 2,000 cubic meters of soil) may require additional testing and documentation

2.12.4.4 Endangered Species Act

Section 9 of the *Endangered Species Act, 2007* (ESA) prohibits:

- killing, harming, capturing and taking living members of species listed as endangered, threatened or extirpated on the Species at Risk in Ontario list
- damaging or destroying the habitat of species that are listed as endangered or threatened on the Species at Risk in Ontario list

A permit, agreement or conditional exemptions in O. Reg.242/08 or O. Reg.830/21 is required if an activity is prohibited under the ESA.

While the ESA was in effect at the time of writing for the EMP, Ontario's Bill 5: Protect Ontario by Unleashing our Economy Act, 2025, was enacted on June 5, 2025. This Act introduced numerous changes to the ESA, including altering the definition of "habitat" for various species groups. At the time of writing for this EMP, however, many standing policies managing the implementation of the ESA have not yet been updated. As such, recommendations within this report related to the ESA consider existing ESA-related policies, but also recognize upcoming changes to the extent feasible. The most significant such change will be the full replacement of the ESA with the Species Conservation Act (SCA), likely in early 2026 (Species Conservation Act, 2025). The Species Conservation Act was enacted as part of Bill 5, but is not yet in force as of the date of this EMP. However, permitting processes required/employed to ensure a net benefit for SAR under future site works will most likely be managed under the SCA rather than the ESA. Regardless, the actual mitigation and/or compensation measures that would ultimately be imposed or employed through permits issued under either act are anticipated to be largely similar. As such, any recommended actions within this report associated with the ESA, are proposed to apply equally under the SCA.

2.12.5 Ontario Ministry of Transportation

A permit may be required for planning land development, highway access, construction, utilities, work or other activities near a provincial highway and are within Ministry of Transportation (MTO) Controlled Areas.

2.12.6 Rideau Valley Conservation Authority and South Nation Conservation

2.12.6.1 Conservation Authorities Act, Section 28.

Projects that alter a property near any waterbody, wetland, steep slope or floodplain in the Rideau Valley Conservation Authority or South Nation Conservation jurisdictions require a permit under Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits.

Proposed work within the regulated area in or near a river, stream, floodplain, steep slope or wetland, may require approval from the local Conservation Authority. This includes:

- construction, reconstruction, erection or placing of a building or structure of any kind
- changes that would alter the use or potential use of a building or structure
- increasing the size of the building or structure or increasing the number of dwelling units in the building or structure
- site grading
- the temporary or permanent placing, dumping or removal of any material, originating in the site or elsewhere
- straightening, changing or diverting or interfering with an existing channel of a river, creek, stream or watercourse, or changing or interfering with a wetland

2.12.7 Ontario Ministry of Agriculture, Food, and Agribusiness

2.12.7.1 Drainage Act

The Drainage Act, 1990, defines a process for overriding the common law, as it relates to drainage, and providing property owners with a process for resolving drainage issues through their local municipality. The Drainage Act prescribes a process and requires certain applications or submissions/petition to be undertaken to allow related activities to take place.

The creation of new municipal drain may be considered through the filing of a petition under Section 4 and the prescribed process.

Once a drain exists, there are a number of procedures for affecting changes, including abandonment. These include:

- drain improvement (Sections 77 and 78)
- maintenance and repair (Sections 74, 75, 79 and 81)
- assessment schedule updates:
  - severances (Sections 65(1) and 65(2)
  - land use changes and subsequent connections (Section 65 (3))
- complete new assessment schedules (Section 76)
- abandonment (Sections 84 and 19)

There are no proposals to abandon Municipal Drains triggered as part of the Tewin Lands development process.

Discussions around the legal and sufficient outlets are part of a separate Drainage Act coordination process.

2.12.8 Municipal Class Environmental Assessment

The community planning and infrastructure design process for Tewin is advancing through a coordinated Planning Act and Municipal Class Environmental Assessment (MCEA) process (Approach #3). The Transportation and Infrastructure Plans will identify the recommended transportation, water, sanitary, and stormwater infrastructure required to service the new community.

2.12.8.1 Coordinated Planning Act and Environmental Assessment Act Approvals

A key component of the Tewin Secondary Plan work plan is the coordination of approval processes, including requirements under the *Planning Act* and *Environmental Assessment Act*.

The Community Design and Land Use Plan, culminating in a Tewin Secondary Plan to be adopted as an Amendment to the Official Plan, represents the *Planning Act* component of the coordinated *Planning Act* and *Environmental Assessment Act* process.

The interdisciplinary work plan for the Tewin Secondary Plan is being advanced to also fulfill requirements of the 2024 Municipal Engineers Association's Municipal Class Environmental Assessment (MCEA) for related environmental and infrastructure projects, to fulfill *Environmental Assessment Act* requirements. Specifically, Master Plans and Studies and associated infrastructure

projects for water, wastewater, storm drainage, stormwater management, and roads are following the 'Approach 3' master planning process as set out in Section A.2.9 of the MCEA, which permits proponents to combine the community and infrastructure planning processes into a coordinated approach with the *Planning Act*.

The planning and coordination of the infrastructure and approval requirements in consultation with the community will help to ensure that the objectives of the City, the community, and approval authorities are fulfilled.

This MSS identifies the individual projects to be implemented under the Master Plan and will identify the MCEA project schedules for each project. The final Notice issued for completion of the *Planning Act* and MCEA process, and availability of supporting documentation, shall list the individual projects for which the MCEA process is deemed to be completed.

Once approved, the preferred municipal infrastructure projects within the development study area would not be subject to additional EA approval requirements with the submission of subsequent site plan or plan of subdivision applications under the *Planning Act*. This ensures that the environmental protection measures identified in the Master Plans to permit development in the Study Area will be adhered to by any subsequent developments. Any amendments or revisions may be made using the addendum procedures in the MCEA, with the appropriate public review.

2.12.9 Planning Act Approvals

2.12.9.1 Official Plan Amendment & Secondary Plan

An Official Plan Amendment will be adopted by Ottawa Council to establish a Secondary Plan for the Tewin Lands.

2.12.9.2 Plans of Subdivision, Zoning By-law Amendment, Site Plan Control

Subsequent to the Official Plan Amendment/Secondary Plan, further Planning Act approvals are required for urban development to be advanced, including:

- Plans of Subdivision (Sections 50, 51)
- Zoning By-laws/Zoning By-law Amendments (Section 34)
- Site Plan Control By-law (Section 41)

The Planning Act prescribes a process for the preparation and submission of such applications for review and approval by the City.

3 Existing Conditions Assessment

The existing conditions technical reports provide the basis for identifying and mapping significant natural features within the limits of the Tewin Lands in accordance with provincial and municipal policies. Watercourse investigations extended downstream off-site where appropriate.

3.1 Existing Condition Reports

The environmental inventory represents the integrated summary and assessment of the natural features in the following existing conditions technical reports:

- **Tewin Existing Conditions and Preliminary Opportunities Report** dated December 2024 and prepared by Urban Strategies
- **Fluvial Geomorphology Study – Tewin Lands: Existing Conditions Summary Report – Bear Brook and Ramsay Creek Watersheds** dated December 2024 and prepared by GEO Morphix Ltd.
- **Background Review and Drainage Characterization of Ramsay Creek** dated April 24, 2025 and prepared by GEO Morphix Ltd.
- **Tewin Lands: Existing Conditions Hydrogeological Study** dated March 2025 and prepared by Dillon Consulting
- **Existing Conditions – Geotechnical: Tewin Lands** dated November 2024 and prepared by Paterson Group
- **Tewin Lands: Natural Heritage Preliminary Existing Conditions Report** dated April 2024 and prepared by Kilgour and Associates
- **Tewin Lands: Cumulative Hydrologic Impact Assessment** dated April 2024 and prepared by JFSA Canada Inc.
- **Tewin Lands: 2021-22 Field Monitoring Report** dated April 2024 and prepared by JFSA Canada Inc.
- **Tewin Lands: 2021-24 Field Monitoring Report** dated April 2025 Update prepared by JFSA Canada Inc.
- **Tewin Lands – Existing Conditions Water Budget** dated October 2024 and prepared by JFSA Canada Inc.
- **Tewin Mobility Existing Conditions** dated May 2024 and prepared by CGH Transportation
- **Stage 1 Archeological Assessment Tewin Lands** dated July 14, 2023 and prepared by WSP Canada

Full versions of the existing conditions technical reports are in Appendix I.

3.2 Field Investigations and Study Approaches

Fieldwork conducted as part of the existing conditions reporting was initiated in 2021 when weather conditions and timing were deemed suitable based on the survey protocols being implemented. Surveying and monitoring continued through to the publication of the Existing Condition Reports which established baseline metrics. Surface water, groundwater, ecological, geotechnical and erosion monitoring will continue as the Tewin Lands develop to provide longer record sets, and detailed site-specific information to inform construction and protect against impacts from land use

change. Photo documents of site conditions are provided in the existing conditions technical reports located in Appendix I.

Field teams specializing in biological and ecological sciences, hydrogeology, geotechnical engineering, geomorphology, land surveying, and surface water engineering have conducted comprehensive studies and ongoing monitoring of the site and surrounding areas over several years. The data collected through rigorous investigation and surveying has been systematically analyzed, shared among relevant stakeholders, and meticulously compiled to develop robust inventories of existing conditions and empirical datasets.

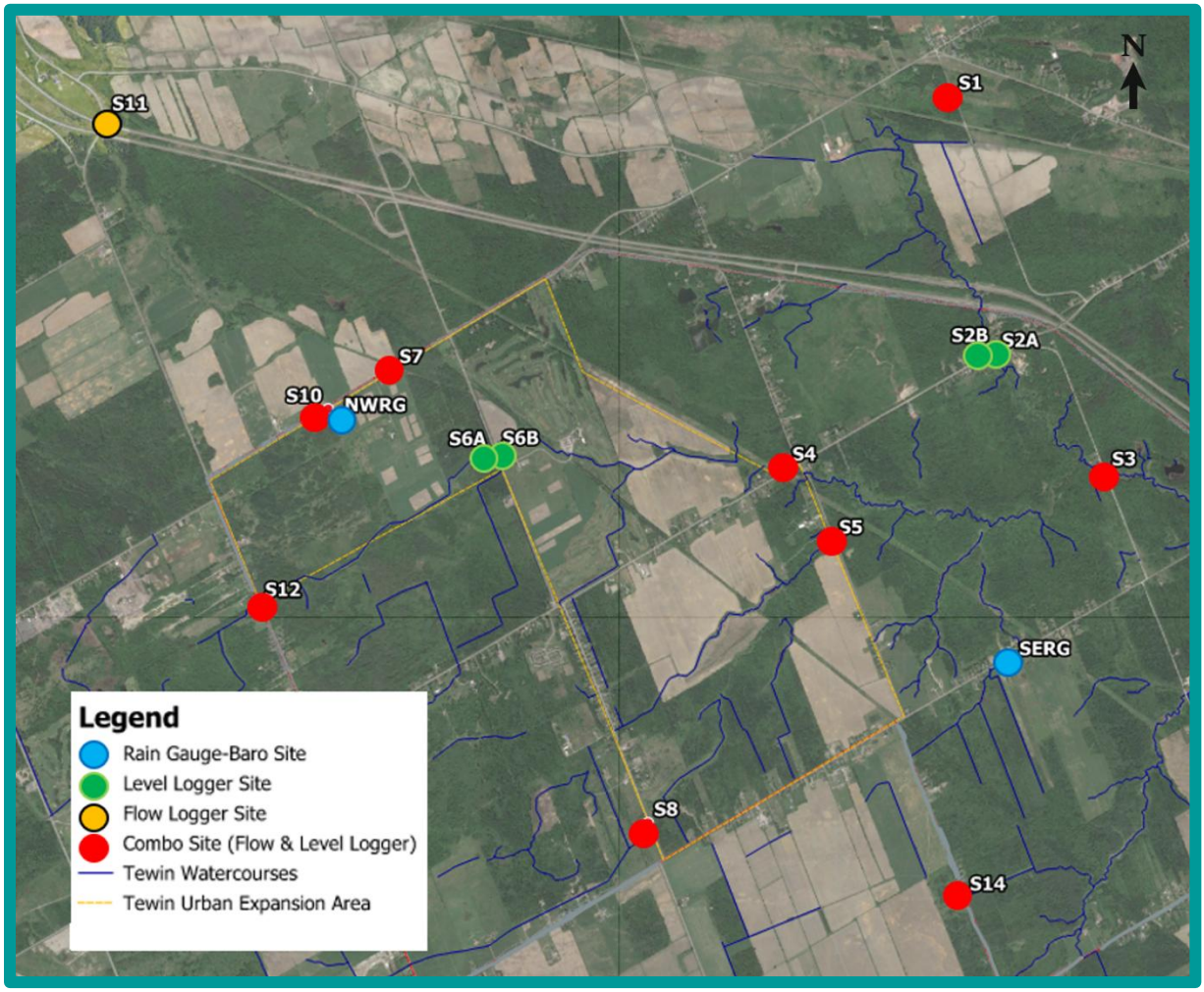
All work was carried out in accordance with accepted guidelines and established manuals to ensure accuracy and consistency. Furthermore, the methodologies and findings were reviewed and accepted by both municipal and external agency reviewers including peer reviewers, confirming compliance with regulatory standards and best practices.

3.3 Surface Water

3.3.1 Monitoring

JFSA personnel completed a short monitoring program in 2021, which started in late August and ended in mid-November. This program consisted of 9 level loggers, 2 barometric loggers, and 2 rain gauges, deployed in strategic locations in the Bear Brook and Ramsay Creek systems. An overview of the monitoring locations is shown in **Figure 12**. These works were intended to develop a strong understanding of how the watercourses react to various environmental conditions and how flows and water levels are related at key locations within and outside the Tewin Lands. For the monitoring program commencing in 2022 and onward, several additional sites were selected for both water level and surface flow monitoring to better understand hydrologic/hydraulic characteristics of the area. Soil infiltration field tests were also conducted. The monitoring program ultimately consisted of 11 level loggers, 2 barometric loggers, 8 MantaRay Portable Area Velocity Flow Meters, and 2 rain gauges. Snow measurements are taken over the winter to ensure snowpack moisture storage is captured.

Figure 12: Surface Water Monitoring Sites

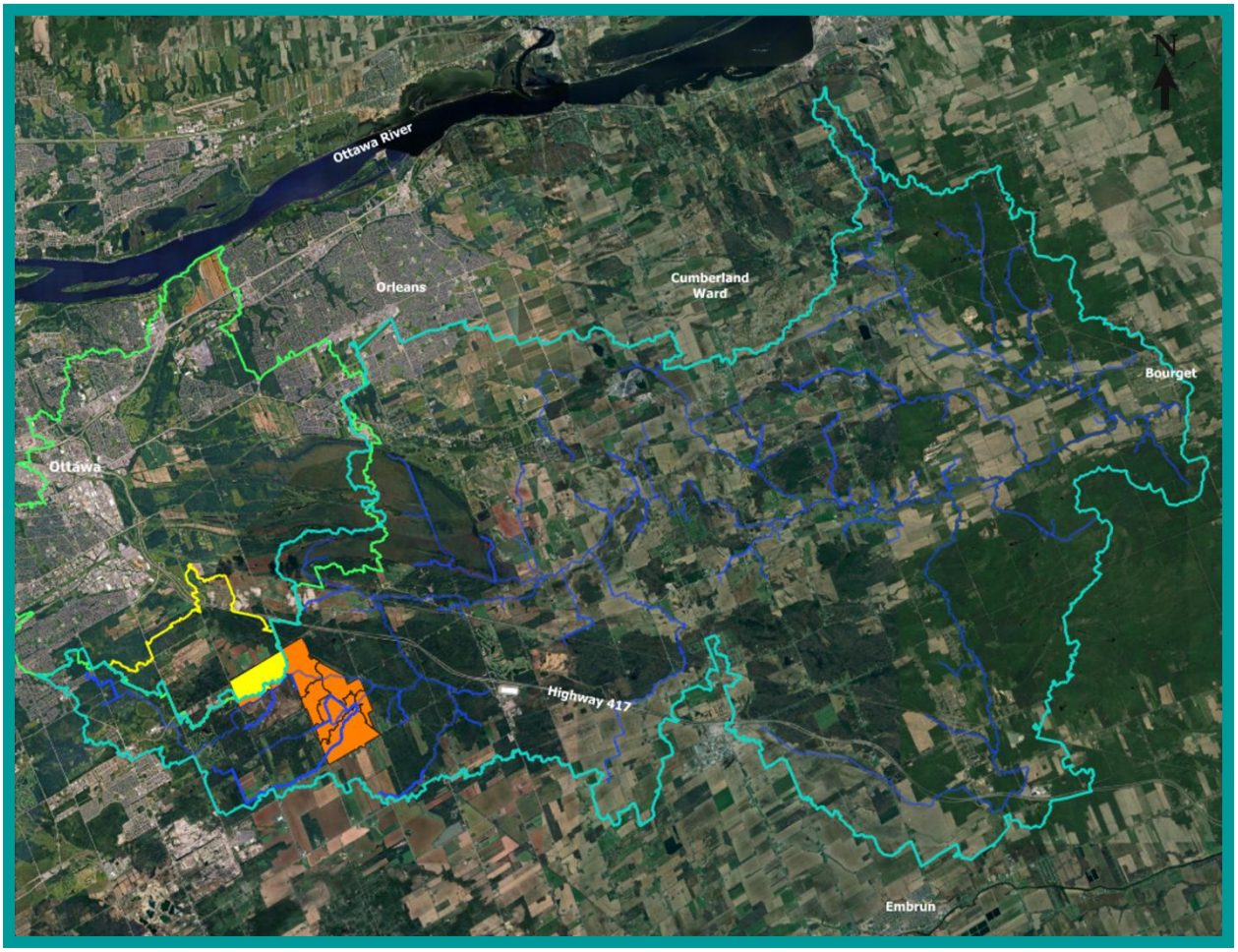


3.3.2 Major Tributaries & Catchments (Bear Brook / Ramsay)

The Tewin Lands are situated in the headwaters of the Bear Brook and Ramsay Creek watersheds (**Figure 13**). Bear Brook is a tributary of the South Nation River and drains an area of approximately 48,800 ha, 727 ha of which are the Tewin Lands. A section of the Smith-Gooding and Johnston Municipal Drains (tributaries to Bear Brook) also bisect the Tewin Lands. Ramsay Creek is a tributary of Green's Creek which drains an area of approximately 1,400 ha and 11,988 ha respectively; Green's Creek is a tributary of the Ottawa River. Tewin occupies roughly 1.5% of the overall Bear Brook watershed and 1.35% of Green's Creek watershed, with 11.6% of the Ramsay Creek subwatershed area.

Land uses along the channel reaches within the Tewin Lands are a mix of forested and agricultural lands. The headwater reaches of Ramsay Creek, upstream of Leitrim Road, are straight drainage channels. The tributaries of Bear Brook, which drain and traverse the site, are a mix of headwater drainage features, municipal drains, and relatively sinuous reaches with floodplains situated in confined valley settings.

Figure 13: Tewin Lands in Bear Brook and Ramsay Creek/Green's Creek Watersheds



3.3.3 Cumulative Hydrologic Impact Assessment

An assessment was undertaken to understand if there was potential for development of the Tewin Lands to have an impact on the Bear Brook and tributaries watershed. The work, initially based on the Bear Brook SNC 2022 HEC-HMS model, determined that proposed post to pre stormwater controls would not have adverse downstream impacts in terms of peak flow increases along the watercourses, compared to existing conditions. These stormwater controls are carried forward and discussed in Section 5.2.4 of this EMP and in the associated MSS under separate cover. Further, it established that provided the same controls were applied to other urban expansion development lands within the watershed, there would be no increase in peak flows in Bear Brook. A subsequent analysis was undertaken which used the updated SNC 2025 HEC-HMS model and considered a long-term potential development scenario across the City of Ottawa within the Bear Brook watershed. (See **Appendix F**)

3.4 Wetlands

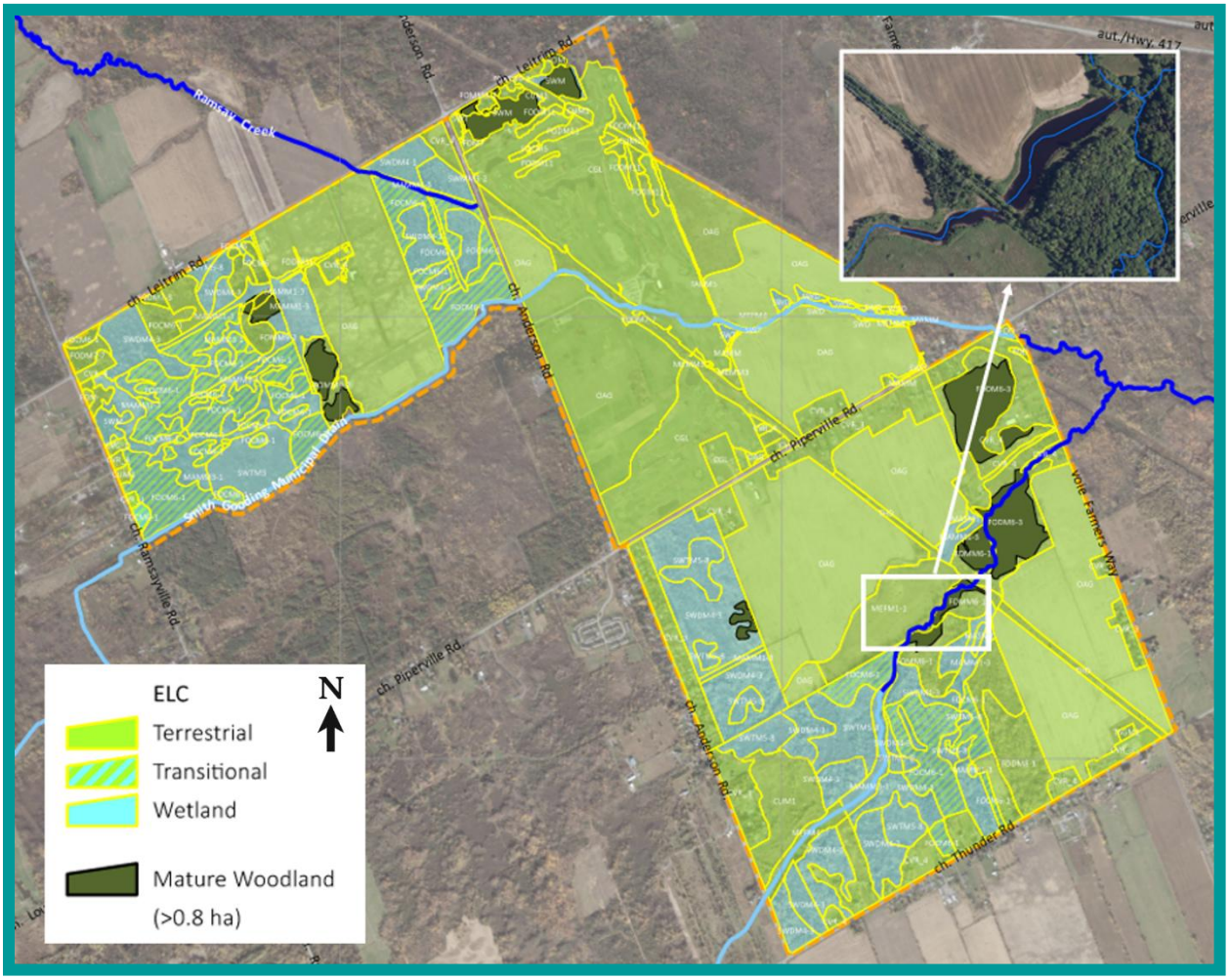
3.4.1.1 Ecological Land Classification

There are no Provincially Significant Wetlands on the Tewin Lands or within 100 metres of the boundary. The site does, however, include areas that are classified by the ECL process directly as wetland ecosites. Additionally, multiple areas across the site presented as (recently naturalizing) tree plantations - being vegetatively dominated by linear rows of monocultural tree crops; but soil conditions and emerging ground cover there typically indicated emerging wetland conditions. There is no ELC code, however, for a wetland tree plantation. As a compromise solution, the mapping within the EMP indicates these areas as "transitional wetland", while still including the "terrestrial" ecosite codes typically associated with "plantation". Effectively, however, these areas should also be considered wetlands.

Wetlands contribute to maintaining the natural functions of an area and are part of the natural heritage system that extends throughout the urban and rural area and into adjacent municipalities. These wetland areas on the Tewin Lands were almost entirely under active agriculture up to at least 1976 based on GeoOttawa imagery, with small, scattered patches left treed (see mature woodlands section 3.5.2). These areas also contain extensive networks of agricultural ditching, connecting to the Smith-Gooding and the Johnston Drains.

Wetlands currently identified on the site consist primarily of marsh and meadow marsh (40 ha), thicket swamps (24 ha), marsh swamp (13 ha) and deciduous swamps (87 ha) with the majority of tree coverage stemming from rowed coniferous plantation stock in swamps (71 ha). The high-water table in these features maintains wet to saturated soil conditions, however the surface water within these swamps is often marginal, limiting the direct habitat functionality of these areas for fish, turtles and/or anurans. During periods beyond the spring freshet (which is short due to the flashy nature of the drainage in this area), accessible surface water is limited to a small marsh area associated with the reaches downstream of the Johnston Drain (**Figure 14**).

Figure 14: Wetlands (source: Kilgour and Assoc.)



3.4.1.2 Mer Bleue and South Bear Brook Provincially Significant Wetlands

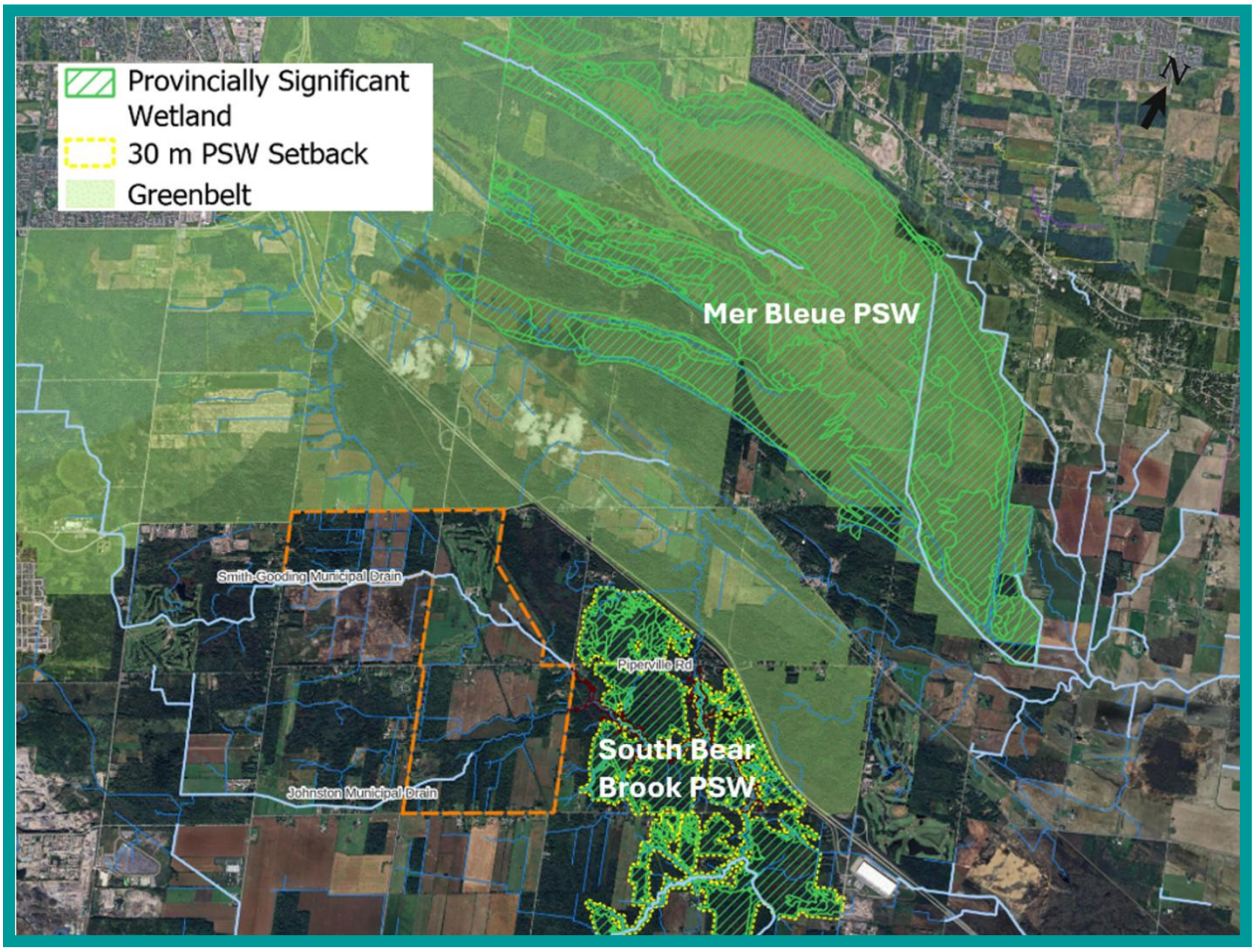
These provincially significant wetlands, shown in **Figure 15**, are located downstream of the Tewin Lands. An evaluation of the groundwater, surface water and terrestrial relationship based on existing conditions has determined it is not expected that these important wetland features' long-term sustainability will be impacted by Tewin.

The thin layer of shallow coarse-grained material that occurs both within the Tewin Lands and in the vicinity of the Mer Bleue bog are distinct and non-contiguous. As such, there is minimal hydrogeological interaction between these areas (pre-development). Any post-development changes in hydrogeological conditions within the proposed Tewin lands would not be expected to have any meaningful or perceptible impact on conditions in the Mer Bleue bog.

The hydrogeology in the area of the Tewin Lands and nearby South Bear Brook wetland is interpreted to consist of a shallow groundwater system (active within the coarser deposits noted above) that discharges to local surface water, with very limited input from the underlying thick clay deposits. The surface water features within the Tewin lands represent headwater features of the

South Bear Brook wetland, however those watercourses run among, rather than into the South Bear Brook wetlands. The shallow groundwater table which provides itinerant (snow melt and precipitation event-driven) baseflow to the local watercourses also is understood not to travel laterally any notable distance and does not cross compacted features such as roadbeds. For these reasons, the Tewin Lands are not considered to contribute to the hydrological regime of the South Bear Brook Wetlands in any meaningful way. Additional details are provided in ***Appendix G.***

Figure 15: South Bear Brook & Mer Bleue Provincially Significant Wetlands



3.5 Ground Water

The site and adjacent areas consist of two distinct surficial units: a thin silty sand unit ranging in depth between zero and approximately 3 metres, overlying a thick silty clay unit. The thick clay layer has a shallow upper brown silty clay and a lower grey silty clay. The underlying grey silty clay acts as a 'floor' beneath the thin silty sand areas with low permeability characteristics.

The groundwater flow system is therefore a shallow system, dominated by horizontal movement towards surface water features, mainly in the shallow silty sand upper layer with relatively higher permeability. This silty sand is discontinuous and very thin over large areas; therefore, it is unlikely to be a major groundwater flow pathway.

The surface water level elevations in the Ramsay Creek headwaters are typically higher than the groundwater levels, however groundwater level elevations localized around the Bear Brook are consistently above nearby surface water level elevations (typically between 0.5m and 3 m), indicating the potential for groundwater discharge. The amount of groundwater discharge as baseflow to surface water features is limited due to the relatively low permeability of the silty brown clay and the thin and discontinuous silty sand.

Additional details are provided in the Dillon report in ***Appendix I***.

3.6 Water Budget Assessment

A hydrologic water budget analysis was conducted for the Tewin Lands to establish predevelopment conditions. Runoff coefficients derived for Tewin (using site-specific precipitation and flow monitoring data) were validated against watershed coefficients established with flows from the Bourget Bear Brook WSC gauge. Both showed similar trends, responding to weather events in a similar way as the data/ flows collected/ measured within and around the Tewin site. The average difference between the coefficients was +/-6% (a difference under 10% is considered excellent in hydrology), supporting the use of Bear Brook data as a good proxy for Tewin.

Runoff coefficients for both were found to vary throughout the year due to land cover, soil conditions, precipitation patterns, and vegetation growth. Higher values were observed in late spring and early summer, lower in mid-summer, and an increase in late summer and early fall.

Using 68 years of Bear Brook data, consistent seasonal patterns were observed, with runoff coefficients exceeding 1.0 during snowmelt in March and April. This means that during this time, the rainfall became runoff rather than infiltrating, highlighting the importance of snow accumulation and melt in water budget calculations.

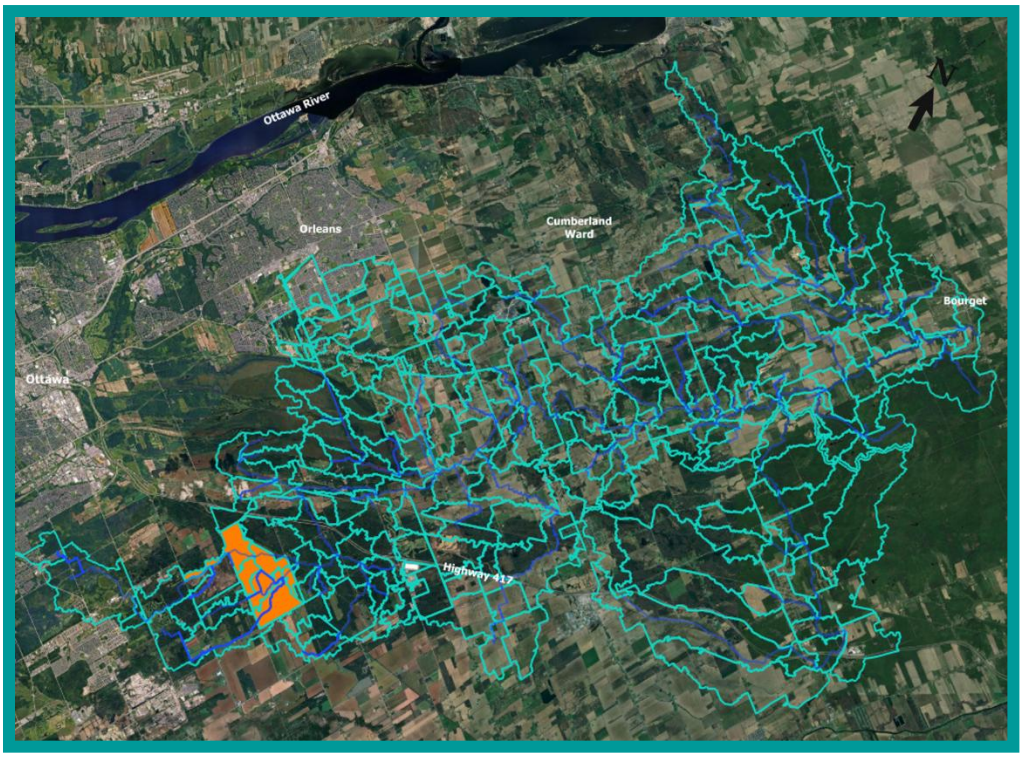
We note that given the physical characteristics of the Tewin Lands; for the purpose of assessing contributions to natural features and watercourses, surface runoff is considered to include the shallow groundwater system. This is appropriate as the shallow groundwater system is within a permeable material less than 3 metres from the surface and is operating in the same manner as surface runoff at the surface, travelling laterally and flowing into lower features.

The water budget for the Tewin Lands concluded the following:

- Ramsay Creek Watershed annual precipitation: 53% runoff (includes shallow groundwater system), 0.05% infiltrates into deep groundwater, and 47% evapotranspirates.
- Bear Brook Watershed annual precipitation: 52% runoff (includes shallow groundwater system), 0.05% infiltrates into deep groundwater, and 48% evaporates/evapotranspirates.

A regional-level water budget for the Bear Brook watershed has been prepared for South Nation Conservation as part of the Bear Brook Watershed Study. **Figure 16** illustrates the Tewin Lands within the Bear Brook watershed. The findings from this study, at the time the EMP was prepared, indicate general agreement on the broader water budget apportionment for the Bear Brook watershed, with limited groundwater infiltration, and most precipitation split between runoff and evapotranspiration. Differences in percentages can be accounted for by the categorisation of shallow groundwater flow and the refinement available within the Tewin Lands due to site-specific analysis based on extensive data collection from field investigations over several years.

Figure 16: Tewin Lands within the Bear Brook Subcatchments



3.7 Geomorphology

3.7.1 Fluvial Geomorphology

The extent of fluvial geomorphic assessment activities completed to-date spans the onsite tributaries of Bear Brook and Ramsay Creek, including the Smith-Gooding Municipal Drain and Johnston Municipal Drain, as well as downstream Bear Brook to the South Nation River, and Ramsay Creek through its confluence with Green's Creek down to the Ottawa River. Both field-based and desktop-based assessments have been completed, which included the following activities:

- Background review of all existing documents related to the Tewin Lands and topography, physiography, and geology maps of the local watersheds and area.
- Reach delineation for all watercourses in the Tewin Lands, including various tributaries downstream of the site boundary.
- Historical assessment of changes in land use and channel form and function using historical aerial photographs.
- Site reconnaissance, including rapid geomorphological assessments and channel characterization for all reaches identified on participating lands.
- Detailed geomorphological assessments of erosion-sensitive reaches identified by site reconnaissance to inform future erosion threshold analysis.
- Meander belt delineation and erosion identification for confined and unconfined reaches within the Tewin Lands.

Field investigations along Bear Brook and Ramsay Creek were completed over several months between October 2021 and December 2023. Rapid geomorphic field investigations were completed on a reach-by-reach basis on participating properties within and downstream of the Tewin Lands. Reach-by-reach observations generally included the following:

- Confirmation of desktop reach delineation extents
- Instream estimates of bankfull channel geometry
- Bed and bank material composition and structure
- Description of riparian vegetation type and cover
- Observations of erosion, scour, or deposition

Following the rapid field assessments, detailed geomorphological assessments were also completed on seven reaches within the Tewin Lands and along downstream reaches within both the Bear Brook and Ramsay Creek watersheds.

3.7.1.1 Terrain Analysis

Terrain analysis of a high-resolution digital elevation model (DEM) was used to classify the channel valley type for each of the channel reaches within the Tewin Lands, based on a publicly available LiDAR dataset maintained by OMNRF (2019/2020 data). This also included a review of the longitudinal profiles along Bear Brook.

3.7.1.2 Historical Assessment

A series of historical aerial photographs dating back to 1965 were reviewed to determine changes to watercourse systems and surrounding land use/cover over time.

3.7.1.3 Desktop Reach Delineation

Reach delineation was undertaken within the Tewin Lands, while also including reaches along Ramsay Creek and Bear Brook downstream to better identify areas sensitive to erosion. It should be noted that field assessments were generally limited to reaches on participating lands within the Tewin Lands.

3.7.1.4 Erosion Hazard Assessment

The erosion hazard is delineated as a meander belt width in unconfined systems. Unconfined systems are those with poorly defined valleys or slopes well outside where the channel could realistically migrate. Confined systems are those where the watercourse is contained within a defined valley, where contact between the watercourse and a valley wall is possible. Valley confinement and overall erosion hazards for confined systems have been identified by the geotechnical and geomorphological consultants in their respective existing conditions reports.

3.7.2 Geomorphological Assessment

3.7.2.1 Historical Assessment

Directly downstream of Tewin, Ramsay Creek's main branch meanders through a mix of active agricultural fields and treed areas in 1965 with little visible change to present day. Many of the tributaries were straightened for agricultural purposes and drain the surrounding actively cultivated fields. The upstream reaches of Ramsay Creek and its tributaries within the Tewin Lands (i.e., south of Leitrim Road) exhibit little planform development.

Historical imagery between 1976 and 1991 shows little observable changes in channel planform throughout the Tewin Lands for Bear Brook and tributaries. Land use remains predominantly active or fallow/transitional former agriculture. Riparian vegetation along the main branch of Bear Brook matures, as well as many of the upstream Bear Brook reaches located in the southern portion of the Tewin Lands.

Between 1999 and 2011, major changes within the Tewin Lands include the development of the Anderson Links Golf Course resulting in additional outlets to the main branch of Bear Brook through a series of constructed ponds. Several large beaver ponds are observed along upstream reaches of Bear Brook, resulting in slight changes in channel planform due to backwatering. Much of the land use remains active agriculture and forested plots increase in maturity.

3.7.2.2 Terrain Analysis

The longitudinal profiles along the main branch of Bear Brook exhibited the greatest change in slope around beaver dams, crossings, and tributary confluences. Generally, the areas with relatively lower gradients tended to precede beaver dams, most likely due to the deposition caused by backwatering and slower flows, as observed in the field assessments.

3.7.2.3 Erosion Hazard Assessment

3.7.2.3.1 Unconfined Valley Reaches

A review of recent and historical aerial imagery did not indicate the presence of significant meanders along any of the reaches. Based on this and field observations, unconfined reaches within the site are generally small and straightened. Definition of the erosion hazard for reaches within the Tewin Lands was based on an empirical modelling approach to determine a range of potential meander belt widths.

Results of the empirical modelling exercise and preliminary recommendations for meander belt widths are established on a reach-by-reach basis and range from 6 metres to 48 metres. These widths have been mapped as part of the natural hazard constraint through the Tewin Lands.

3.7.2.3.2 Confined Valley Reaches

A toe erosion allowance in the range of 5-8 metres for all confined reaches where the channel is within 15 metres of the valley slope is recommended based on field observations of geomorphic processes and local surficial geology. This information is incorporated into the slope assessment to establish boundaries of natural hazards on the Tewin Lands.

3.7.3 Erosion Threshold Analysis

Field-based and desktop-based assessments were completed for the main channels of Bear Brook and Ramsay Creek as well as several of their tributaries, including the Smith-Gooding Municipal Drain and Johnston Municipal Drain. A drainage characterization was completed to determine the geographical extent of the study area required to assess potential downstream impacts resulting from the development and to guide erosion threshold analyses. Based on the results of the drainage characterization and field-based assessments, erosion thresholds were determined for six erosion-sensitive reaches along Bear Brook, and two erosion-sensitive reaches within Ramsay Creek.

Erosion thresholds are used to determine the magnitude of flow required to potentially entrain and transport bed and/or bank material (Garcia, 2008; Villard and Parish, 2003). As such, they are used to inform erosion mitigation strategies in channels influenced by conceptual flow and stormwater management plans. An erosion threshold is often expressed as a critical streamflow discharge or shear stress. Changes in the magnitude, duration, and frequency of streamflow may alter the pattern and rates of channel erosion. The erosion threshold is a theoretical value, typically expressed as a critical discharge or shear stress, at which entrainment of sediment would occur based on the physical properties of the bed and bank materials. Due to variability between bed and bank composition and structure, erosion thresholds are determined for both bed and bank materials. The lower of the bed and bank erosion thresholds is adopted, as it provides the more conservative and limiting erosion threshold estimate for the subject reaches.

Two erosion-sensitive sites were identified along Ramsay Creek; Reach RC1 and RCB. An erosion threshold of 0.856 m^3/s was established for RC1, based on the critical velocity of 0.53 m/s required for the entrainment of the silt loam bed materials (Fischenich, 2001). An erosion threshold of 1.045 m^3/s was established for Reach RCB, based on the critical shear stress for the fairly compact clay

bed materials (Chow, 1959). The criteria and corresponding erosion thresholds for each reach are outlined below in **Table 1**.

Table 1: Erosion threshold summary for the two erosion-sensitive Ramsay Creek sites.

RAMSAY CREEK EROSION THRESHOLD ANALYSIS		
Reach	**RC1**	**RCB**
Limiting factor	Bed	Bed
Criteria	Sandy loam (Fischenich, 2001)	Fairly compact clay (Chow, 1959)
Critical velocity (m/s)	0.53	-
Critical shear stress (N/m^2	-	9.57
Erosion threshold (m^3/s)	**0.856**	**1.045**

Six erosion-sensitive sites were identified within the zone of impact along Bear Brook; BB5-5A-3, BB5-5, BB5, BB6, BB1 and dBB1. Erosion thresholds were established based on the critical shear stress and critical velocities required for entrainment of bed or bank materials. The criteria and corresponding erosion thresholds for each reach are outlined below in **Table 2**.

Additional details including channel parameters for all erosion sensitive reaches are provided in ***Appendix F.***

Table 2: Erosion threshold summary for the six erosion-sensitive Bear Brook sites

RAMSAY CREEK EROSION THRESHOLD ANALYSIS						
Reach	**BB5-5A-3**	**BB5-5**	**BB6**	**BB5**	**BB1**	**dBB1**
Limiting factor	Bed	Bed	Bank	Bed	Bank	Bed
Criteria	Fine gravels (Komar D84, 1987)	Alluvial silt (Fischenich, 2001)	Silty loam (Fischenich, 2001)	Silty loam (Fischenich, 2001)	Sandy loam (Fischenich, 2001)	Sandy loam (Fischenich, 2001)
Critical velocity (m/s)	0.73	0.61	0.53	0.57	-	-
Critical shear stress (N/m^2	-	-	-	-	2.39	2.39
Erosion threshold (m^3/s)	**0.89**	**0.81**	**1.38**	**2.18**	**2.95**	**3.48**

3.8 Natural Environment

3.8.1 Surveys

3.8.1.1 Vegetation Cover

High-level vegetation surveys were conducted from May to July 2022 using Ontario's Ecological Land Classification (ELC) system (Lee et al., 1998). The ELC provides a standardized method to classify, describe, and map vegetation communities based on soil and plant species composition across terrestrial and wetland habitats. This classification helps assess habitat diversity, potential species presence, and suitability for species at risk (SAR). The 2022 ELC surveys were planned partially based on informal explorations of the site conducted in the fall of 2021; minor ecosite boundary confirmations/rechecks were conducted in the summer of 2023.

3.8.1.2 Woodlands

Significant woodlands were assessed based on the City of Ottawa's Official Plan criteria. Areas classified as "woodlands" under the *Forestry Act* or as "forest" ecosites in the Ontario Ecological Land Classification (ELC) system were evaluated.

- Urban Areas: Woodlands ≥0.8 ha and ≥60 years old were identified using historical imagery and field verification.

3.8.1.3 Canopy Cover

Canopy cover was assessed using ELC classifications. Percent canopy cover was estimated within ecosites during the ELC investigation with general averages noted for broad landcover types.

3.8.1.4 Wildlife (Terrestrial and Aquatic)

Wildlife surveys were conducted from May to August 2022 to identify species at risk within Tewin Lands.

3.8.1.4.1 Breeding Birds

Morning breeding bird surveys followed the Ontario Breeding Bird Atlas Guide (2001) and used point counts at survey stations covering all habitat types. Surveys were conducted under calm weather conditions (Beaufort Scale <3, no precipitation).

3.8.1.4.2 Anurans

Anuran surveys followed the Marsh Monitoring Program (Birds Canada, Environment Canada, 2009). Multiple survey stations were visited three times at night, at least 15 days apart, during spring and early summer to capture spatial and habitat variability.

3.8.1.4.3 Fish

Aquatic studies, including full fish characterization, were conducted by SNC in 2020 and 2021, with additional surveys of Tewin water bodies in 2022.

3.8.2 Wildlife (terrestrial and aquatic)

3.8.2.1 Breeding Birds

A total of 67 bird species were detected in the Tewin Lands via morning breeding bird surveys and incidental observations during the 2022 field season.

Six listed SAR were detected during the morning breeding bird surveys and through incidental observations. Eastern Wood-pewee was relatively widespread across the site and was detected throughout the breeding season within all larger forested areas. Bobolink and Eastern Meadowlark were detected in the large open fields north of Piperville Road. Both species were also observed on the golf course, though this area has limited potential to provide direct habitat. Grasshopper Sparrow was detected from a single survey station, also on the golf course, and only one time, suggesting a limited breeding presence directly on the site. Barn Swallow was consistently observed during all three surveys, but only from the active farm field north of Piperville Road. Wood Thrush was detected at two locations in the larger mature woodlands south of Piperville Road, but only on one occasion, as with Grasshopper Sparrow, the lone observation is suggestive of a transient presence only. No Eastern Whip-poor-will or Common Nighthawk individuals were heard during any of the 2022 surveys, despite the suitability of survey conditions.

3.8.2.2 Anurans/Frogs

A total of four frog species were observed during evening aural surveys across Tewin in 2022. Spring Peeper and Wood Frog were the only species observed in full chorus during aural surveys, both during the early spring survey. Across the site, however, only one of the two species would be present in abundance at a given location, except in wetland areas associated with the Johnston Municipal drain near Anderson Road, where both species occurred in abundance. For the other two species observed at Tewin - American Bullfrog and Green Frog, only small numbers of individuals were ever noted in any given wetland.

3.8.2.3 Fish

The Bear Brook Watershed is home to at least 26 different species and based on fish community assessments conducted by SNC (2020 and 2021) and the 2022 field survey, there have been no invasive fish species nor fish species that are currently listed under the *Endangered Species Act* or the *Species at Risk Act* that were caught. Rock Bass and White Suckers were the only “sport fish” caught on the site. Overall, the most caught species in the Bear Brook Watershed were the Creek Chub, Central Mudminnow, and Pumpkinseed. All fish captured other than the Rock Bass were common baitfish to Central Ontario and are all tolerant to warm waters. Within the portion of the Bear Brook Watershed in the Tewin Lands, fish were only observed within the larger creeks and municipal drains east of Anderson Road.

The upstream-most reach of Ramsay Creek on the northeast corner of the Tewin Lands was found to support a single species of fish (Central Mudminnow). The reach is not a pristine watercourse and does not provide critical habitat for endangered species but likely supports the full life cycle of the (limited) resident fish species. A single former farm ditch in the central portion of the golf course retained water throughout the summer because of the presence of beaver dams. Immediately downstream of these beaver dams, on the north side of Leitrim Road, the channels were observed to fully dry by early spring. The ponded area behind the dams formed a series of long linear troughs

which supported Central Mudminnow, Northern Redbelly Dace, Finescale Dace, Brassy Minnow, Fathead Minnow, Creek Chub, and Brook Stickleback, but only in low numbers. Given the conditions in the lower reaches by early spring, that reach would not be anticipated to support a fish community without the beaver dams.

3.8.3 Fish Habitat

The Tewin Lands are characterized by two significant tributaries of Bear Brook and two small headwater tributaries to Ramsay Creek. Both watersheds contain numerous smaller channels heavily modified or constructed by anthropogenic activities to support agricultural and infrastructure drainage. Fish habitat in the watercourses on the Tewin Lands is limited to the reaches shown with yellow dashes on **Figure 17** and the municipal drains. In some cases, higher water levels were supported by backwater and beaver damming than would otherwise likely be expected.

The Bear Brook watercourses are generally characterized as 'flashy', with water levels and flows driven by rain and snowmelt events which quickly run off from the surface or through the shallow groundwater table into the channels. Deeper groundwater in the clay unit is not understood to be contributing any significant baseflow, and the main tributaries' hydration is generally supported by upstream flows moving through the Tewin Lands.

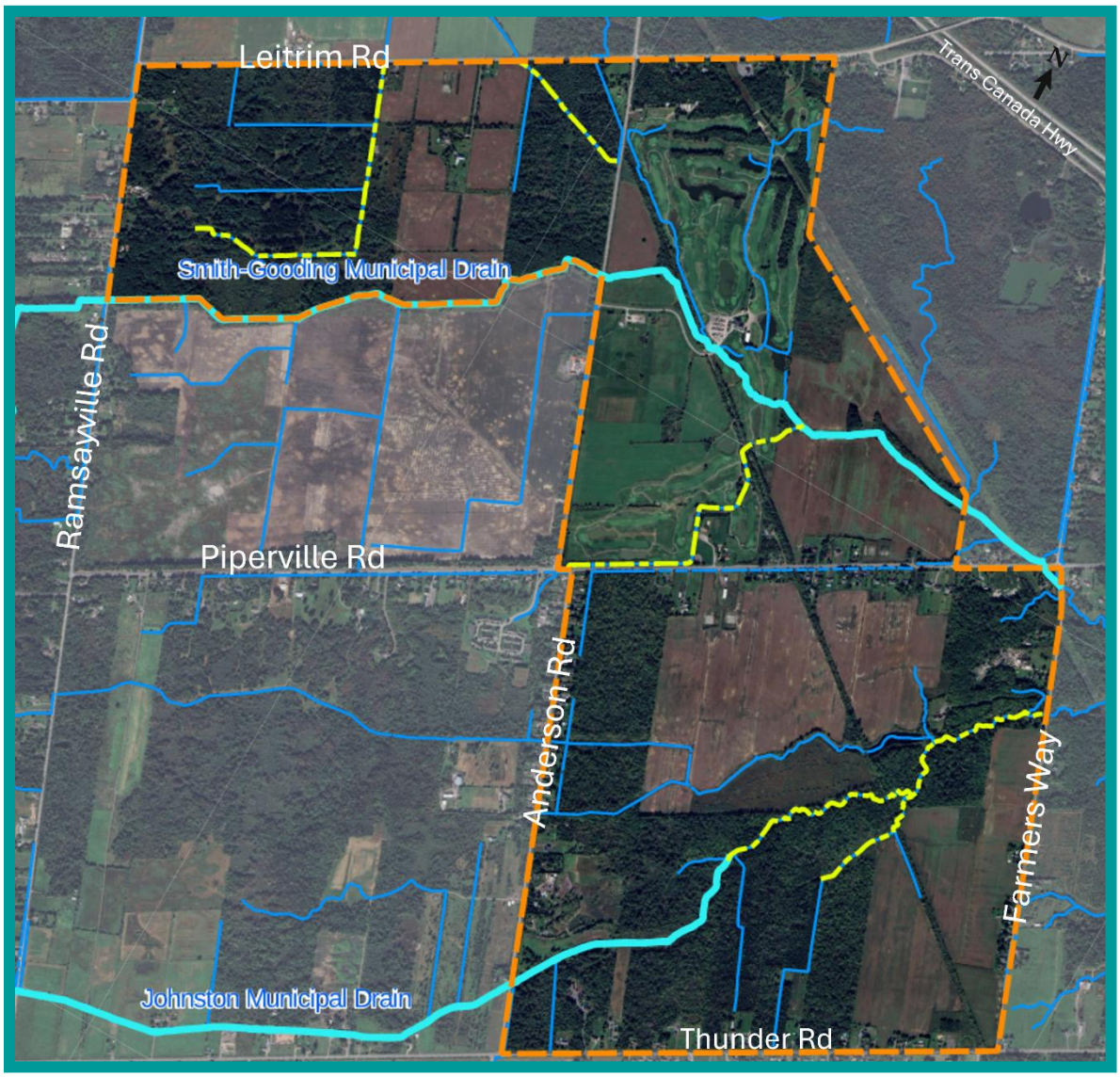
In the Ramsay Creek catchment, the watercourses are linearized, low-order, former farm drains or erosion gullies adjacent to the former farm ditches. Other than the two permanent small headwater reaches upstream of the connection under Leitrim Road, these ephemeral features were wet during the spring but were all found to fully dry up through May and thus did not provide useful fish habitat or water contributions downstream.

The western reach of the Smith-Gooding Municipal Drain is a trapezoidal channel, frequently dammed by beavers, permanently wet year-round containing fish habitat.

Within the golf course and adjacent agricultural fields, banks along the Smith-Gooding Drain generally included narrow bands of trees and/or deciduous shrubs, but smaller tributaries consisted of shallow swales from the adjacent fields, conveying spring meltwater runoff. These features were all fully dry by late May and, as such, none provided areas of additional fish habitat or more than ephemeral flows.

In the southeast of the Bear Brook catchment, there are two permanent tributaries. These are characterized by many small side channels with wetted widths of 2 metres and depths generally ≤15 cm or less at the peak of the spring freshet, and do not provide additional fish habitat or water contributions outside this period. Channels were damp to dry by late May. Fish habitat through the area was limited to the Johnston Municipal Drain and reaches shown with yellow dashes in **Figure 17.**

Figure 17: Watercourses and Fish Habitat



3.9 Soils and Geology

3.9.1 Geotechnical Investigations

Geotechnical investigations of the Tewin site were completed by Paterson Group between March and December of 2022. A total of 98 boreholes, as shown in **Figure 18**, were assessed to maximum depth of 58.0 metres and were located to provide general coverage of the Tewin Lands while sampling the overburden. The geotechnical review also considered earlier such investigations by Paterson undertaken throughout the Tewin Lands in the fall of 2011. Samples collected considered the substrate materials and stratigraphy as well as groundwater level.

3.9.1.1 Geology and Physiography

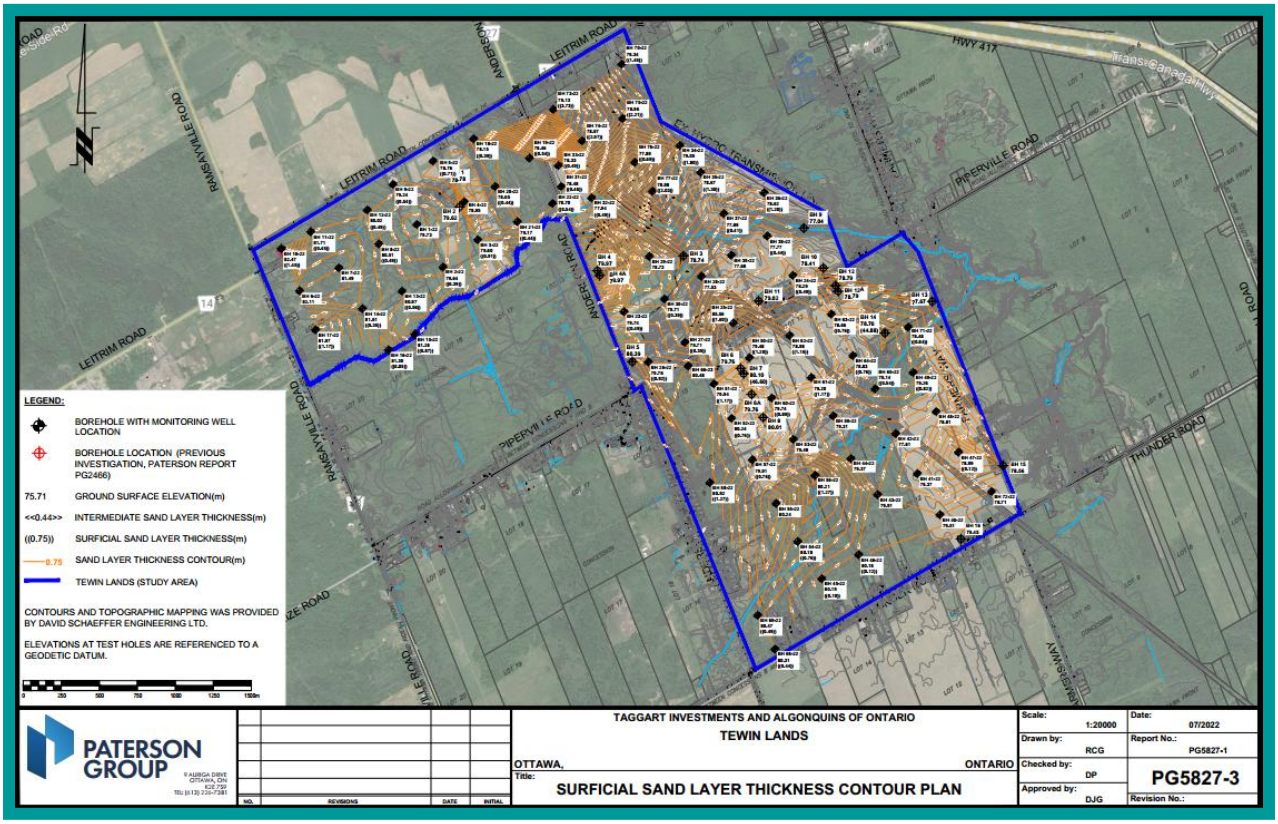
The site is in a physiographic region known as the Russell and Prescott Sand Plains with sand deposits across the site associated with the Champlain Sea. The surficial geology is mapped as fine-to-medium-grained (nearshore deposits) along the western boundary of the Tewin Lands, with silt and clay (off-shore marine deposits) mapped across the central portion of the site. The surficial deposits along the northeastern corner of the area are mapped as medium-to fine-grained sands with characteristics of deltaic and estuarine deposits. The courser-grained materials are non-cohesive and more susceptible to erosion, whereas the finer silty and clay-sized materials that are mapped across most of the Tewin Lands have a greater cohesive bond and are, therefore, more resistant to erosion (see Paterson Group Geotechnical Report in ***Appendix I***).

3.9.1.2 Subsurface soil profile and stability

Generally, the subsurface profile encountered consists of a deposit of silty clay overlain by a relatively thin layer of weathered clay or sand and underlain by a deposit of glacial till and further by the bedrock formation. The subsoils throughout the site consist of a clay deposit typical of many parts of the Ottawa Area including Centretown, Kanata, Barrhaven, Richmond and Orleans (among others) and extending to between 21 to 52 metres below the ground surface.

These subsurface conditions have been extensively investigated, and the site is considered suitable for the proposed development from a geotechnical perspective. The soils underlying the study area are not susceptible to liquefaction or cyclic softening during earthquakes. The presence of the silty clay deposit establishes a preliminary permissible grade raise restriction of 0.5 to 0.6 metres above the existing and original ground surface for the proposed grading, if standard mitigation measures are not employed. There may be opportunities to improve the permissible grade raise through additional geotechnical study and ground improvement programs.

Figure 18: Sand Layer Thickness Contours (source: Paterson Group)



3.10 Terrestrial Natural Features

3.10.1 Vegetation Cover

A total of 38 distinct ELC units (ecosites, vegetation types, or other), encompassing both terrestrial (upland) and wetland communities, were delineated for the Tewin Lands. Twenty-five of these ELC units are terrestrial and thirteen are wetland classifications. Some terrestrial ecosites, however, were more accurately characterized as "transitional", rather than being fully described as either terrestrial or wetland. Following the ELC ecosite descriptions, areas with dominant vegetation coverage comprised of linear, monocultural rows of non-wetland-specific coniferous trees are defined as plantations. Plantations (including naturalizing plantations) are formally classified as terrestrial ecosites. An overview of the ELC units is provided in **Figure 19**.

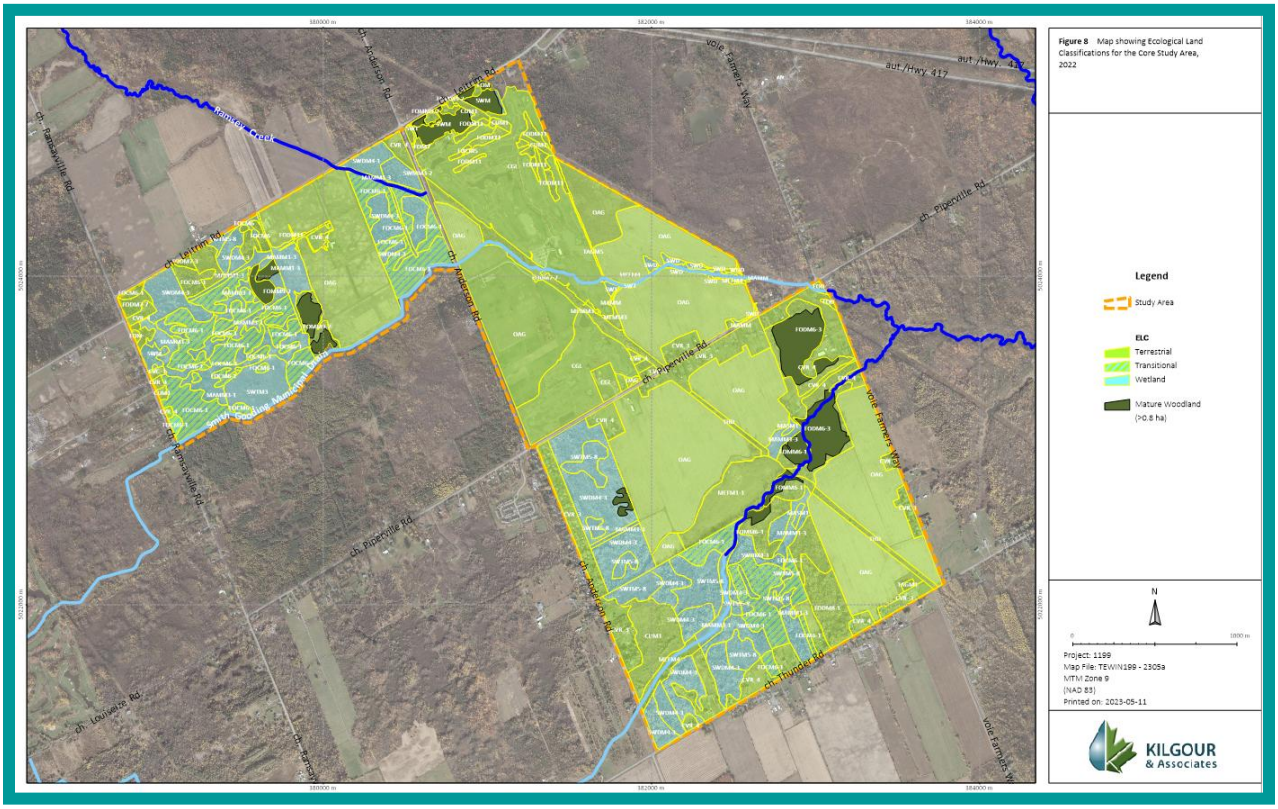
The ELC designations were used in subsequent analyses to identify potential habitat that may be used by species of interest (i.e., SAR) potentially occurring within the Tewin Lands.

In reviewing plant species within the delineated ecosites, seven tree species from the broader region were noted as having cultural significance to the Algonquin peoples:

- Eastern White Cedar (*Thuja occidentalis*)
- White Birch (Betula papyrifera)
- Sugar Maple (*Acer saccharum*)
- Trembling Aspen (*Populus tremuloides*)
- American Basswood (*Tilia americana*)
- White Spruce (*Picea glauca*)
- Tamarack (Larix laricina)

Five of these species were documented as widespread or dominant species in at least one ecosite within the Tewin Lands. American Basswood and Tamarack were not recorded as dominant species in any of the ecosites.

Figure 19: Ecological Land Classification for Tewin Lands, 2022 (source: Kilgour and Assoc.)



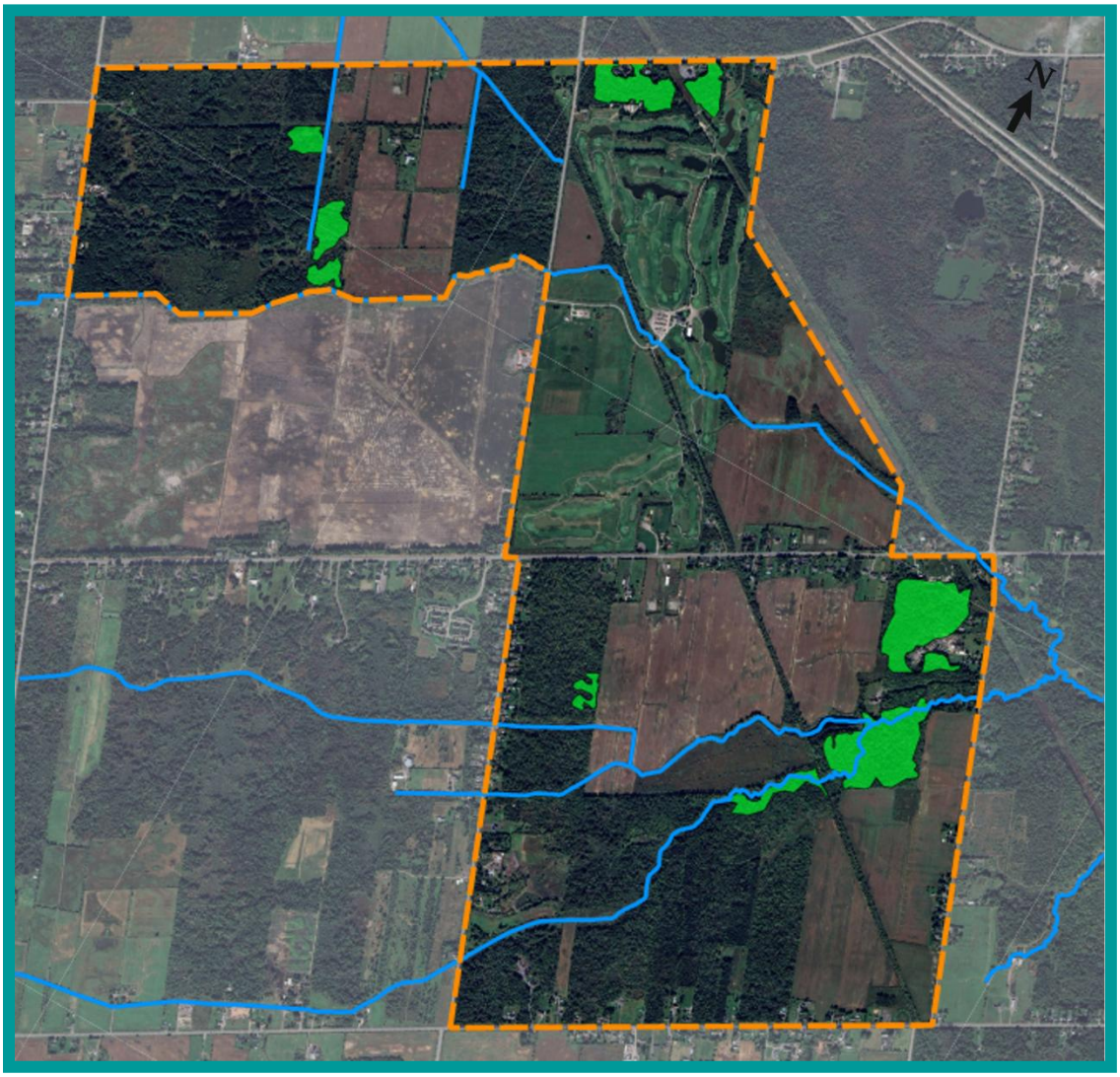
3.10.2 Woodlands

National Air Photo Library 1964 air photos were correlated with 1976 and more recent imagery to establish polygons over 0.8 ha of woodlands at least 60 years of age.

Eight of these areas are relatively small, ranging in size from 0.83 ha to 4.45 ha and comprise of mixed forest, naturalizing conifer plantation, mixed swamps, deciduous swamp, and thicket swamp. The mature woodlands are shown in **Figure 20**. Two areas located near the corner of Farmer's Way and Piperville Road, however, comprise relatively larger areas (8.8 and 10.4 ha respectively) of mature, Fresh-Moist Sugar Maple – Yellow Birch Deciduous Forest.

Of these woodlands identified in the 2022 existing conditions report, some are on privately owned lands.

Figure 20: Areas meeting the definition for Significant Woodland within the Tewin Lands.

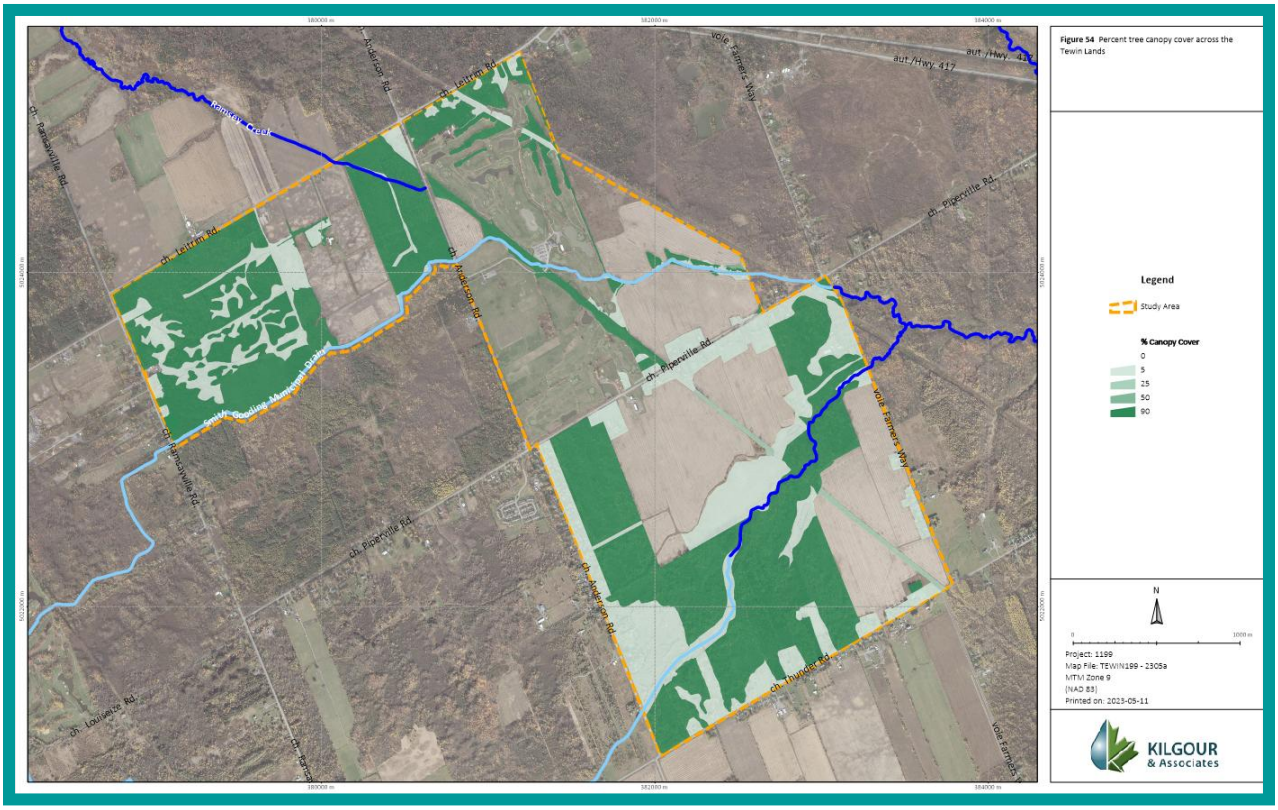


3.10.3 Canopy Cover

As shown in **Figure 21**, the canopy cover within the site was estimated to be 31.9% based on the ELC for the area. The ELC delineation of "forested" ecosites — including forests, plantations, and swamps — captured heavily treed extensions on residential/commercial lots as well as dense hedgerow features, while excluding noticeable gaps within more broadly treed areas. As such, these ecosites generally comprised 90% canopy cover. Canopy cover over the golf course and commercial areas was deemed negligible (0%), having treed clusters excluded from their ecosite delineation. Roadway corridors were delineated to the edges of natural vegetation and so were also listed as having 0% canopy cover. Other open areas include occasional individual trees and were estimated to have 5% canopy cover on average. Tree canopy cover within thicket ecosites was generally around 25%, while woodland ecosites had 50%.

The canopy cover of the Tewin Lands in 2022 has been calculated as 31.9 %, however alterations by private owners outside of Tewin ownership, and clearing by Hydro Ottawa for a substation have lowered this number at the time of writing of this EMP.

Figure 21: Percent tree canopy cover across the Tewin Lands



4 Opportunities and Constraints

The Tewin Lands encompass numerous natural features, though only a few are noteworthy. The site has been entirely manipulated by anthropogenic activities over the past one-hundred years in support of agriculture, transportation, utilities and residential uses. Aerial imagery of the site as it existed in 2024 is presented in **Figure 22**. For this reason, and in consideration of the Tewin Intent, the challenges and opportunities on the site are approached from a broader holistic perspective. This strategy ensures that the few features of ecological significance are protected, and that new rich and high-quality natural features are established in tandem with the advance of development, supporting a large, robust natural system, connected through the Tewin Lands and the adjacent landscape. This system-based approach places higher value on connectivity and functionality, with support and buffering by complementary adjacent land use, rather than feature-by-feature-based protections.

Natural hazards, existing infrastructure and other technical constraints have been identified and addressed.

Tewin's approach to climate change is aligned with the City of Ottawa Climate Change Master Plan and specifically supports the priorities of natural system sustainability and services, water resilience and cultural shifts away from carbon-generating activities. Current predictions and scenarios consider potential and extent of climate change impacts, however the long period over which the Tewin Lands will be developed allows for adaptation to evolving information and the implementation of novel strategies as they enter practice.

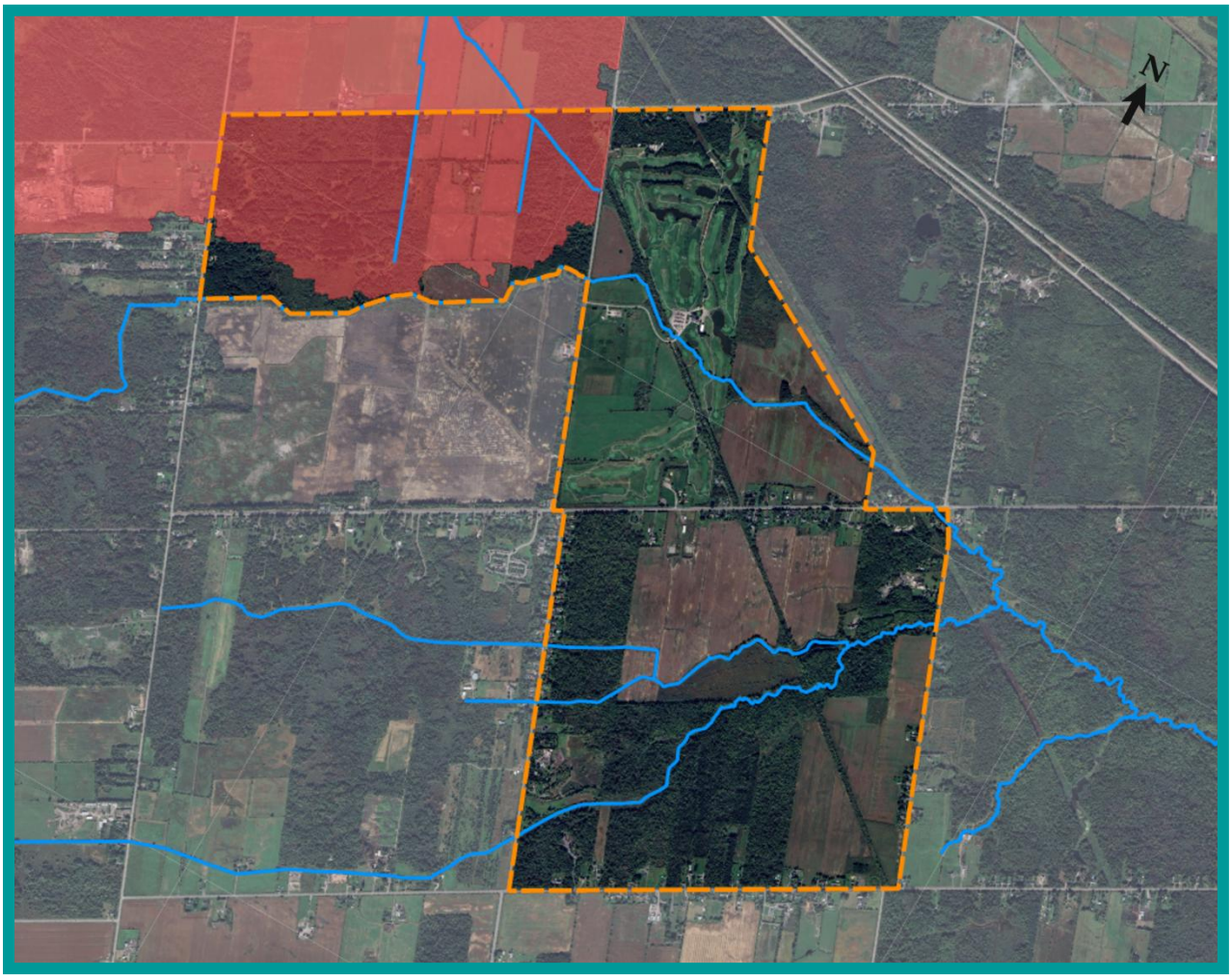
Figure 22: Tewin Lands 2024

4.1 Natural Heritage Considerations

4.1.1 Watersheds

The watercourses and associated headwater features identified on the Tewin site are part of the upper watersheds of two distinct watersheds, the Bear Brook and Ramsay Creek (**Figure 23**). It is important to maintain the surface water divide between the two watersheds to support hydration in each system and protect against the exacerbation of hazards associated with watercourses.

Figure 23: Ramsay Creek and Bear Brook Watershed Divide



4.1.2 On-site Watercourses

4.1.2.1 Natural Drainage Density

The landscape and drainage pattern of the Tewin Lands has been substantially altered, mainly in support of past agricultural practices. Tile drainage, ditching and watercourse straightening are found across the landscape. Using historical survey mapping, the watercourses that originally evolved to establish a natural drainage fabric over the lands can be compared against the Euro-Canadian settlement attempts to manage the land for crop production.

Figure 24: Historical Mapping from 1863, 1879, 1908 (source: WSP)

Mapping from 1863, 1879 and 1908 was reviewed to identify the original locational and density of watercourses occurring naturally across the site prior to anthropogenic intervention for agricultural drainage.

The archeological research undertaken on these lands describes the historical mapping as follows:

- 1863 plan of Carleton County: Two watercourses are depicted passing through the study area and likely show the original locations of the larger sections of Ramsay Creek and Bear Brook before the study area was impacted by land clearing and drainage alterations associated with Euro-Canadian settlement.
- 1879 plan of Carleton County: Some changes in the locations of watercourses are apparent between the 1863 and 1879 plans. Ramsay Creek is now shown as ending in the northwest portion of the study area and more of the headwaters for Bear Brook are depicted, some extending west into the urban expansion boundary area.
- 1908 topographic map: Portions of Ramsay Creek have been visibly straightened, likely in the creation of drains to facilitate agriculture.
- The 1908 map was selected as the most accurate and complete for the purpose of establishing the on-site water course network.

This window into the original natural drainage fabric across the Tewin Lands establishes a target watercourse density and layout to support a sustainable natural system. Comparing the anthropological altered watercourse layer of present day against the most detailed of the historical mapping shown in **Figure 24** results in an understanding of the location of the mainstems and indicates the degree of disturbance across the landscape.

Tracing these historically surveyed reaches onto the site (shown in dark blue on **Figure 25**) and measuring their lengths in a GIS application provided a good standard for understanding the watercourse network that evolved for natural drainage prior to settlement activities. This core watercourse system provides an important foundation for establishing connected natural corridors through the site with an appropriate density of drainage.

The target lengths to be supported in the development area, reflecting a sustainable natural drainage density on the landscape, are provided in **Table 3**.

Figure 25: 1908 Legacy watercourses (dark blue) with existing network (light blue).

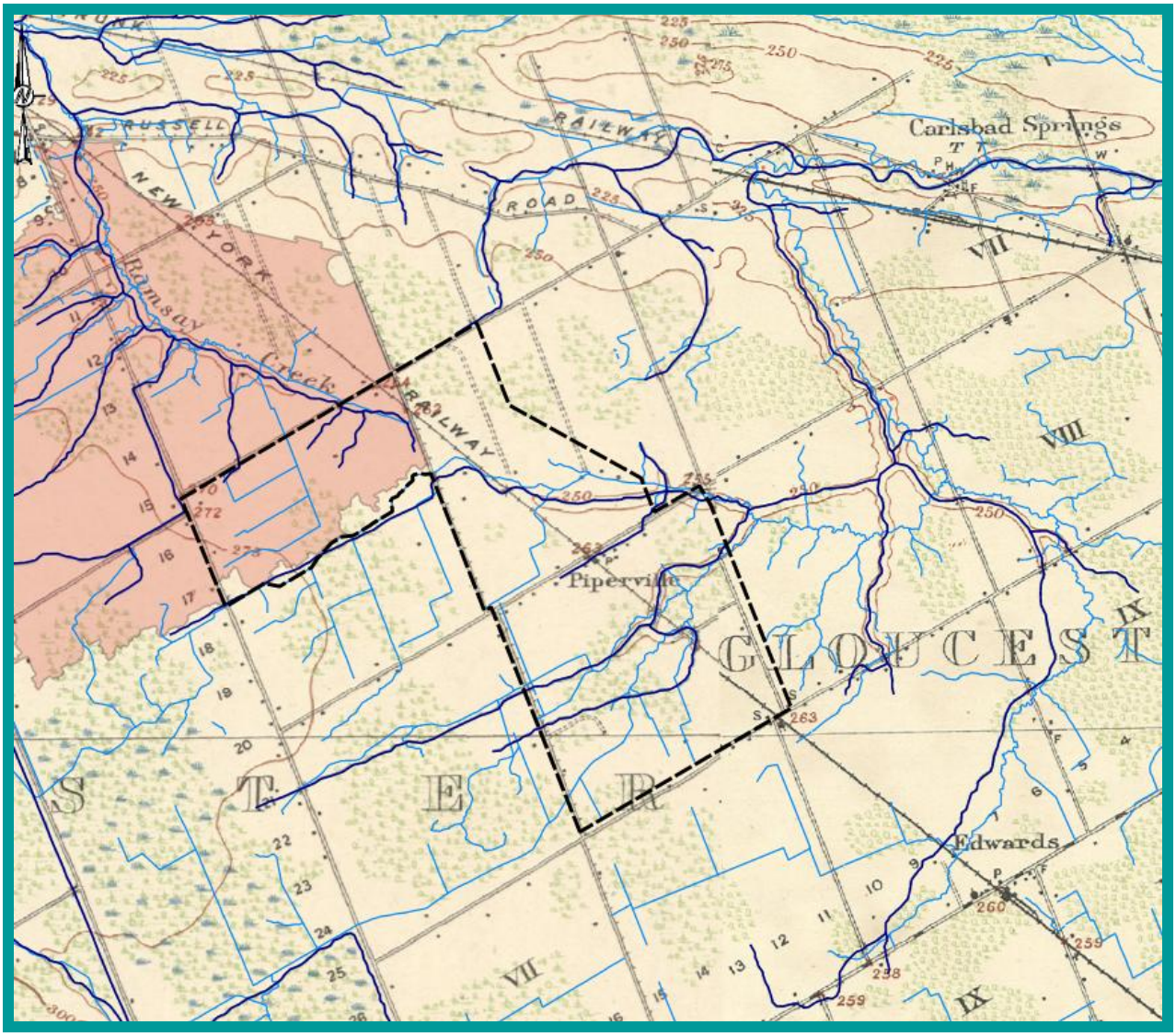


Table 3: Pre-Euro-Canadian Site Alteration (1908) Watercourse Lengths

Watershed	Length of pre-settlement watercourses (1908)
Ramsay Creek	2,130.0 m
Bear Brook	9,727.2 m

4.1.2.2 Ramsay Creek existing on-site

The western headwater network (south of Leitrim Road) is mapped as a forked network of straight ditches constructed to support drainage of the area for agricultural uses. Long abandoned, they are barely discernible on the ground and have no banks or flow. No floodplains or slopes are associated with these ephemeral watercourses, and they provide limited fish habitat.

The eastern tributary is comprised of two straightened channels historically servicing a small group of tile-drained fields. These channels also collect flows from the roadside ditches of Anderson Road and small set of the remaining cropped fields still under production.

Opportunities to rehabilitate watercourses in this area should be sought. This should include providing permanent hydration, quality aquatic habitat and hydrologically connected wetlands at an appropriate density in the Ramsay Creek catchment.

4.1.2.3 Bear Brook existing on-site

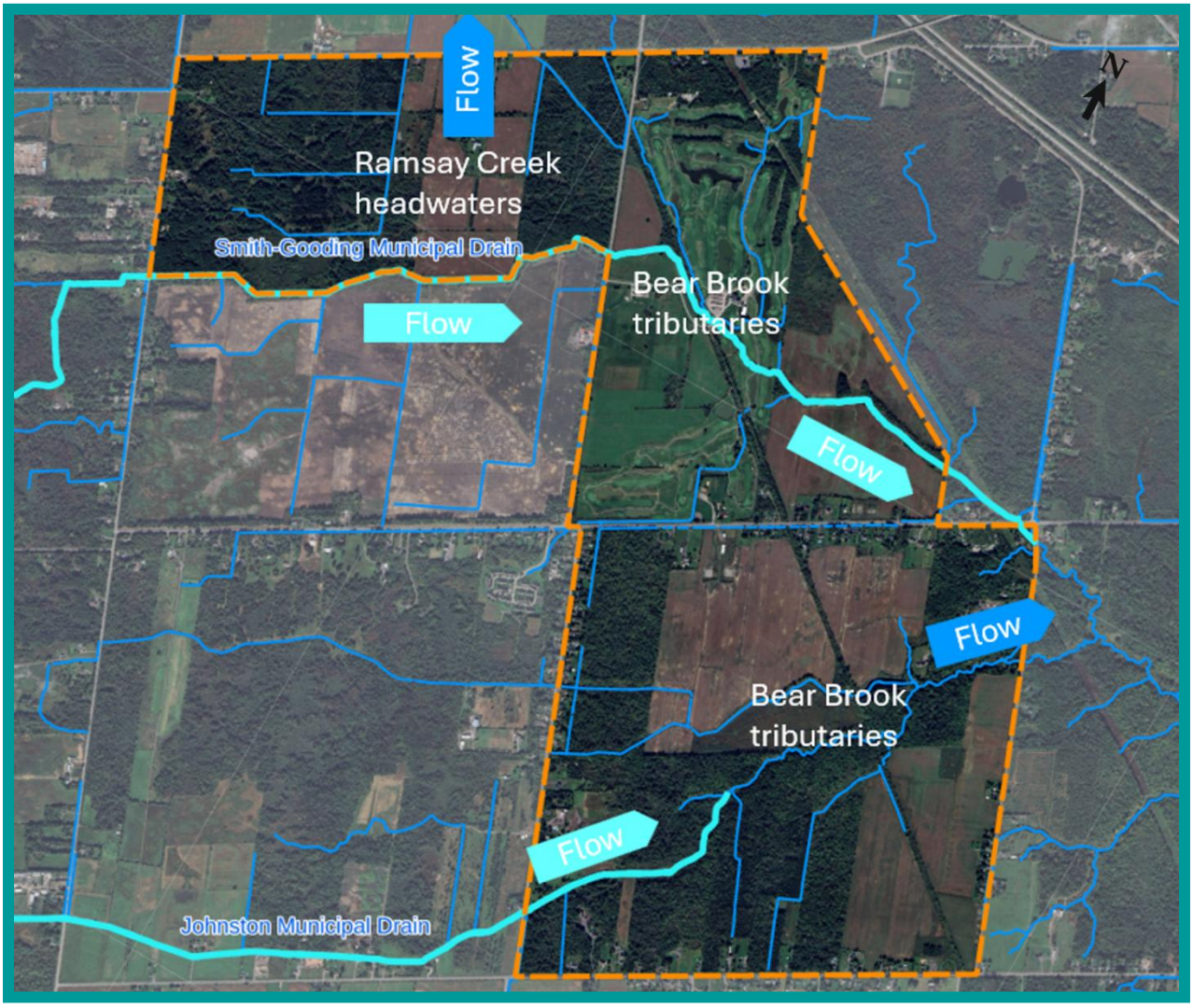
The Bear Brook watershed covers the remainder of the site east of Anderson Road, with smaller headwaters beyond the site limits to the west. Divided into two main reaches (north and south) flowing west to east, they outlet under Farmers Way, and connect on adjacent downstream lands before flowing under the Highway 417 and eastward through the Greenbelt lands, as shown in **Figure 26**.

The mainstem of the northern reach runs along the southern boundary of the north-west block. This section is encumbered as a municipal drain, straightened and designed as a trapezoidal channel to efficiently carry water downstream in accordance with the 1973 Drainage Engineers Report for the Smith-Gooding Drain. The historical mapping does not suggest a significantly different location as it crosses under Anderson Road and traverses through the central area, becoming more deeply incised as it reaches Farmers Way. Access requirements established by the Drainage Engineers Report indicate access is available for maintenance on both side of the drain.

The southern reach collects flows from the west and south of the site, flowing eastward in three separate channels, including the Johnston Municipal Drain, established by the 1978 Engineers Report. The channels combine and become more deeply incised before flowing under Farmers Way.

The mainstem tributaries should be preserved and enhanced with riparian vegetation, hydrologically connected wetland cells, continued hydration and quality aquatic habitat. Upstream flows travelling through the site must have the outlet protected.

Figure 26: Existing Ramsay Creek and Bear Brook Drainage Network and Municipal Drains



4.1.3 Downstream Receivers

4.1.3.1 Ramsay Creek

Flowing to the north into Green's Creek and ultimately the Ottawa River, Ramsay Creek receives flows from the Tewin Lands through 2 culverts under Leitrim Road. The Ramsay Creek headwaters subwatershed is shown in **Figure 27**. The drainage area associated with the Tewin Lands accounts for approximately 11.7 % of the total drainage area of the Ramsay Creek watershed, and approximately 1.4% of total drainage area of the Green's Creek watershed at its confluence with the Ottawa River. As such, the Tewin Lands occupy a relatively small portion of this drainage area.

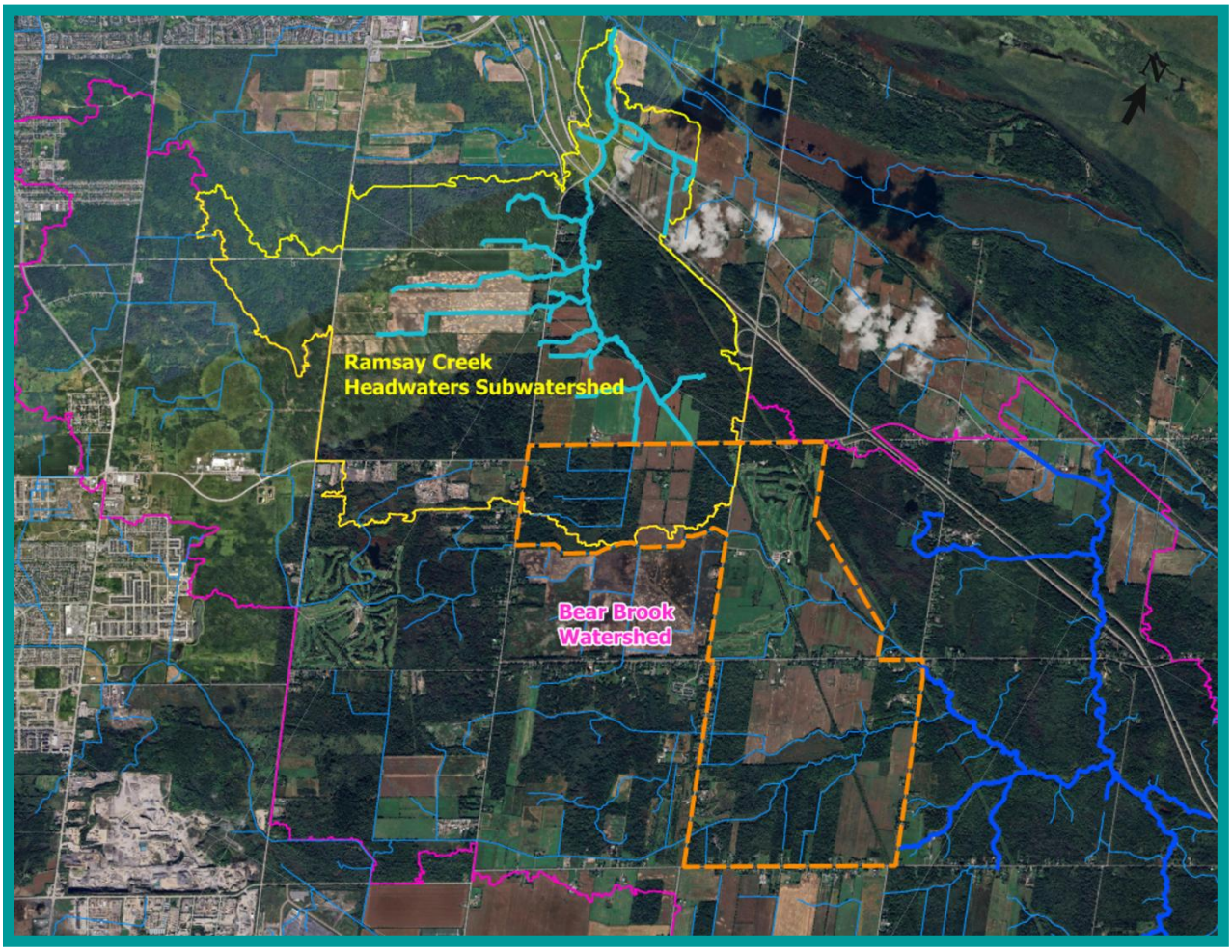
Reach-scale channel gradients within and downstream of the Tewin Lands are relatively shallow (i.e., generally <0.5%) throughout the Ramsay Creek system. Directly downstream of Leitrim Road, Ramsay Creek is channelized and has limited riparian area through the agricultural lands. The

Leitrim Road culverts do not support good aquatic connections with the Tewin Lands and are perched during dryer seasons.

Opportunities are therefore available to work with adjacent landowners to achieve environmental enhancements along the watercourse corridors to improve riparian conditions and aquatic habitat, while securing outlets for the urbanized Tewin Lands.

Appropriate on-site stormwater management (SWM) controls shall be designed to control flows from the Tewin Lands to ensure no increase in flooding or erosion potential within the receiving, downstream reaches of Ramsay Creek.

Figure 27: Bear Brook and Ramsay Creek Watersheds



4.1.3.2 Bear Brook

The Bear Brook flows through the Tewin Lands east of Anderson Road, exiting the site at two locations under Farmers Way, combining into one channel immediately downstream and flowing east under Highway 417.

The Bear Brook supports aquatic habitat and therefore hydration of the system is important to maintain environmental functions.

At the same time, the impacts of future urban flows originating from the Tewin Lands must not exacerbate erosion or flooding. Erosion is a natural process in river systems and so the objective of stormwater management (SWM) is not to eliminate erosion, but to maintain a level of stream erosion that is consistent with pre-development conditions. A combination of desktop and field-based geomorphological assessments have been completed along Bear Brook from the Tewin Lands to the South Nation River and have found that there is evidence of existing erosion along the downstream, receiving reaches of Bear Brook. **Figure 28** provides an overview of the Bear Brook main branch.

A hydrological cumulative impact assessment accounting for other urban planned expansion areas within the watershed found that with post to pre quantity stormwater controls up to the 100 -year event in place on the Tewin Lands and other development areas, there were no cumulative peak flow increases downstream (see ***Appendix I***).

A subsequent analysis was undertaken which used the updated SNC 2025 HEC-HMS model Spring and Summer events, considering the 2-year to 100-year peak flows. In addition to accounting for the Tewin lands and planned future expansion areas, this additional study considered all potential future development lands within the City of Ottawa boundaries except for lands identified by long-term constraint designations such as prime agriculture, provincially significant wetlands, aggregate resources and natural hazards. It is noted this is a highly exaggerated development scenario from a stormwater management perspective, and that any potential expansion beyond the current Official Plan Future Neighbourhood Areas would be subject to detailed consideration under separate processes under the Planning Act.

The analysis found that applying the Tewin stormwater management (SWM) design with a 70% imperviousness assumption, that increases in annual flood risk were prevented, and, in general, reduced peak flows for the 2-year to 100-year design events at the model nodes evaluated.

This works supports an approach that the application of appropriate on-site SWM controls on the urban flows from the Tewin Lands will not increase flooding or erosion potential within the receiving, downstream reaches of Bear Brook.

Mutually beneficial opportunities to work with adjacent landowners to improve riparian conditions and aquatic habitat should be explored to coincide with securing outlets for the urbanized Tewin Lands.

Figure 28: Bear Brook Downstream from HWY 417 to South Nation River (source: GeoMorphix)

4.1.4 Woodlands

The legacy of agricultural clearing, plantation and fallow cropland has preserved few mature woodlands greater than 60 years old across the site. Those that remain contribute valuable canopy, habitat, natural beauty, diversity and social values. These woodlands over 0.8 ha have been mapped as shown on **Figure 20** in Section 3.10.2. Some woodlands identified remain privately owned and the management will be addressed either through private owner initiatives or future development applications. Those woodlands within the Tewin Lands under control of the Tewin ownership group shall be preserved in their entirety, with an exception to the polygons east of Anderson Road, fronting on Leitrim Road. In this single location, the integrity of the consolidated feature is currently jeopardized by the multiple private individual properties, hydro cut through, and golf course facilities. Preservation of the entire feature has been balanced with realistic expectations and manageable boundaries.

The eight fully intact woodland areas will not be isolated, rather they must be connected with other natural features and adjacent complementary land uses to support their integrity and benefit from their environmental contributions.

The hydrological conditions supporting these woodlands have been investigated through feature specific water budget exercises (***Appendix E***).

It was found that for the significant woodlands, on average, **57%** of the annual precipitation will evaporate/transpire back into the atmosphere, **43%** of the annual precipitation will runoff (surface runoff + interflow + baseflow), and approximately **0.056%** of the feature specific water budgets will infiltrate into the deep groundwater layer. For the surface drainage areas contributing to the Woodland area, it is found that, on average, **54%** of the annual precipitation will evaporate/transpire back into the atmosphere, **46%** of the annual precipitation will runoff, and approximately **0.056%** will infiltrate into the deep groundwater layer.

In consideration of these conditions, and the known character of the tree species, deep groundwater elevation changes are not expected to be a significant factor in the long-term

sustainability of these woodlands. However, surface drainage and the shallow ground water table do support these trees, and these contributions and conditions must be maintained post development.

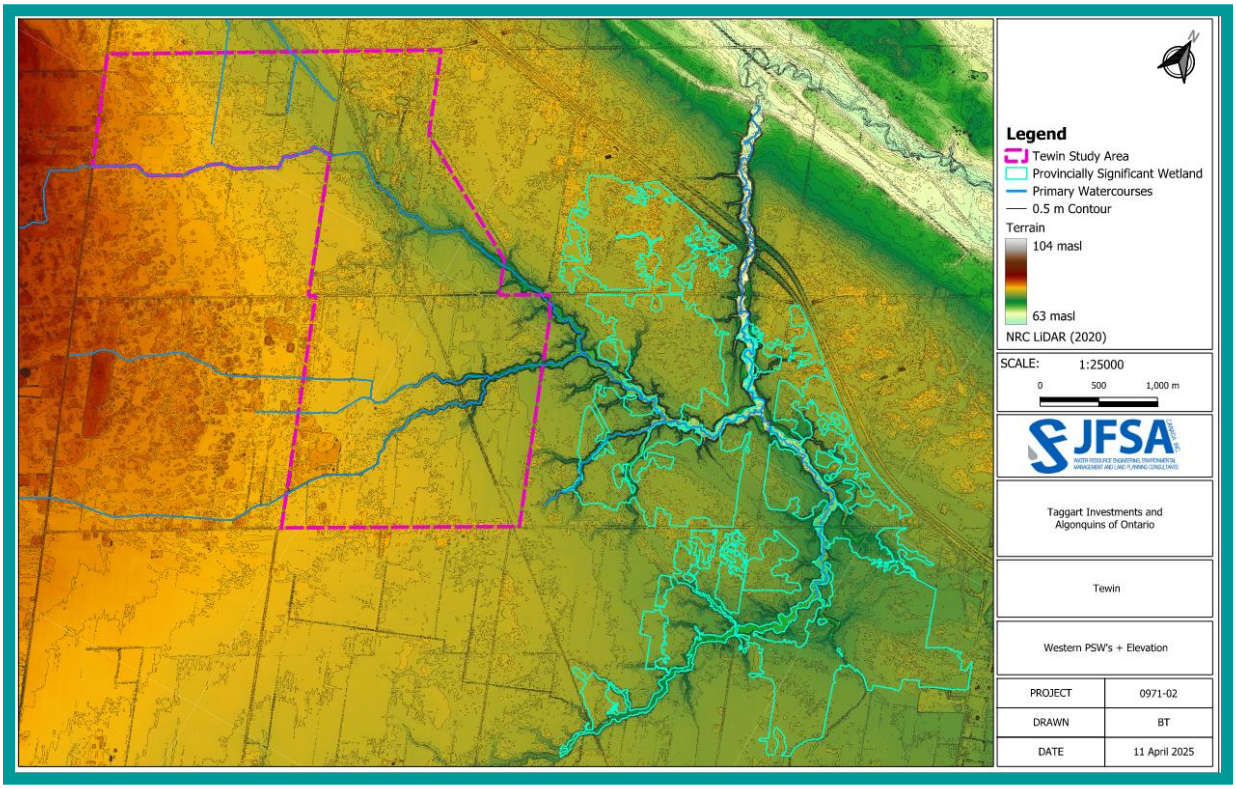
4.1.5 Wetlands

4.1.5.1 On-site wetlands

The Tewin Lands include areas of treed swamps, thicket swamps, and marshes. These on-site wetlands, resulting from the poor-draining clay soils and flat landscape, lack diversity and richness, however, they do provide habitat for amphibians and species relying on moist environments and support headwater tributaries. On the Tewin Lands, investment in the creation and restoration of connected and high-quality wetland cells with more permanent water depth will support and diversify the available habitat. These must be linked with other natural features to increase the diversity and support the sustainability of the natural system.

The South Bear Brook Provincially Significant Wetlands (PSWs) are directly east of the site and enrich the rural landscape between Farmers Way and Highway 417 (**Figure 29-30**). They are sustained by the flat topography, with shallow surficial silty sand deposits overlying a thick silty clay unit. Hydrated principally by precipitation and moisture from the shallow groundwater layer found in the surficial silty sand layer overlying the clay, over time these lands have evolved to be rich with organic soils and vegetation that thrives in moist conditions.

Figure 29: South Bear Brook PSWs

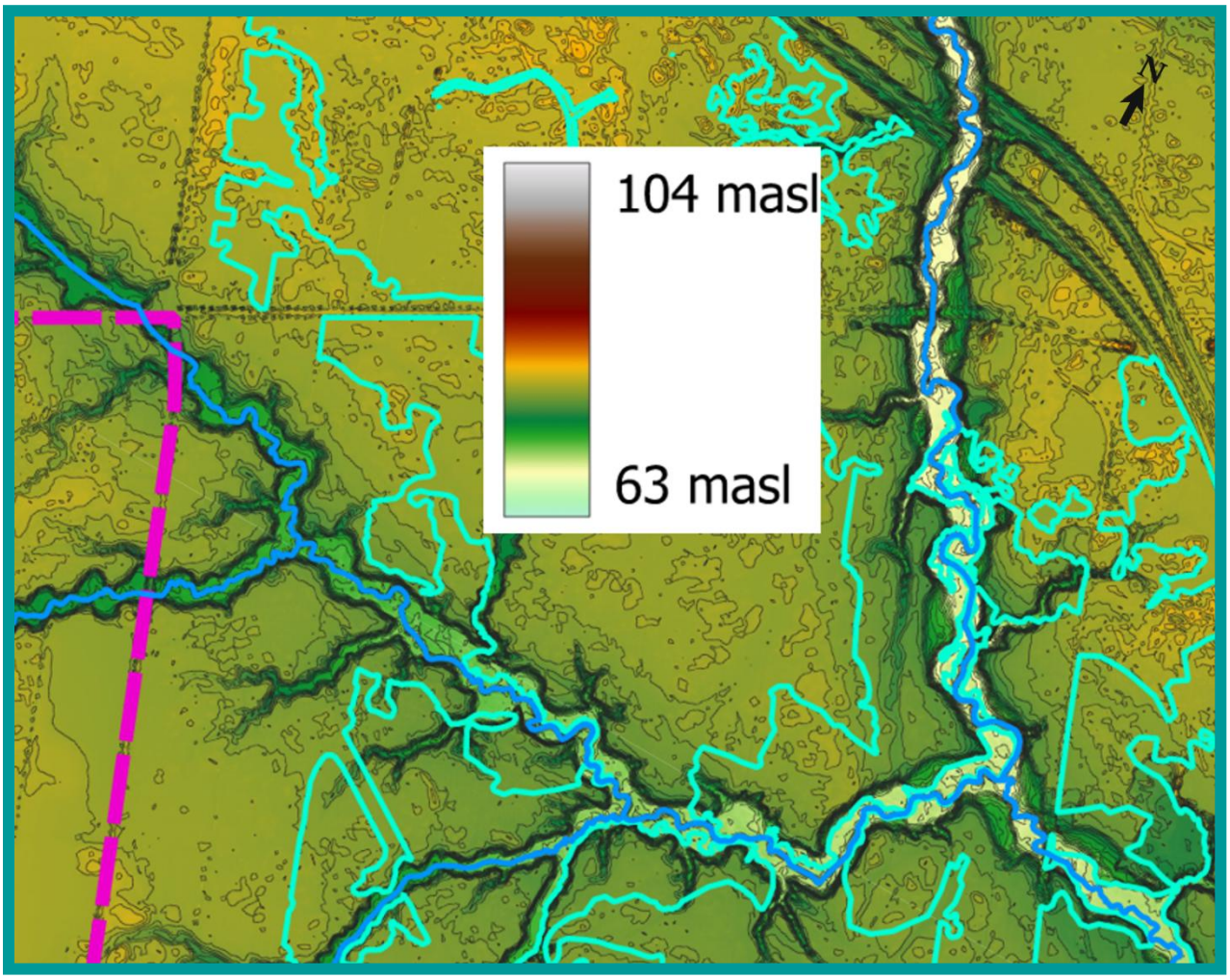


The tributaries of South Bear Brook run among these wetlands before passing under Highway 417. The watercourses are deeply incised into the clay unit in this location, collecting flows from the upstream lands and some inputs from the immediately adjacent portions of the shallow

groundwater table. They do not hydrate the South Bear Brook PSW downstream. The surface water flows through these watercourses and the deeper groundwater conditions underlying the wetland areas are not expected to significantly change due to the limited connectivity of the shallow surficial soils and low hydraulic conductivity of the underlying thick clay unit. The shallower groundwater table on Tewin Lands is inhibited from interacting with the wetlands by established compacted roadbeds.

The stormwater design and surface water features in the Tewin lands must include measures to maintain surface water flows leaving the development area similar to existing pre-development conditions.

Figure 30: Tributary depth relative to South Bear Brook PSWs.



4.1.6 Canopy

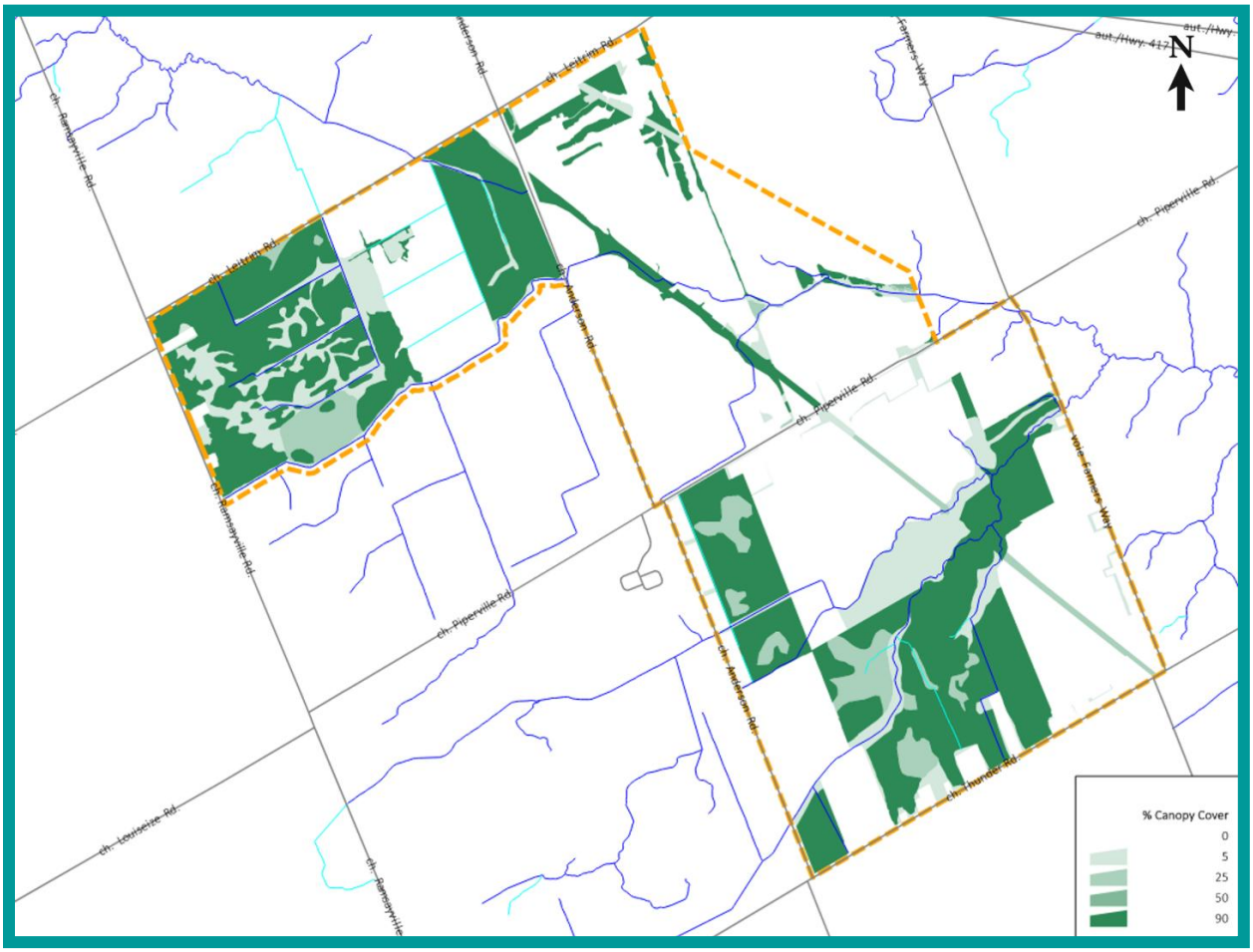
The existing landscape of early succession, plantation and mature woodlands provide an overall canopy of 31.9% across the site (**Figure 31**). The City of Ottawa targets 40% canopy coverage city-wide.

Unique to Tewin, value is placed on culturally significant species and succession (Algonquin Seven Generations) planning. Aggressive planting of these species in residential, commercial, institutional and recreational spaces, in addition to areas designated to support a connected natural system, should be planned across the site to achieve the same or better percentage of current canopy coverage in support of the city-wide target.

Clay soils are expected to be a factor when considering species type and locations of tree planting. The City of Ottawa Tree Planting Guidelines specify the physical surficial conditions and the associated limitations on tree sizes and setback distances.

Even so, the canopy coverage at 40 years is expected to be maximized above traditional development areas through setting minimum coverage percentages by land use to achieve the overall coverage and the same - or better than - canopy.

Figure 31: Existing Canopy Cover (source: Kilgour and Associates)



4.1.7 Species at Risk

At-risk species of birds, bats and trees that may utilize the site shall be accommodated in the natural spaces to be established and/or improved throughout Tewin. Natural restoration and enhancement opportunities in these areas must specifically include the creation of habitat supporting both listed species currently occurring in Tewin and a greater diversity of species generally.

Changes to the species listed under the Endangered Species Act are expected over the long development time of the Tewin Lands and must be addressed on a site-by-site basis as development applications are brought forward accordingly.

With respect to bats specifically, recent MECP policy directives following the update to the ESA definition of habitat under Ontario's Bill 5 call for the consideration of all forest and shrub areas as SAR bat habitat.

4.2 Natural Hazard Considerations

These constraint lands should be leveraged as locations to enrich with additional natural features to support the ecological integrity of the watercourse corridors through the area. Linear Infrastructure and passive recreational features may cross these constraint lands with appropriate review and approval.

4.2.1 Erosion

4.2.1.1 Onsite Bear Brook Toe Erosion

On-site field characterizations indicate that the watercourse features within the Tewin Lands are generally degraded, largely from past and present agricultural activities. Many channel corridors have been evidently straightened, leading to the re-development of sinuous low-flow channels within the corridor and causing significant bank erosion. Riparian conditions across many of the major channels are often compromised, reducing stability and erosion resistance within the channel banks. Bed substrate is predominantly sand with observations of clay and silt also commonly noted throughout the study area, indicating potential excess sedimentation due to agricultural activities, as well as generally sensitive channel conditions.

Considering the aforementioned field characterizations, opportunities to improve existing channel conditions through future mitigation and enhancement activities should be investigated concurrent with stormwater management. Opportunities generally relate to improving long-term channel stability, water quality, and overall stream health, as many watercourses within the study area are evidently degraded and negatively impacted by prior modification.

A toe erosion allowance in the range of 5 to 8 metres for all confined reaches where the channel is within 15 metres of the valley slope has been established and implemented in the slope stability analysis (Refer to Existing Conditions Geotechnical Report in ***Appendix I***).

4.2.1.2 Erosion Thresholds

Erosion thresholds were investigated to inform erosion mitigation strategies in channels influenced by conceptual flow and stormwater management plans, as shown in **Table 4**. Initial work scoped the extent of Tewin's influence downstream and identified six potential sensitive reaches along Bear Brook, and two along Ramsay Creek, both within and downstream from the Tewin Lands. (Refer to GEO Morphix Erosion Threshold Reports in ***Appendix F*** and Existing Conditions Report in ***Appendix I***). The development of the Tewin lands shall mitigate any impacts on the receiving watercourses.

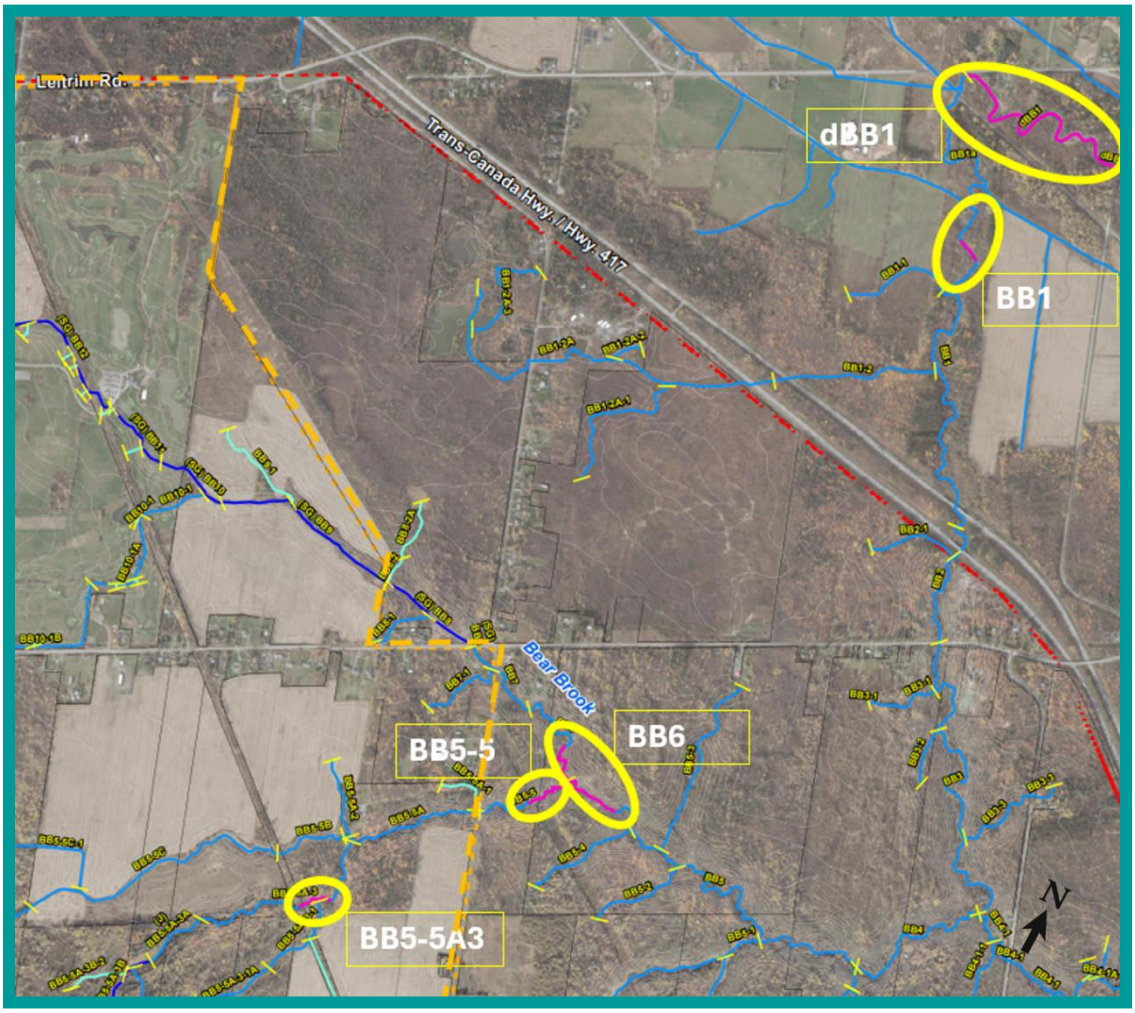
4.2.1.2.1 Bear Brook

Erosion thresholds were modelled using a JFSA adapted version of the event-based SNC hydrological model and detailed field observations of selected reaches along Bear Brook. The selected reaches are identified in **Figure 32** and were determined to be the relatively erosion-sensitive reaches within the potential zone of impact downstream of the SWM outlets for the Tewin Lands. The results of the erosion threshold assessment are provided in **Table 4** below.

Table 4: Bear Brook Erosion Thresholds

EROSION THRESHOLD SUMMARY						
	BB5-5A-3	**BB5-5**	**BB6**	**BB5**	**BB1**	**dBB1**
Critical discharge (m^3/s)	0.885	0.8087	1.382	2.184	2.949	3.477

Figure 32 : Bear Brook Channel Identification (Source GMX)



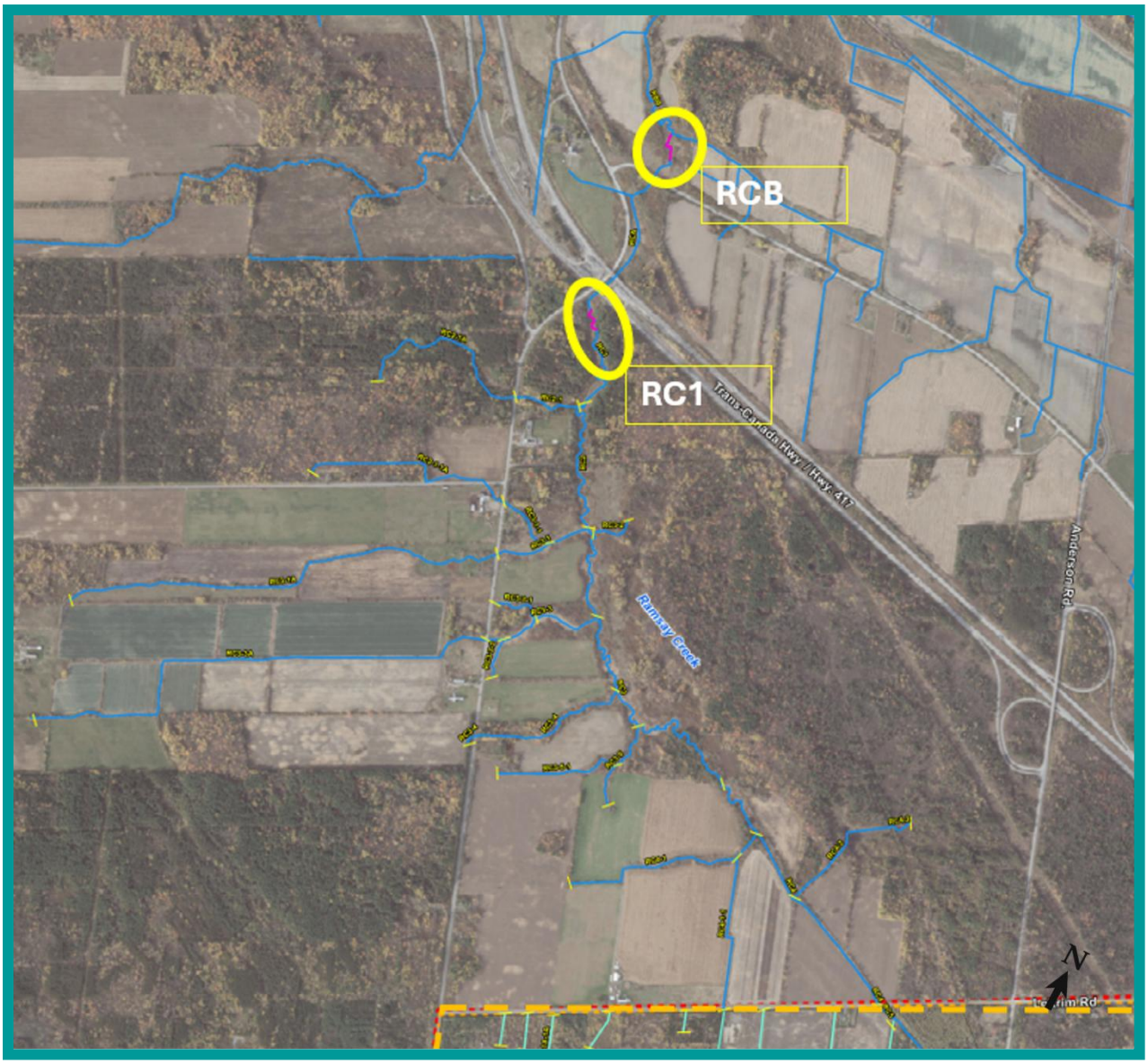
4.2.1.2.2 Ramsay Creek

Erosion thresholds were modelled for two sites along Ramsay Creek to support the erosion mitigation assessment. The reaches RC1 and RCB (See **Figure 33**) were selected as the most erosion sensitive reaches downstream within the potential influence of the Tewin Lands. The results of the erosion threshold assessment are provided in **Table 5**.

Table 5: Ramsay Creek Erosion Thresholds

EROSION THRESHOLD SUMMARY		
	RC1	**RCB**
Critical discharge (m^3/s)	**0.856**	**1.045**

Figure 33: Ramsay Creek Reach Identification (Source GMX)



4.2.2 Slope Stability and Retrogressive Landslides

Watercourse slopes were found to be stable from a geotechnical perspective; however, some signs of erosion were observed at the toe of the slopes and are captured by conventional geotechnical setbacks. A limit of hazard lands to accommodate the stable slope, toe erosion and erosion access allowance is applied to all applicable watercourse reaches. Setbacks range from 11 to 16 metres from the top of the slope.

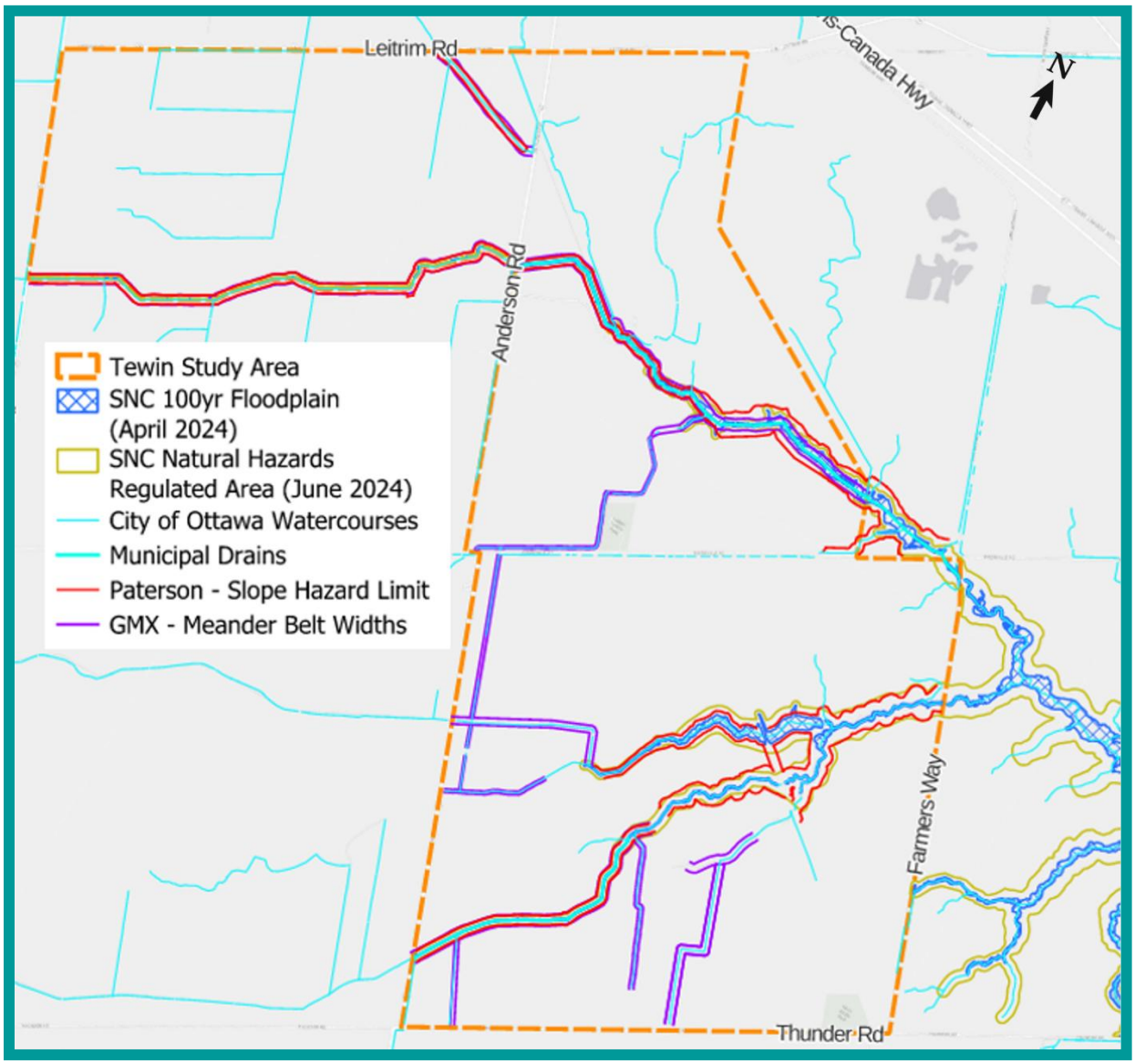
The current Limit of Hazard Lands shown on **Figure 34** setback is based on existing conditions. Based on this, future proposed conditions such as grade raise height and building loads should be accounted for in sit specific slope stability analysis where development will be in proximity to the current Limit of Hazard Lands setback.

A review was completed considering proximity to mapped historic landslides, slope height and topographic relief, proximity to watercourses, overburden drift thickness, the presence of potential artesian groundwater conditions, the geometry and fluvial characteristics of watercourses and associated table valley corridors, and the sensitivity of the clay located throughout the area. At the time this document was prepared, there are no criteria triggering retrogressive landslide risk concerns within the study area. (Refer to Existing Conditions Geotechnical Report in ***Appendix I***)

4.2.3 Meander Belts

In unconfined valley reaches of the watercourses, conservative meander belt widths were established and mapped.

Figure 34: Natural Hazard Delineations: Erosion, Slope Stability, Meander belt and Floodplain



4.2.4 Floodplains

South Nation Conservation published the Bear Brook floodplain Mapping Study in 2023. The mapped 100-year floodplain established by this study has been applied on the Tewin Lands. A 350-year event has also been mapped to address potential impacts due to climate change. No significant differences were identified. No development is proposed within the 100 or 350-year floodplain boundaries.

Consultation with the Rideau Valley Conservation Authority confirmed that no floodplain mapping is warranted in the Ramsay Creek catchment area as the small headwater drainage ditches have catchment areas smaller than the established threshold for such studies. A floodplain mapping

study is expected to be undertaken by the RVCA in the future on downstream reaches of Ramsay Creek. No implications on the Tewin Lands are expected from this future work.

4.3 Geotechnical and Hydrogeological Considerations

4.3.1 Geotechnical Components

Like much of Ottawa, the Tewin Lands sit on a thick deposit of grey silty clay overlain by up to 3.7 metres of topsoil and silty sand and/or brown silty clay. The grey silty clay, ranging in depth from approximately 20 to 50 metres has suggested that preliminary grade raise restrictions of 0.5 to 0.6 metres are expected. The flat nature of the landscape will require grade changes beyond preliminary grade raise restrictions, which may be addressed with preloading and/or surcharging practices, lightweight fill, or other ground improvement practices commonly employed throughout development sites in Ottawa. **Figures 35** and **36** show hydrologic subsurface cross-sections of the Tewin Lands.

Due to the flatness of the landscape, to maintain the watershed divide and provide drainage, impacts relating to grade changes on the development lands and the invert of the receivers should be considered. A net environmental benefit to the receiving watercourses will be required to support a balanced strategy.

4.3.2 Hydrogeologically Sensitive Areas

The low-permeability clays close to the surface across the site limit deep groundwater movement and maintain the water table at shallow elevations. This shallow groundwater sitting above the clay soils and in the near surface soils - 'interflow' - is primarily sustained by infiltrating precipitation. The shallow groundwater moves horizontally through the surficial materials down gradient towards the main watercourse channels, providing some baseflow contributions. As the shallow interflow also moves down gradient towards watercourses, it also sustains vegetation and returns to the atmosphere through evapotranspiration. The proposed development is expected to have a localized impact on the shallow water table elevation due to the geology at the site, however protection of baseflows and natural features on the site is informed by feature-specific water budgets and secured through surface water management strategies. **Figure 37** shows the infiltration potential of the Tewin Lands and surrounding area.

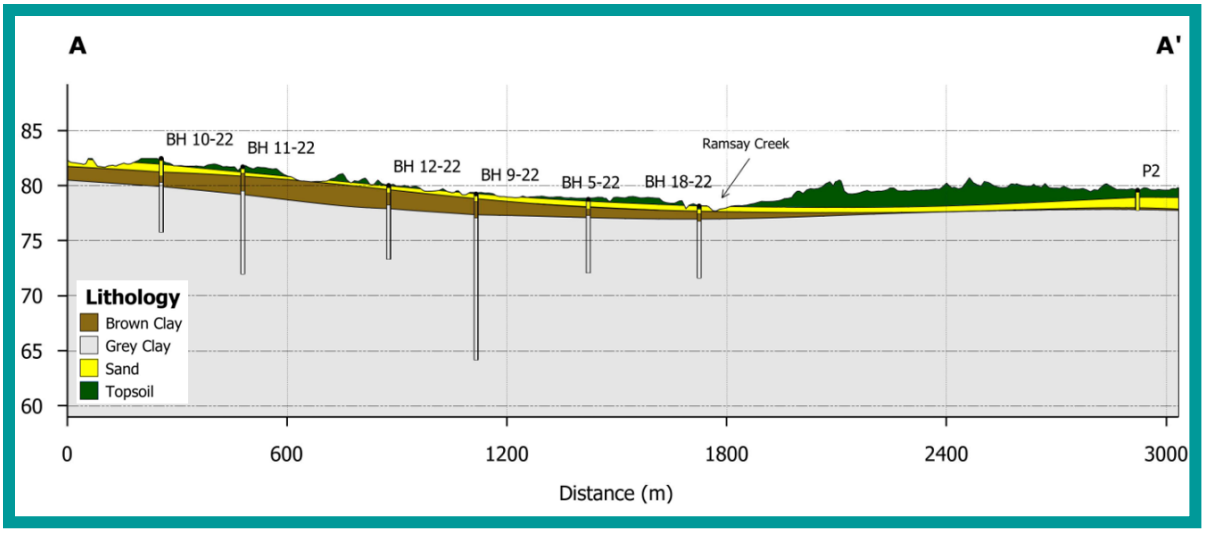
Investigations into the potential for hydrogeological interactions with the adjacent Bear Brook Provincially Significant Wetlands and Mer Bleue Bog have concluded that due to the thick clay deposits, groundwater movement from the Tewin site does not contribute to the hydration of the wetlands in any meaningful way. Rather, the wetlands are sustained by the flat topography and undulations on the surface of the clay soils, preventing shallow subsurface horizontal drainage. Rainfall/snowmelt is the main hydrating contributor to the wetland features, which correlates with the water levels in the local watercourses responding quickly and directly to surface water and interflow runoff after precipitation events. Thus, the local interflow immediately adjacent the PSWs and shallow groundwater table in the close vicinity play the significant role in the wetland hydration.

The Tewin Lands do not contain any Intake Protection Zones or Wellhead Protection Zones that require consideration. Deeper groundwater conditions are not expected to significantly change due

to the limited connectivity of the shallow surficial soils and low hydraulic conductivity of the underlying thick clay unit.

Figure 35: Cross-Section Key Map:

Figure 36: Hydrologic Subsurface Cross-Sections



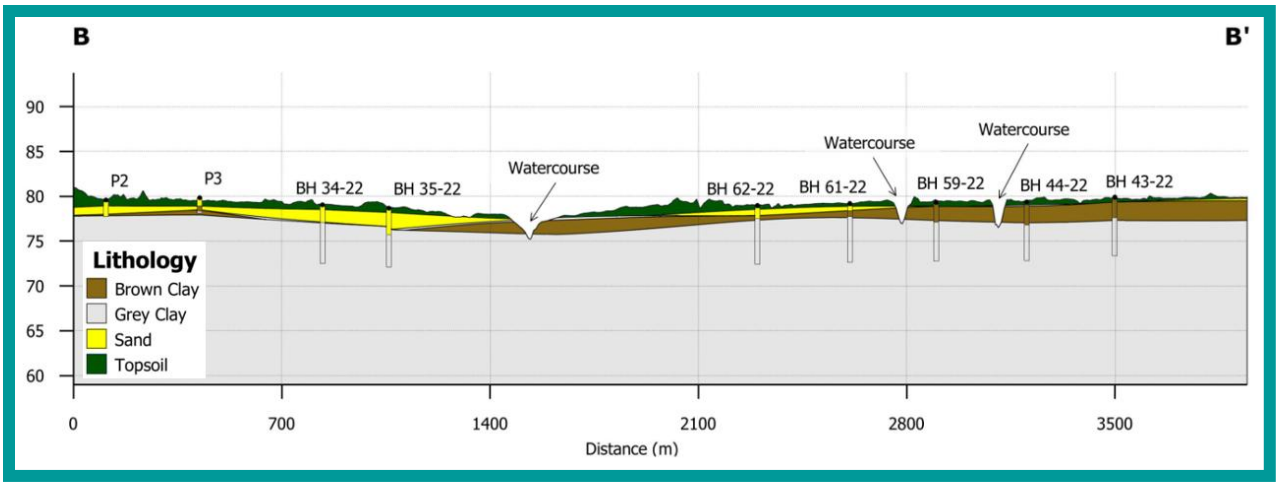
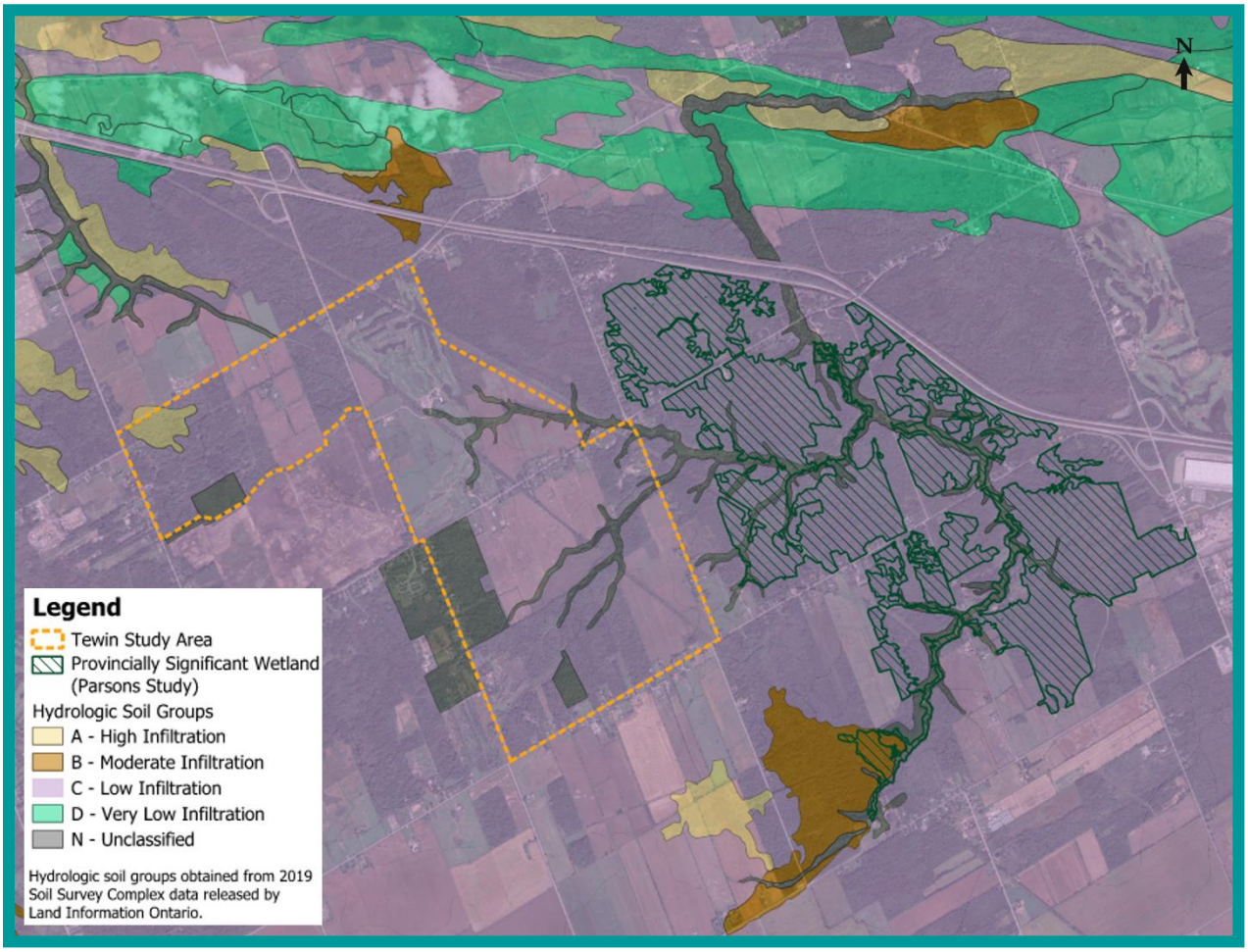


Figure 37: Infiltration Potential



4.3.3 Water Budget

A water budget for the pre-development conditions of the Tewin Lands has been prepared, based on on-site monitoring, extensive data inputs and daily continuous simulations. The results are shown in **Table 6**. The conclusions reflect the limited infiltration through the thick clay unit underlying the site and a balance between evaporation and surface water runoff (which includes shallow groundwater and baseflow). Observations of flashy flow responses in the watercourse network to precipitation events and the hydrogeological findings regarding the clay subsurface correspond with the calculated budget. This data also nests appropriately within the watershed-wide groundwater model prepared by South Nation Conservation, taking into account a refined investigation producing a Tewin Lands-specific discrete data set.

Table 6: Site-Wide Water Budget

Watershed	Runoff and shallow groundwater	Evaporation / Evapotranspiration	Deep Groundwater Recharge
Ramsay Creek	**53 %**	**47 %**	**0.05 %**
Bear Brook	**52 %**	**48 %**	**0.05 %**

Urbanization significantly reduces evapotranspiration mechanisms such as vegetation and ponding areas which exist on undeveloped lands. A strategy to support this component of the water budget post development must include creation of wetland features, large reservoir ponds, and most importantly an emphasis on native vegetation throughout all the land uses on the Tewin Lands. This includes parkland, schools and community facilities, residential developments of all densities, infrastructure installations and natural spaces.

4.4 Existing Land Fabric

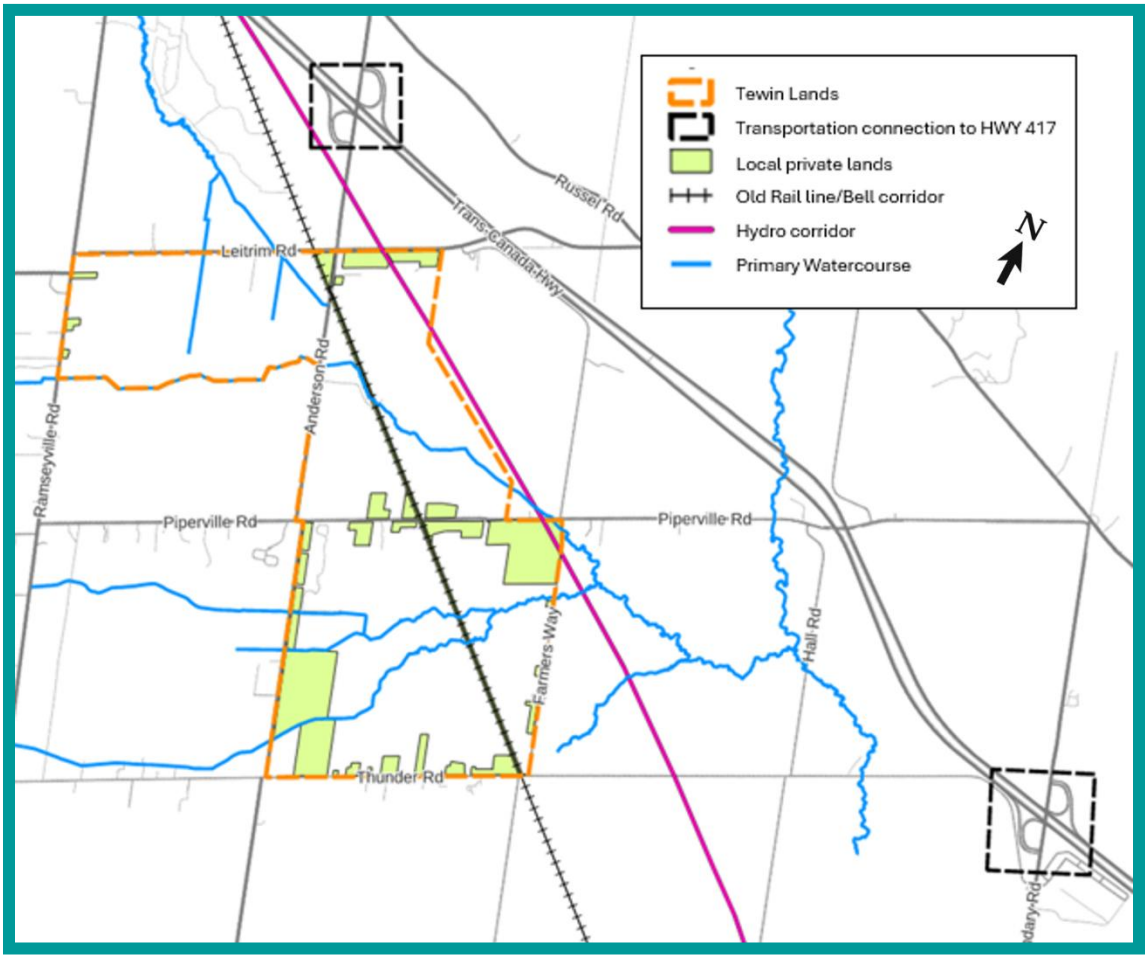
4.4.1 Transportation and Infrastructure Corridors

The fabric of roads crossing through the Tewin Lands are long established as a grid with some offset connections. Highway 417 and the interchanges at Anderson and Boundary Road provide major accesses. Established roadways provide frontage to existing private properties and have municipal ditches and multiple culvert crossings. Drainage and local subcatchments are influenced by this road network and the culvert crossings.

One legacy railway route passes at an angle through the Tewin Lands. Now decommissioned, the former railbed has been removed and is either at grade or raised, influencing the drainage fabric connections. Existing underground utility infrastructure (Bell) is located within this corridor.

A major Hydro corridor with overhead wires runs parallel to the rail corridor on the edge of the site, cutting across the north-east corner of the Tewin Lands. This corridor is periodically maintained to remove trees and vegetation but does not inhibit any drainage functions. An overview of the local linear infrastructure and private properties is shown in **Figure 38**.

Figure 38: Local Linear Infrastructure and Private Properties



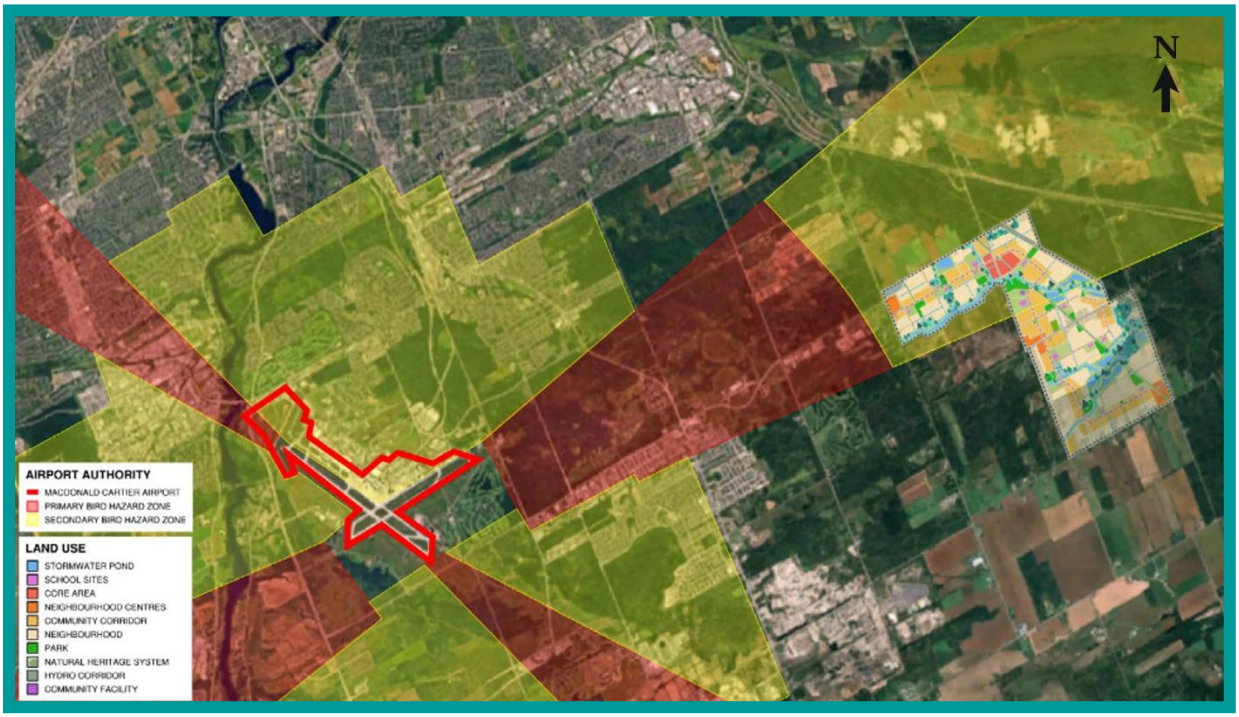
4.4.2 Airport Bird Hazard

The Ottawa Macdonald-Cartier International Airport Zoning Regulations (SOR/2009-231) state that no owner or lessee of land within the limits of the bird hazard zone shall permit any part of that land to be used for activities or uses attracting birds that create a hazard to aviation safety.

The Secondary Bird Hazard zone, as identified by the Airport, overlaps with a portion of the Tewin Lands, as shown in **Figure 39**. This zone requires that certain land uses and features, such as water bodies, mitigate for potential bird hazards.

The proposed Tewin Lands include stormwater management ponds within the Secondary Bird Hazard Zone. Mitigation measures, including strategic pond design, landscaping, and monitoring, will be implemented accordingly in consultation with the airport authority.

Figure 39: Ottawa Airport Bird Hazard Zone



4.4.3 Private Properties

Residential homes and businesses are scattered within and around the periphery of the Tewin Lands fronting on the existing road network. These properties are predominantly serviced by the municipally owned Carlsbad Trickle Feed potable water system and private septic systems (**Figure 40**). Legacy private wells of unknown status also exist across the area, as shown in **Figure 41**. Abandoned wells on the Tewin Lands must be decommissioned in accordance with O. Reg. 903. Well abandonment on private properties is the responsibility and at the discretion of the owner, although properties serviced by municipal systems are encouraged to abandon their wells in accordance with O. Reg. 903.

Figure 40: Carlsbad Trickle System (source: City of Ottawa)

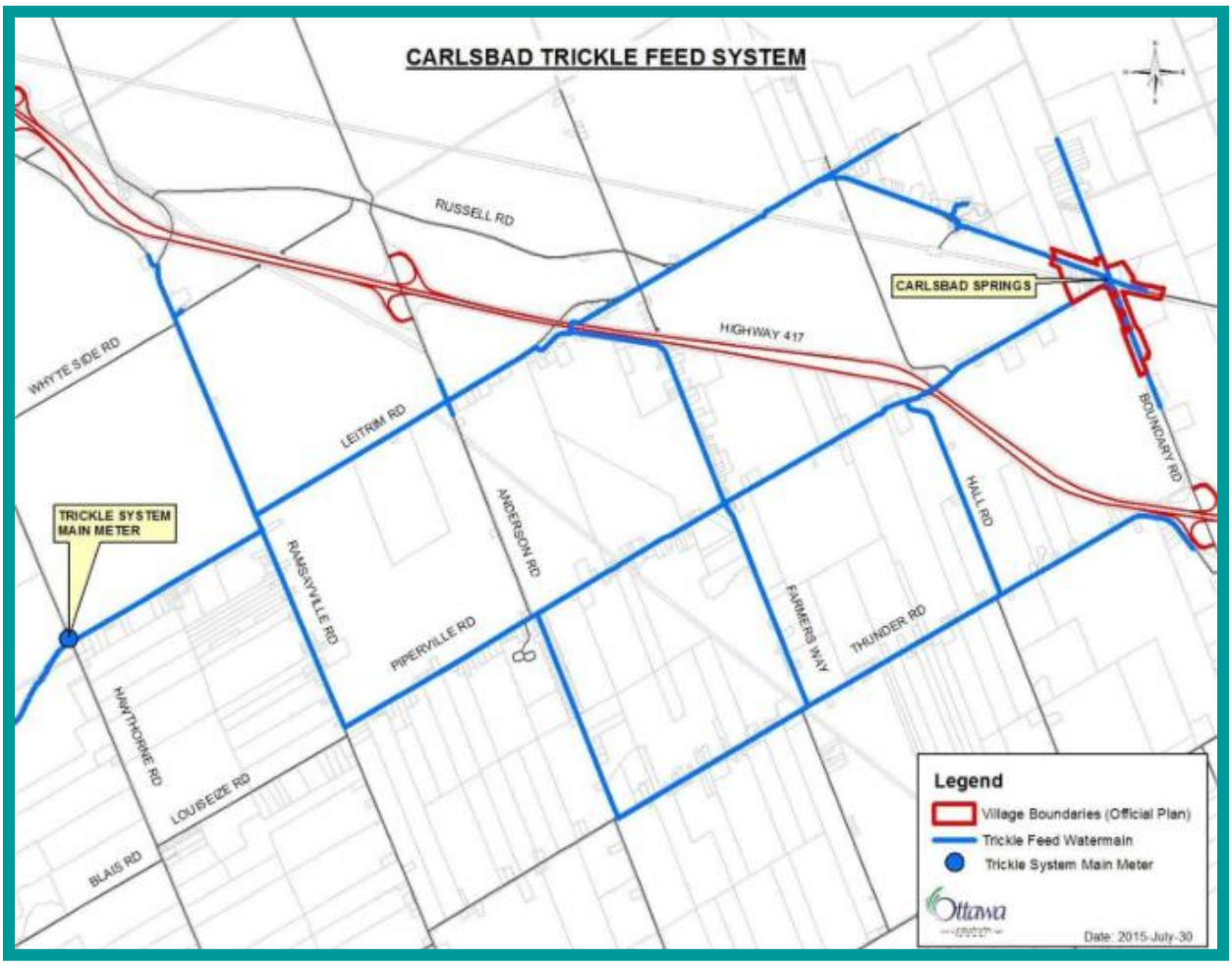
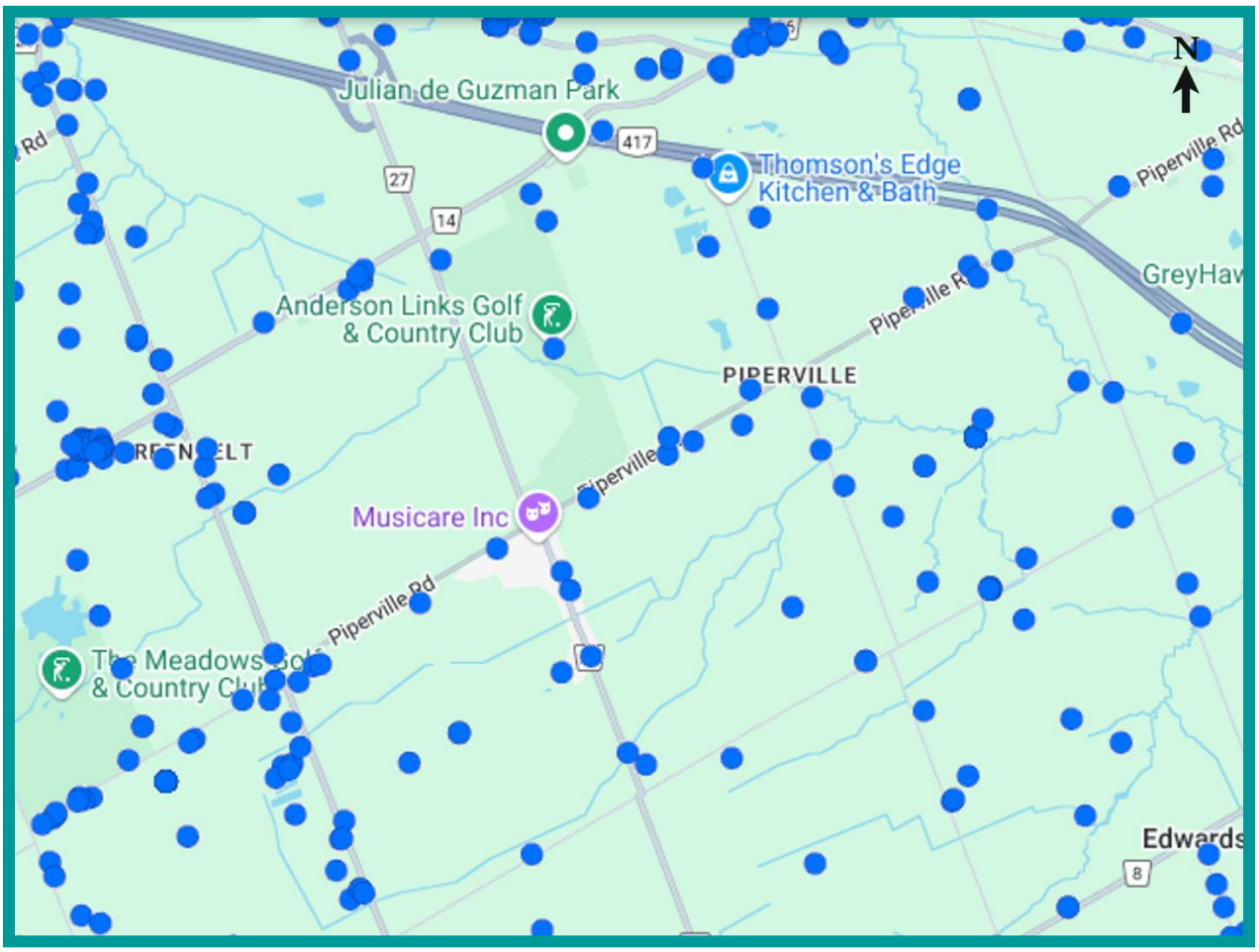


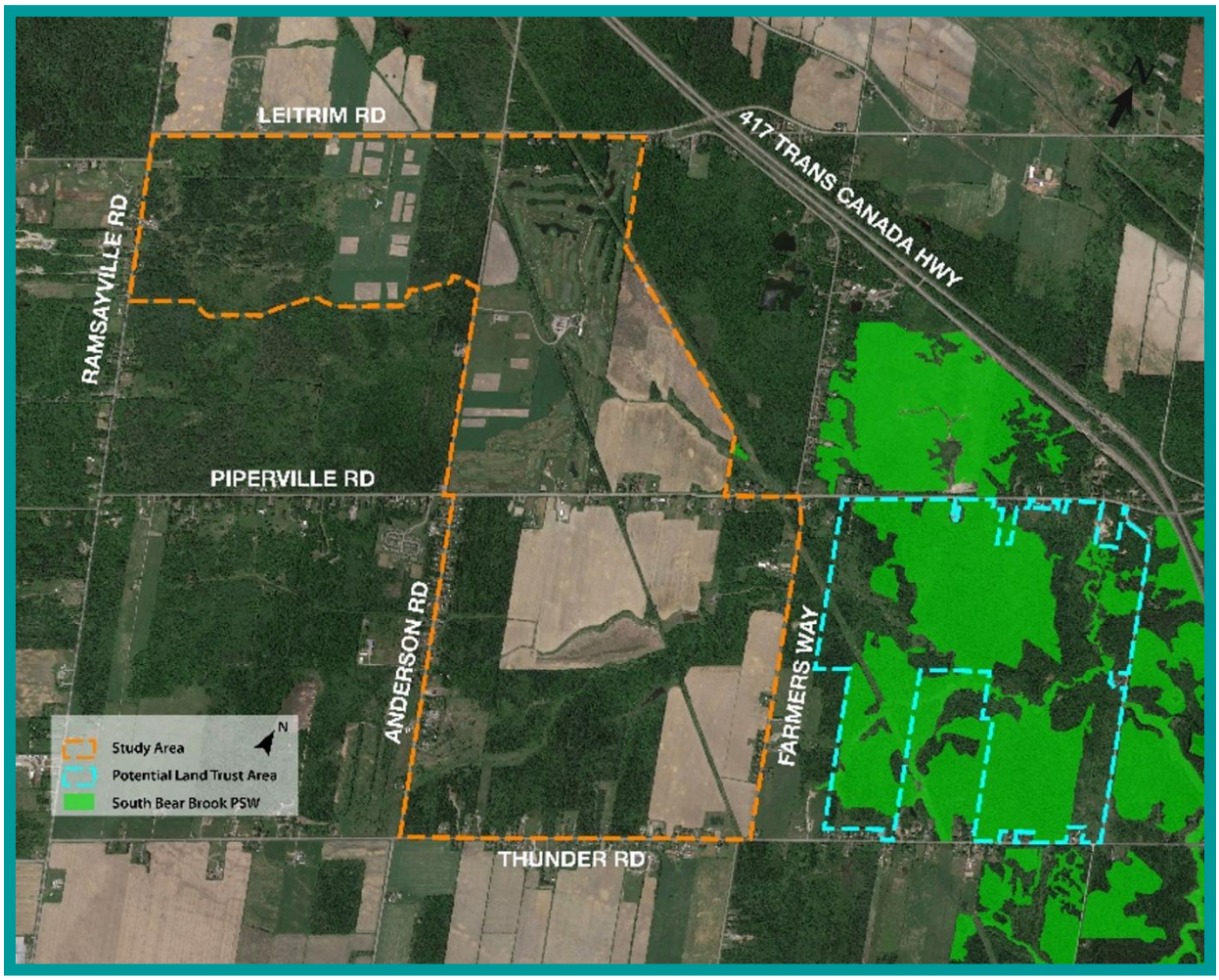
Figure 41: Private Well Locations (source: MECP)



4.5 Future Algonquin Natural Land Trust

The Algonquins of Ontario are committed to enhancing Tewin and the surrounding community by establishing hundreds of hectares of Natural Land Trust on adjacent lands. The proposed potential location is shown in **Figure 42**. Selecting for diversity, high-value environmental features and the presence of water, the lands are generally proposed to be adjacent to the Tewin lands, east of Farmers Way. Planning for the Natural Land Trust will be carried out through a separate process led by the AOO and its development partners. This future process will define the vision, principles, and guidelines for the development and management of the Natural Land Trust.

Figure 42: Potential Location of Proposed Algonquin Natural Land Trust



4.6 Natural Feature Restoration

Mitigation, Enhancement, and Compensation of Watercourses and Wetlands

As the existing agricultural, fallow cropland, recreational golf course, plantation and drainage-manipulated landscape transitions into an urban development, maintaining and enhancing natural hydrological and ecological functions is a priority. Historical land use has resulted in the degradation of natural ecology, anthropogenically constructed drainage systems (tile drains), stream channelization and straightening, and changes to the natural infiltration and evapotranspiration processes. Urbanization can compound these effects through increased impervious surfaces, changes in hydrological regimes, and degraded water quality due to stormwater runoff. In response, comprehensive mitigation strategies that replace, replicate, and enhance natural functions are required to ensure long-term sustainability, climate resilience, and biodiversity conservation.

The Tewin Lands shall pursue the implementation of a restoration strategy focused on wetlands and watercourses functions to integrate hydrological, ecological, and climate resilience principles into the urban landscape while supporting infiltration, evapotranspiration, and habitat connectivity. This aligns with the objectives outlined in Ottawa's Natural Environment Discussion Paper (2019) and the City's Climate Change Master Plan (2020). Key benefits of these restoration features include the following:

1. **Hydrological Function and Water Budget**

- *Infiltration and Shallow Groundwater Recharge:* The integration of vegetated swales, constructed wetlands, and floodplain reconnection enhances localized infiltration and supports baseflow stability.
- *Evapotranspiration and Climate Regulation:* Providing tree cover and integrating constructed wetland cells improves moisture cycling and mitigates urban heat island effects.
- *Flood Mitigation and Flow Attenuation:* Restored floodplains and wetlands provide natural storage, reducing peak flows and downstream flood risks, while also balancing sediment transport and flow regulation.

2. **Biodiversity and Ecological Enhancement**

- *Habitat Complexity and Connectivity:* Wetland restoration, terrestrial habitat enhancement (i.e., vegetated swales, pit-and-mounds, wood piles, basking logs, rock piles, and raptor poles) and natural channel design approaches improve habitat diversity, supporting species at risk and increasing resilience to climate stressors.
- *Improved Aquatic Habitat:* Riffle-pool sequences, addition of habitat features (i.e., woody debris jams, overwintering deep pools), and floodplain connectivity enhance fish passage, macroinvertebrate diversity, and wetland-dependent species populations.
- *Riparian and Wetland Vegetation:* Native species plantings stabilize soils (i.e. brush mattress with live stakes), increase floodplain roughness, provide habitat, and improve ecological connectivity.

The inclusion of some habitat elements within the community will be more directly associated with considerations around SAR, though the final details of SAR-associated habitat elements will be detailed in consultation with MECP via permitting under the ESA (or SCA). General approaches that will be required for different SAR groups, however, will include the following elements.

- *For Bats:* the retention/reestablishment of wooded corridors winding through the community, the fostering of urban canopy cover to provide an even distribution of tree roosting potential in all areas, the installation of bat housing around SWM ponds, parks, and other public spaces, and limiting tree clearing work to between December 1 and March 15 to protect individual bats.
- *For SAR forest birds:* the retention/reestablishment of wooded corridors winding through the community and limiting tree clearing work to between December 1 and March 15 to protect individuals. This timing window is more restrictive than is typically required for birds but is required for bats regardless.
- *For SAR grassland birds:* open grasslands not subject to regular maintenance will quickly follow natural succession to become young forests; the community design does not incorporate open grasslands that would require such regular maintenance. Offsetting for grassland habitat losses required under SAR permitting would occur offsite.
- *For SAR trees:* With only small numbers of SAR trees, offsetting for the removal of individuals would consist of managed replanting programs.

3. Climate Resilience and Carbon Sequestration

- *Carbon Storage in Wetlands:* Restored wetlands act as carbon sinks, capturing organic matter and reducing atmospheric CO_2.
- *Naturalized Floodplain Expansion:* Increasing the capacity for water storage and filtration aligns with Ottawa's climate adaptation strategy.

4. Water Quality Improvements

- *Nutrient Retention and Sediment Filtration:* Wetland forebays and sediment retention features improve water quality by trapping contaminants before they reach downstream systems.
- *Baseflow Enhancement:* Buffer zones and complementary land uses improve localized infiltration and reduce the impacts of surface runoff to the surrounding corridor.

4.7 Climate Change Resilience

Infrastructure Design and Management

Tewin will implement strategies that reduce vulnerability to extreme weather and environmental changes. Some key approaches include:

- *Green Infrastructure:* Integrating urban green spaces, such as parks and green roofs, helps absorb excess rainwater, reduce heat, and improve air quality.
- *Flood Management*: Stormwater management system design includes sensitivity testing to 100 year + 20% events. Implementation of best practices and significant tree canopy. Locating development away from flood risk areas.
- *Energy Efficiency:* Exploring building designs with better insulation, solar panels, and energy-efficient systems reduces reliance on fossil fuels.
- *Smart Transportation:* Encouraging public transit, cycling infrastructure, and electric vehicle adoption lowers emissions and improves air quality.
- *Disaster Preparedness:* Establishing communication provide advanced warning and implement emergency response plans ensures residents can prepare and respond to climate-related events.

Watercourses and Wetlands

- Protect watercourses and natural features by supporting hydration and buffers.
- Establish stormwater storage to manage flooding and erosion in watercourses.
- Ensure shading on water systems for thermal regulation.
- Support downstream systems by maintaining water quality and quantity regimes.

Trees, Plants and Species

- Plant for succession over seven generations
- Prioritize native vegetation but recognizing that planting plans may include some near-native species/varieties (e.g. from further south in Ontario) where required to effectively establish climate change resilience.
- Establish and encourage alternatives to grass lawns
- Focus on culturally significant native plants that are drought tolerant and pollinator-friendly
- Enhance vegetation with diverse planting to protect against pests and disease and invasive species
- Consider heat, dryness and wind events in species choices

4.8 Natural Heritage System

The natural heritage component of the Tewin Lands is unique due to the size of the site, the historical land uses and the adjacent lands. The fundamental considerations are based on the Tewin Intent, One Planet Living framework and direction in the City of Ottawa 2022 Official Plan. The strategy utilizes a restoration, connection and stewardship approach to establish a robust sustainable natural ecological corridor through Tewin, linking with the adjacent natural areas and integrating with future land uses.

A systems approach emphasizes the interconnected functions and relationships within the natural environment, rather than focusing on isolated features. It prioritizes *synergistic interdependence between all elements*, supporting resilience and functionality. This promotes the complex relationships where each element contributes unique qualities that sustain the health and stability of the entire system.

4.8.1 Key Principles:

Connectivity: Support healthy and robust ecological function of ecosystems, connecting through the site internally and onto external adjacent land.

Watercourse Network: Reflect the original density of pre-settlement watercourses that would have naturally occurred on the landscape. Restore and design natural channels to enhance and improve the overall values of the ecological corridor system.

Diverse Habitat: Promotes a variety of terrestrial, wetland and aquatic habitats, supporting a wildlife corridor with a range of species and natural succession within the system.

Functionality: Support high-quality wetland habitat, contiguous tree cover, diverse vegetation and water storage, habitat for amphibians, fish nurseries, and various wildlife during their life cycles and seasonal needs.

Resiliency: Prepare for adaptation to climate change, invasive plants and human activity through diversity and robustness.

Accessible: Support stewardship and respect for the land by ensuring current and future generations are connected directly to it. Support the educational, recreational and mental health benefits proximity and access to natural spaces provides.

4.8.2 Components

4.8.2.1 Watersheds and Watercourses

The core of the system is based on respecting watershed boundaries and alignment with the mainstem watercourses of Ramsay Creek and Bear Brook. The drainage density shall be balanced with the lengths and general locations of watercourses during the pre-settlement landscape. The watercourses will further benefit from enhancement and restoration to support their natural and drainage functions.

The naturalization of existing anthropogenically altered and creation/relocation of new watercourses supports a fundamental reconnection of a functioning natural heritage system to the

larger landscape. Traditional municipal drain design with trapezoidal cross sections, periodic clean outs and limitations on vegetation in the riparian corridor are not complementary to this approach.

Constraints including natural hazards, existing transportation routes, linear public infrastructure, adjacent land uses and private land holdings define the corridor by influencing the location, widths and configuration of its form.

This approach ensures the viability of the ecological corridor by ensuring the surface water system supports hydration of the watercourses and linked natural features, while distinguishing between the protected ecological component and the adjacent land uses and human activities. The Tewin Intent emphasizes the fundamental importance of water being threaded through the community fabric as both a natural asset and a critical component of the Algonquin values.

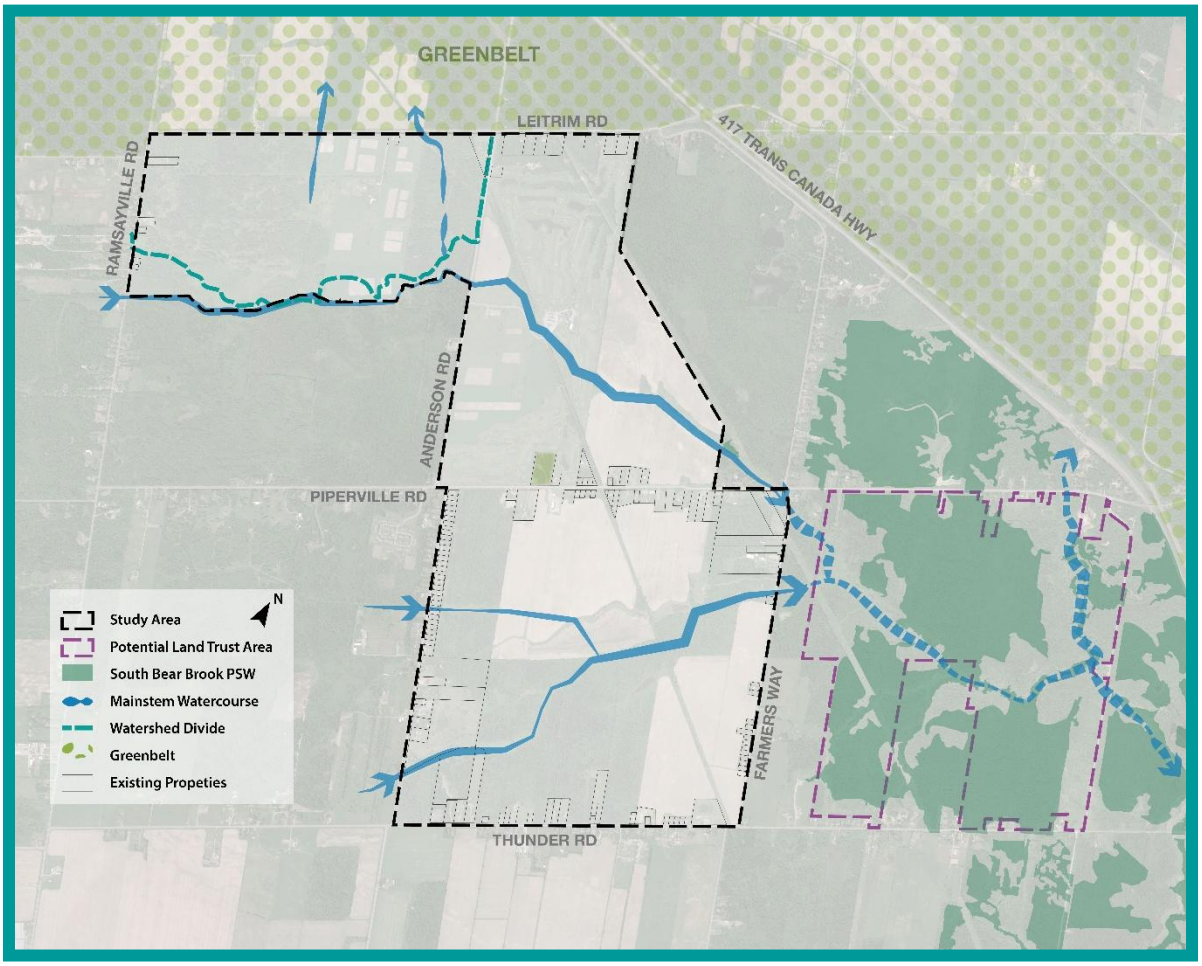
4.8.2.2 External Connections

The aforementioned watercourses link to the external lands west, north and east which contain Provincially Significant Wetlands, the NCC Greenbelt and undeveloped rural area, as shown in **Figure 43**.

External Adjacent Lands:

- North - Greenbelt cropped agricultural and natural areas, Ramsay Creek watercourse connections, potential recreational trails
- East - Provincially Significant Wetlands, potential location of the Algonquin Natural Land Trust, Bear Brook watercourses, private landholdings/residential properties, Highway 417 watercourse underpass
- South - Cropped agricultural lands, landholdings/residential properties
- West - Bear Brook tributaries, Findlay Creek wetlands, cropped and fallow agricultural lands, landholdings/residential properties

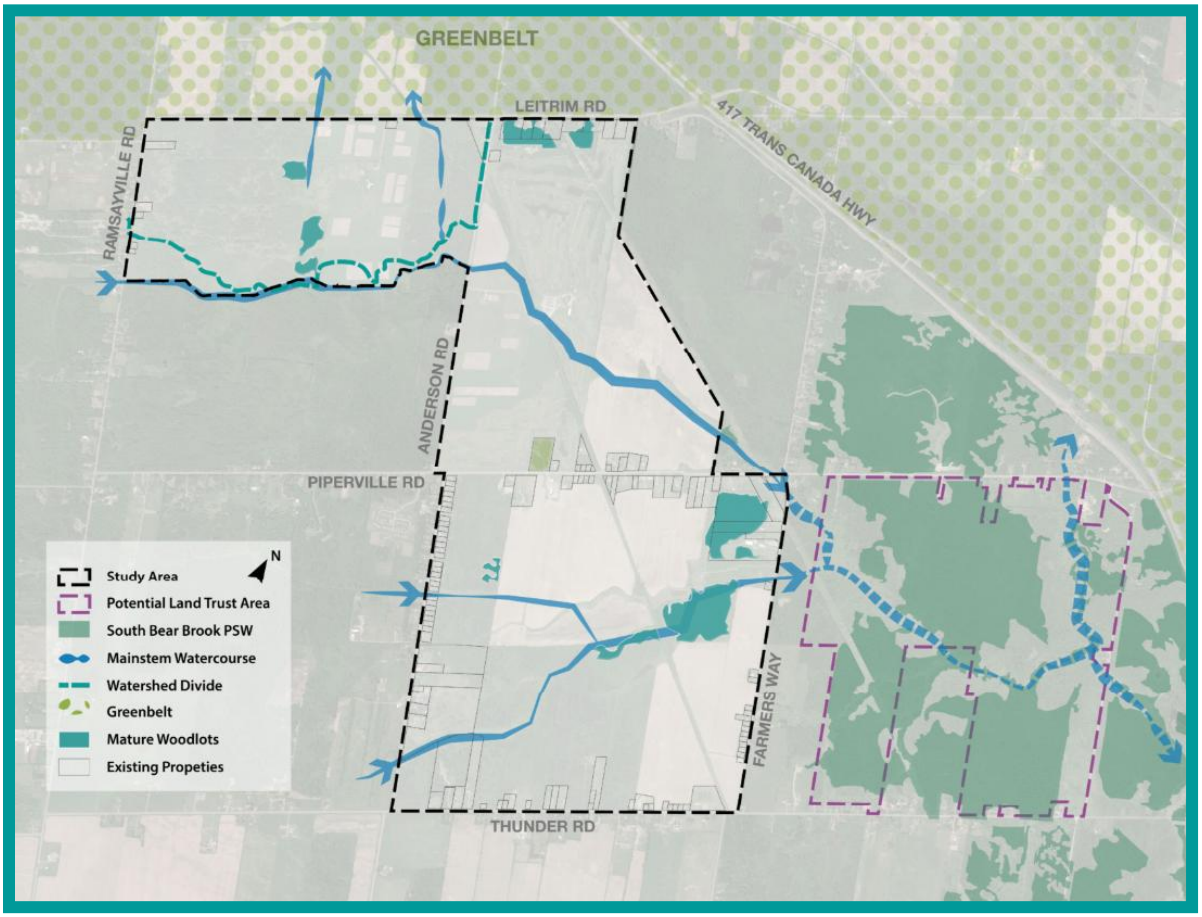
Figure 43: Watercourse Network and External Connections (source: USI)



4.8.2.2.1 Mature Woodlands

As shown in **Figure 44**, the existing mature woodlands within the Tewin Lands are connected to the surface water feature system to ensure hydration, support synergistic relationships and integration between the natural features.

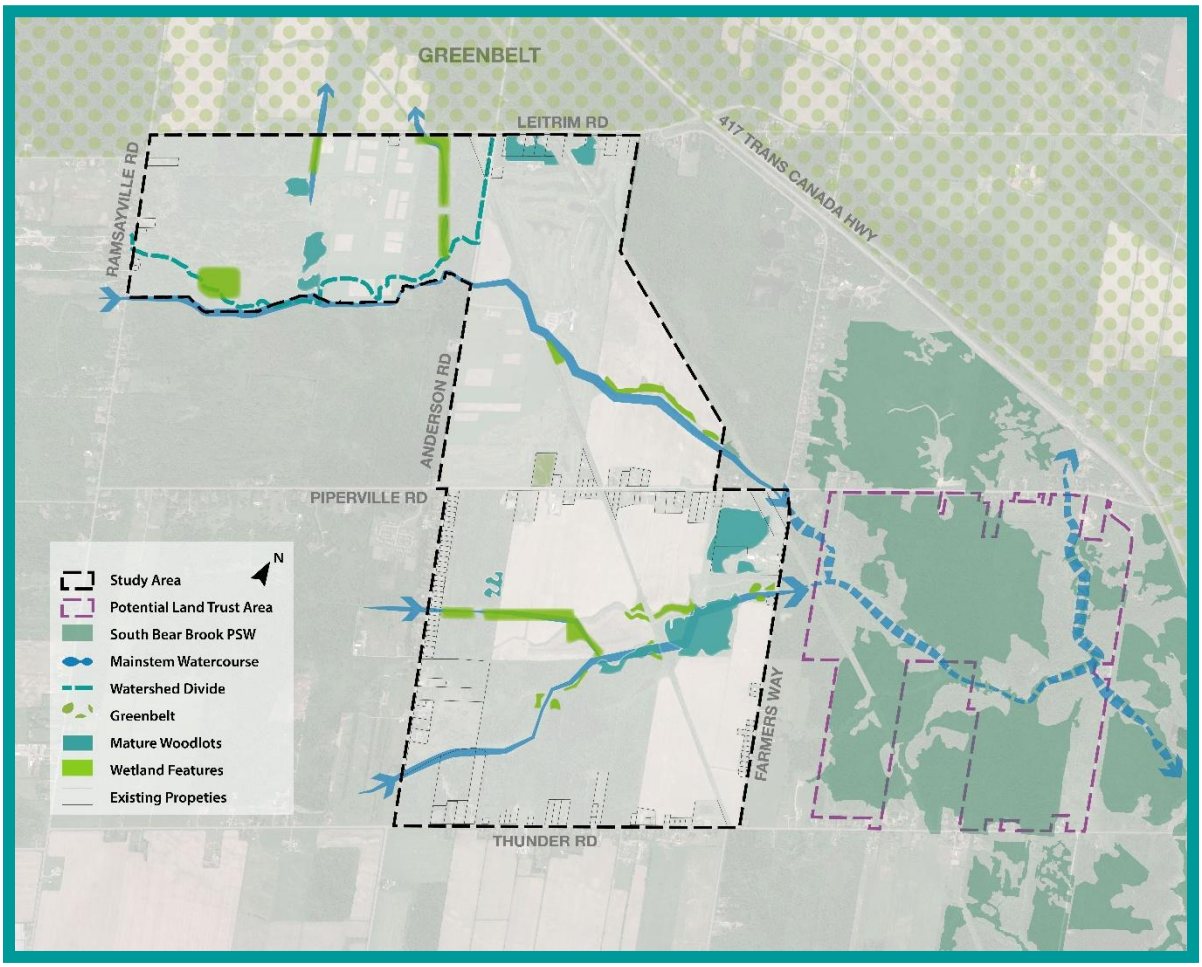
Figure 44: Mature Woodlands (source: USI)



4.8.2.2.2 New and Preserved Wetland Features

The creation and sustainability of high-quality wetlands is realized through their integration into the natural corridor, providing habitat, diversity and surface water moderation by co-locating with watercourses and surface water outlets from the development lands. The new and preserved wetland feature locations are shown in **Figure 45**. The future constructed wetlands will diversify the existing ecological landscape by establishing more permanently wet features that support a wider range of species. A high-quality wetland is preserved in Block 1 adjacent the Smith-Gooding Drain, and multiple constructed wetlands are situated throughout the ecological corridor, hydraulically connected to either the watercourses and/or the storm pond outfalls.

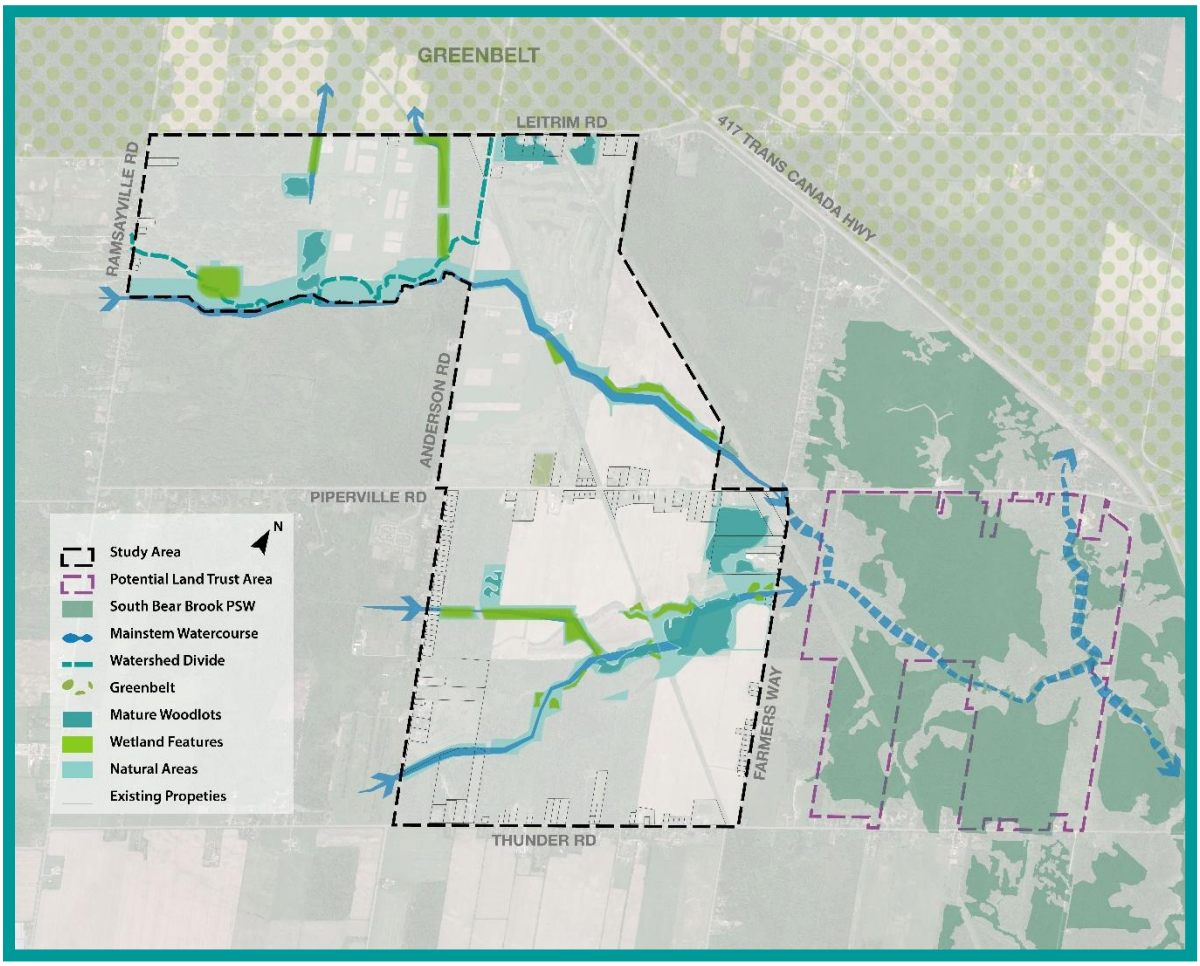
Figure 45: New and Preserved Wetland Features (source: USI)



4.8.2.3 Naturalized Corridor Lands

Watercourse features are the spine of the natural system that is realized as corridors through the Tewin Lands. The configuration and width of the corridors must be robust enough to support a wildlife corridor comprised of habitat, diversity richness, riparian functions, and resilience. Varying widths and components are based on the nature of the watercourse, feature functions and adjacent lands. Detailed dimensions (widths, lengths and areas) shall be established to support the integrity of terrestrial and aquatic habitat and movement, protect water quality, avoid natural hazards and accommodate wetland and watercourse feature construction. These natural areas are shown in **Figure 46**.

Figure 46: Natural Areas (source: USI)



4.8.2.3.1 Surface water management

Future stormwater ponds must be located in proximity to the watercourses to supplement the natural corridor with a complementary land use. The location of the stormwater management ponds is shown in **Figure 47**. In addition to their infrastructure services, stormwater management ponds do evolve into features that offer some aquatic and terrestrial vegetation around the periphery, provide the visual experience of water for aesthetic enjoyment, and build large buffers to more intensive land uses as shown in **Figure 48**. Due to the maintenance requirements, they are not part of the core natural system but a complementary land use offering passive **Community Open Space** benefits. Protected underground and overhead infrastructure corridors (Bell, hydro, etc.) provide structured recreation walking opportunities and link communities into the natural corridor. Outlets need to be located as far upstream in the system as feasible to protect watercourse hydration and aquatic habitat.

Figure 47: Stormwater Management Ponds (source: USI)

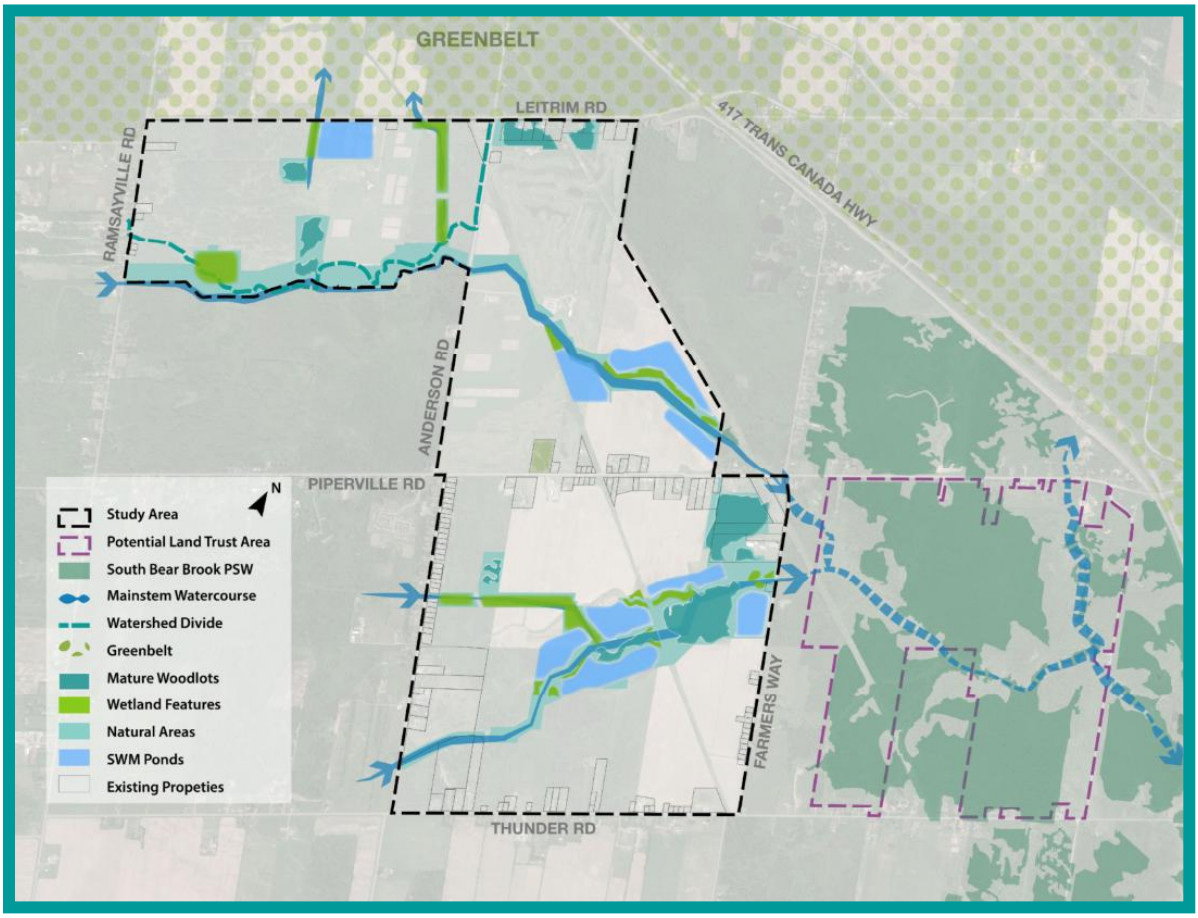
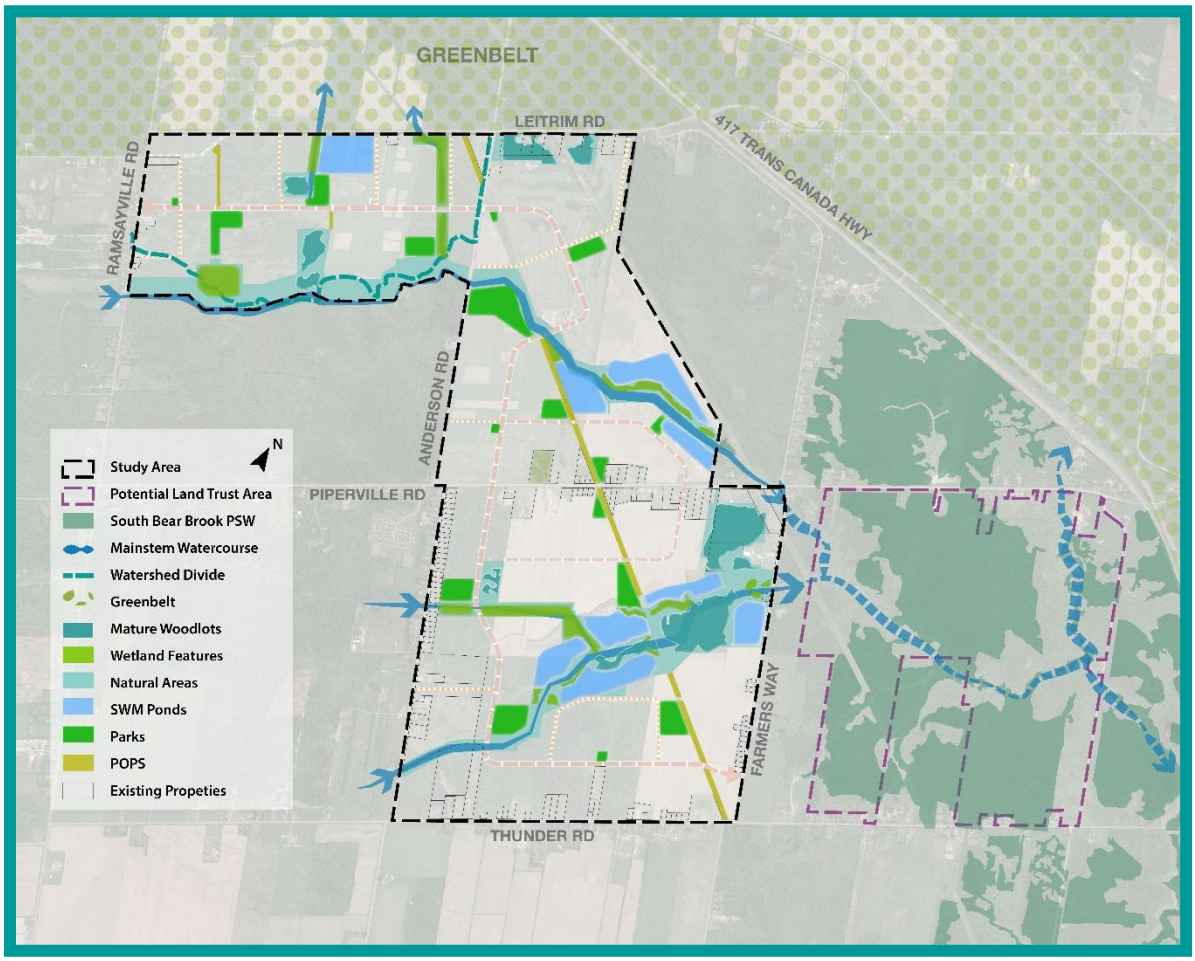


Figure 48: Stormwater Management Facility examples

4.8.2.3.2 Parks and Open Spaces

Parkland throughout the Tewin Lands shall be purposefully located to complement and benefit from the natural corridor as shown in **Figure 49**. Parkland may include passive spaces with native species, shade trees and connected recreational paths. At the interfaces between parkland and the ecological corridor, unmanicured ground cover will be encouraged, and additional tree densities established.

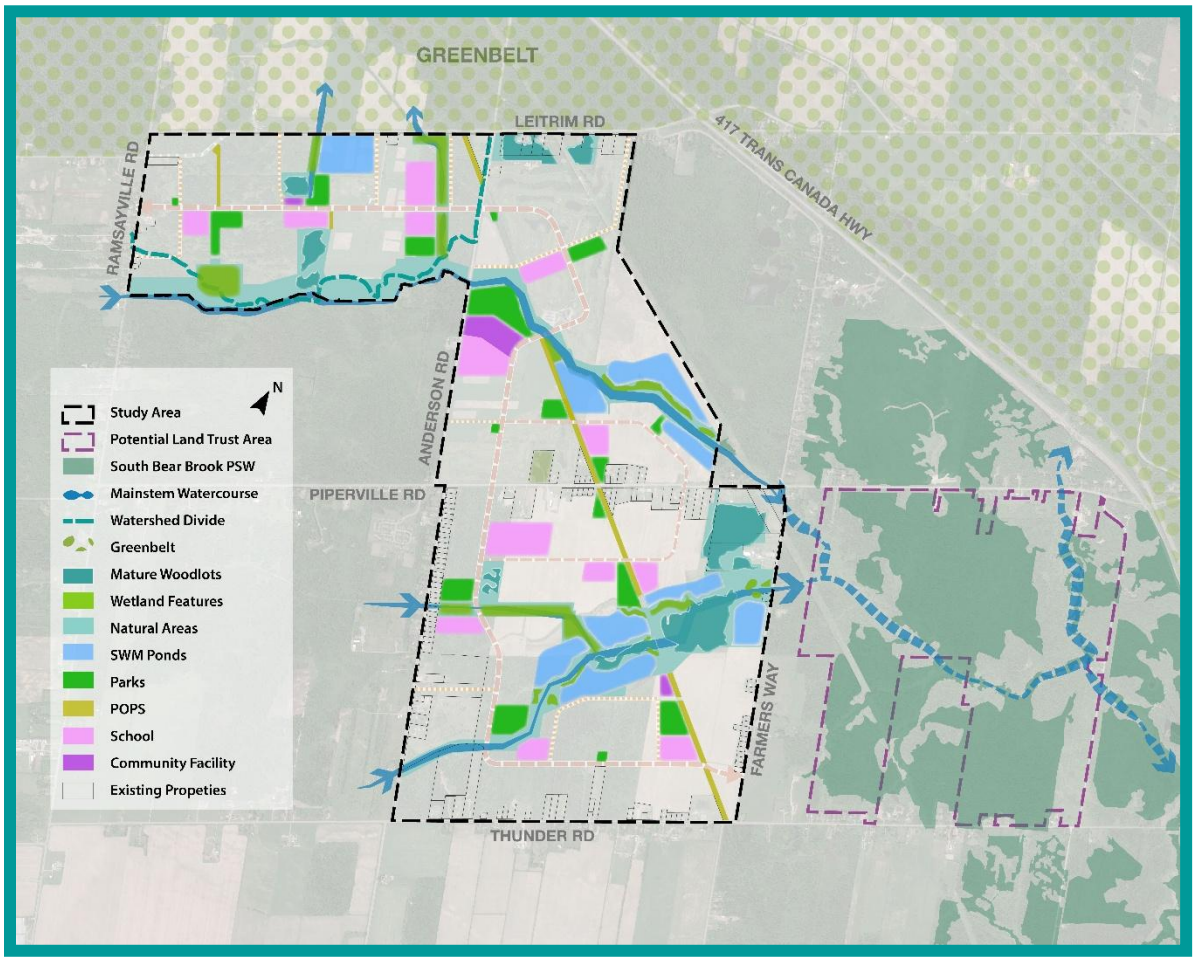
Figure 49: Parkland (source: USI)



4.8.2.3.3 Schools and Community Facilities

The Algonquin values emphasize the connection of people to their natural environment. Distinct and special open spaces associated with schools and community facilities such as community gardens, orchards and meeting spaces are structured alongside the corridor, promoting stewardship and connections to nature. These soft space land uses provide additional transitional land adjacent to the natural corridor, as shown in **Figure 50**.

Figure 50: Schools and Community Facilities (source: USI)



5 Surface Water Management

5.1 Existing Drainage

5.1.1 Watershed Divide

It is recognized that respecting existing watershed boundaries generally results in the least downstream impacts on receivers except in special circumstances. No benefits of watershed boundary manipulation were identified on the Tewin Lands or receivers, and therefore the drainage divide between Ramsay Creek and the Bear Brook has been substantially maintained. Slight deviations are balanced

5.1.2 Existing surface water management

Existing surface water management is handled by roadside ditches with no quality or quantity controls. Two municipal drains within the Bear Brook watershed traverse the site conveying flows from within and upstream through the Tewin lands. Abandoned former agricultural drainage networks collect surface water in the north-west section and convey it under Leitrim Road to the main stem of Ramsay Creek.

5.1.3 Site Topography

The site features a predominantly flat topography, with slight variations in elevation and drainage patterns across different sections. Between Ramsayville Road and Anderson Road, the terrain is higher at the western boundary near Ramsayville, with grades around 82.5m, draining into agricultural ditches. Towards Anderson, the grades decrease to approximately 78.8m, with surface water draining into a separate tributary of Ramsay Creek. The Anderson Links Golf Course has similarly flat characteristics, with grades ranging from 81.0m to 79.5m and localized depressions contributing to surface drainage features. Between the golf course and Piperville Road, the land remains flat, with grades transitioning from 78.5m at the east near Piperville Road to 80.7m in the west, draining northwards into the Smith-Gooding Municipal Drain. South of Piperville Road, the topography is also flat, with elevations ranging from 81.0m to 78.5m. Surface drainage in this area is directed into shallow ditches, ultimately feeding into a Bear Brook tributary.

5.1.4 Watercourses and Drainage Boundaries

There are two watersheds present within the Tewin boundary: Ramsay Creek and the Upper Bear Brook. Much of the site is tributary to the Upper Bear Brook, while the northern portion of the site is tributary to Ramsay Creek. The existing watershed boundaries are presented in **Figure 27**.

5.1.4.1 Ramsay Creek

In the northern portion of the Tewin land west of Anderson, there are low-gradient stream channels swales, primarily remnant agricultural drainage ditches, that drain to Ramsay Creek.

North of Leitrim Road, two unconfined, straightened channels flow through agricultural fields before merging approximately 600 metres downstream.

Ramsay Creek functions as the drainage outlet for the site's northern area, with two culverts on Leitrim Road conveying flow from the site headwater area to the creek. North of Leitrim Road, Ramsay Creek flows through National Capital Commission (NCC) lands, heading north to a Highway 417 crossing. Ramsay Creek is tributary to Green's Creek which eventually outlets to the Ottawa River. The Ramsay Creek tributaries at Leitrim Road are notably high relative to the site's topography.

5.1.4.2 Bear Brook

The remainder of the study area drains into two tributaries of the Bear Brook watercourse. North of Piperville Road is the Smith-Gooding Municipal Drain. The second tributary, located south of Piperville Road, is the downstream end of the Johnston Municipal Drain, with a portion of the watercourse within the site limit with no municipal drain designation. The watercourses come to a confluence point, east of Farmers Way, downstream from the Tewin Lands. The Bear Brook watercourse continues east, crossing under Highway 417 and ultimately connects to the Bear Brook Municipal Drain further downstream beyond the Greenbelt lands.

5.2 Development Impact Considerations and Objectives

5.2.1 Key considerations -Opportunities and Constraints

I. The general urbanization of the subject area will increase runoff which must not cause negative impacts in the downstream receivers.
II. The infiltration potential is considered to be low and generally unsuitable for the implementation of infiltration-based low-impact development features.
III. The relatively flat topography and associated geotechnical grade restrictions will require specific consideration.
IV. Watercourse hydration must be maintained or improved to support aquatic habitat.
V. Downstream Ramsay Creek and Bear Brook have been geomorphologically evaluated resulting in the identification of erosion thresholds that must be implemented.
VI. Downstream Bear Brook has known flooding issues that have been assessed for sensitivity to potential cumulative impacts. The development of the Tewin Lands in combination with other planned short term and potential long term development areas with appropriate stormwater management controls does not exacerbate existing hazards.
VII. Preserved and constructed on-site and downstream natural heritage features and functions must be supported through appropriate water quality protection.
VIII. Drainage from the upstream South Bear Brook catchment areas must be safely and sufficiently conveyed through the Tewin Lands so as not to inhibit or constrain existing or future land uses.
IX. Climate change resilience and sensitivity can be accommodated in the surface water management system.

The MSS (under separate cover) details a broad range of evaluation criteria and the benefits and challenges of various stormwater management options. For the purpose of this EMP, a general summary is provided with a focus on natural features and functions.

5.2.2 External Future Urban Areas

Through the South Bear Brook Subwatershed Study, City of Ottawa staff are committed to ensuring that upstream lands within the South Bear Brook catchment are not impeded from future urban expansion area development due to receiver limitations. At the time the EMP was prepared, the Tewin Lands are coordinating with the subwatershed study to determine if accommodation for upstream stormwater flows, such as potential deepening or other alterations to the watercourses traversing Tewin could be necessary. Watercourse alterations will also be leveraged to incorporate natural channel design where channels are anthropogenically altered and will be explored and undertaken through a separate Municipal Drainage Act process.

5.3 Stormwater Management Criteria

5.3.1 Flood Control Targets

Quantity control requirements were set using the approved Cumulative Hydrologic Impact Assessment (CHIA) for the Bear Brook tributaries, and the Tewin Developments: Ramsay Creek Preliminary SWM Design reports.

5.3.1.1 Ramsay Creek

A stormwater management (SWM) analysis supporting the development of the 150.23 ha portion of the Tewin lands draining to Ramsay Creek was undertaken to quantify pre- and post-development peak flows, establish allowable release rates, and determine required storage volumes to mitigate downstream flood and erosion impacts. (See ***Appendix F***)

5.3.1.1.1 Pre- and Post-Development Drainage Conditions

Under existing conditions, the drainage area is primarily agricultural or wooded, with relatively low imperviousness. Hydrologic modelling was completed from the headwaters of Ramsay Creek (south of Leitrim Road) to an area downstream of Highway 417.

Under post-development conditions, the total drainage area to the Ramsay Creek confluence must remain essentially unchanged from 313.44 ha predevelopment.

Post-development peak flows shall be controlled to remain at or below pre-development levels through iterative pond sizing.

5.3.1.1.2 Unitary Release Rates and Storage Requirements

The required storage volume and allowable release rates were established to ensure compliance with pre and post development conditions, and to satisfy erosion thresholds. The maximum unitary release rate and storage volume needed to manage runoff from the development lands are provided in **Table 7**.

Table 7: Target Release Rates for Ramsay Creek

Return Period	Target Release Rate (L/s/ha)	Storage Requirement (m^3/ha)
2 Yr.	3.21	231
5 Yr.	5.98	318
10 Yr.	6.48	374
50 Yr.	10.74	497
100 Yr.	15.29	546

5.3.1.2 Bear Brook

5.3.1.2.1 Pre- and Post-Development Drainage Conditions

Quantity control requirements were set by the approved Cumulative Hydrologic Impact Assessment (CHIA) for the Bear Brook tributaries.

JFSA evaluated whether proposed stormwater management (SWM) controls for the Tewin Lands - and potentially other future development areas - were adequate to prevent increased peak flows downstream. The analysis focused on the Bear Brook watershed and considered the cumulative impact of development within the Tewin Lands using SNC's 2022 HEC-HMS (Hydrologic Modeling System) as the primary tool. SWMHYMO was then used to assess storage requirements and validate post-development controls. This work was further updated in 2026, based on the 2025 SNC model, and re-assessed the storage and target release rates and considered the impacts of a long-term development scenario in the City of Ottawa. The release rates and storage requirements outlined were determined to be less restrictive than the original analysis presented in Error! Reference source not found.**8**. As such these values are considered conservative from a pond sizing perspective and serve the intended purpose for a master planning exercise. Pond storage requirements are expected to be reviewed and confirmed during later stages of planning applications. (See ***Appendix F***)

5.3.1.3 Unitary Release Rates and Storage Requirements

The unitary release rates for the Tewin Lands were derived to mitigate downstream hydrologic impacts. The resulting storage requirements ranged from 265.18 m^3/ha (2-year) to 617.83 m^3/ha (100-year), inclusive of quality control volumes.

Table 8: Target Release Rates for Bear Brook Tributaries

Return Period	Target Release Rate (L/s/ha)	Storage Requirement (m^3/ha)
2 Yr.	1.37	265
5 Yr.	2.02	362
10 Yr.	2.57	426
50 Yr.	4.10	561
100 Yr.	5.21	618

5.3.2 Quality Control Targets

Enhanced level protection, equivalent to 80% total suspended solids (TSS) removal, is established as the quality control target for drainage areas discharging to both Ramsay Creek and the Bear Brook tributaries.

5.3.3 Erosion Control Targets

Erosion thresholds have been established in reports completed by GEO Morphix – Erosion Threshold and Exceedance Assessments (March 2026) prepared for both Ramsay Creek and Bear Brook watersheds. (See ***Appendix F***)

The formal targets are the following:

Post-development erosion exceedance should match pre-development exceedance (TRCA, 2012; CVC, 2015); practically minor differences of less than 5% in the key erosion metric, Cumulative Effective Work Index (CEWI), are considered negligible as they are within the expected uncertainty of the modeling approach and unlikely to produce a measurable geomorphic response in the receiving watercourse.

5.3.4 Volume Control Targets

Stormwater volumes generated from the geographically specific 90th percentile rainfall event on an annual average basis from all surfaces on the entire site are targeted for control.

No infiltration LID's are supported for the purpose of volume reduction. The extensive tree canopy proposed for the site will support evapotranspiration, as will lot level BMP's.

5.4 Stormwater Management Options & Evaluation

The following section outlines the various stormwater servicing options for stormwater management on the Tewin Lands as they have been identified in the MSS. They have been screened based on feasibility, alignment with regulatory requirements, EMP recommendations and ability to meet the planned development targets.

Option 1: Do Nothing

Urbanizing the Tewin lands without providing stormwater management would not meet the objectives of the Ontario Ministry of the Environment, Conservation and Parks, which include preventing increased flood risk, protecting water quality, and minimizing impacts on natural systems. This approach is also inconsistent with the City of Ottawa's Stormwater Management Design Guidelines and Conservation Authority policies related to watershed protection and erosion control. As this option does not address the project problem statement or regulatory requirements, it was not considered further.

Option 2: Stand-Alone Low Impact Development (LID) Measures

Techniques, such as bioswales, infiltration trenches, rain gardens, and permeable pavements, are commonly used to reduce runoff volume and enhance water quality at the source. While LID can be effective in targeted applications, widespread implementation across the Tewin development is constrained by site-specific limitations, including soil permeability and high groundwater table. LID measures may be considered as supplementary practices but do not offer a standalone solution for meeting the area-wide stormwater management objectives. As such, LID has been screened out as the primary servicing strategy.

Option 3: Stand-Alone End-of-Pipe Treatment Measures

End-of-pipe stormwater management facilities provide a reliable and proven method of controlling peak flows and improving water quality. These facilities can be designed to meet City, MECP, and Conservation Authority requirements, including suspended solids removal, erosion control, and safe conveyance of major system flows.

Option 4: Combined LID Measures with End-of-Pipe Facilities

A combined approach integrates targeted LID practices where site conditions permit, while maintaining end-of-pipe facilities as the primary stormwater control method. This hybrid strategy allows the development to balance practical feasibility, maintenance considerations, and environmental performance. Integrated systems also provide flexibility during detailed design to incorporate LID features where they are most effective. The guidance provided under the CLI-ECA will determine if and where LID measures are appropriate.

A set of evaluation criteria was developed through the Tewin EA process to evaluate the social, environmental and economic impacts of the community design and stormwater management strategies. These criteria were developed, reviewed and presented for feedback early in the study

process as discussed in the Consultation Summary Report which shall be prepared at the end of the engagement period. The evaluation criteria and results are presented in the MSS.

5.4.1 Stormwater Management Facility Configuration Options

End of pipe facility options were tested as quantity control will be required with little to no infiltration potential for the development. The analysis was not meant to preclude LIDs, rather it evaluates the location and number of end-of-pipe facilities which will be required to achieve flood control targets.

Several configurations of stormwater management facilities were considered, as shown in **Figure 51**. Each option aims to balance grading constraints, drainage patterns, and infrastructure needs while maintaining compliance with municipal and provincial standards. The configurations are designed to address site-specific challenges, such as grade raise restrictions and outlet elevations, respond to recommendations in the EMP, and provide sustainable solutions for stormwater quantity control.

Option 1: Minimize Facilities

This configuration assesses the minimum number of off-line stormwater management facilities needed to service the site. While macro-level drainage patterns are maintained, they are consolidated to a single outlet per drainage divide.

Option 2: Mimic Existing Drainage Patterns

This option utilizes the current drainage patterns to strategically place stormwater management facilities. The main advantage is improved grading, as multiple outlets will reduce storm sewer sizes and keep hydraulic grade lines low. Leveraging existing topography, smaller sewers, and lower hydraulic grade lines is expected to benefit grading and minimize the site's grade raise requirements.

Option 3: Maintain Outlets to Tributaries

This configuration proposes keeping outlets to their respective tributaries. Ponds are strategically located based on existing topography, which is expected to minimize grade raise requirements compared to Option 1 but not as much as Option 2.

Figure 51: SWM Pond Configuration Options (DSEL - MSS)

Ponds positioned as low as practical to achieve a positive outlet to the downstream receiver. A conceptual storm sewer network was sized for each option based on the contributing drainage areas. For all preliminary comparison purposes, the pipes were assumed to operate under gravity flow conditions, and no submergence was considered.

5.4.1.1 Stormwater Management Facility Configuration Evaluation

The evaluation of stormwater management options considered several key factors. Permanent pools in the conceptual stormwater ponds were set just above downstream inverts, with ponds positioned as low as practical. A conceptual storm sewer network was sized for each option based on the contributing drainage areas. For all preliminary comparison purposes, the pipes were assumed to operate with no submergence.

Option 2 - Mimic Existing Drainage Features is the preferred solution as it leads to the most optimal grading condition, hydrates the watercourses at various locations and has the most economical pipe network.

5.4.2 Legal Outlet

The City of Ottawa Infrastructure Master Plan states that statutory approvals are required to establish stormwater outlets for proposed development areas that are both legal and sufficient. It

accepts two primary forms of legal stormwater outlets: i) natural watercourses; and ii) petition drains, or other drains (commonly referred to as municipal drains).

Ramsay Creek: The northern portion of the site drains to Ramsay Creek. Consultation with the NCC has been initiated to accommodate a lowered creek profile with a natural channel design. The design will be informed by post-development hydrologic, hydraulic, and erosion analyses to ensure the adequacy of both the proposed channel and downstream channels in conveying post-development flows. As part of ongoing coordination with the NCC, a maintenance agreement is expected to be requested to enable the City of Ottawa to perform channel maintenance, as required.

Bear Brook: Pre- and post-development modelling for the development's stormwater management strategy, supported by a geomorphological study of the watercourses to which Tewin is tributary, has been prepared (See ***Appendix F***). The strategy for obtaining a legal and sufficient outlet for the Tewin development relies on using the Municipal Drain process under Ontario's Drainage Act. The City has asked to appoint an independent engineer under Section 65(3) to review and verify the proposed connections to the Bear River and Smith-Gooding Municipal Drains, supported by hydrologic modelling from the project team. Once that review is complete, a formal Section 65(5) application will be made to City Council to authorize the connection, recognizing that approval may come with conditions.

5.4.3 Stormwater Control Assessment

Appendix A of the CLI-ECA provides direction on the preferred hierarchy of stormwater control as outlined in Table A1-Footnote. The applicable footnotes for the assessment of stormwater controls state:

[3] Stormwater volumes generated from the geographically specific 90th percentile rainfall event on an annual average basis from all surfaces on the entire site are targeted for control. Control is in the following hierarchical order, with each step exhausted before proceeding to the next: 1) retention (infiltration, reuse, or evapotranspiration), 2) LID filtration, and 3) conventional Stormwater management. Step 3, conventional Stormwater management, should proceed only once Maximum Extent Possible [8]

[8] Maximum Extent Possible means maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices, given the site constraints [11].

[11] Site constraints must be documented. A list of site constraints can be found in Table A2.

The following sections describe the site constraints and assess the applicable stormwater controls for the 90th percentile rainfall event. Each step of the hierarchy has been reviewed based on its ability to provide effective quality treatment.

5.4.3.1 Site Constraints

The following are site constraints that are applicable to the proposed development as outlined in Paterson's Existing Conditions – Geotechnical report, Dillons Existing Conditions Hydrological Study and the EIS report.

While conditions vary across the site, the following general constraints are present based on the geotechnical and environmental findings:

- There is generally a high groundwater table, with fluctuations seasonally, with rapid response to rainfall and observed rises in monitoring wells.
- Generally, the subsurface profile encountered consists of a deposit of silty clay overlain by a relatively thin layer of weathered clay or sand and underlain by a deposit of glacial till.
- Localized organic and fill materials are present in select areas, contributing to variability in soil conditions.
- Site includes low-lying or seasonally wet areas influenced by surface water.

These constraints are to be carried forward into the servicing and stormwater assessment under the CLI-ECA framework.

5.4.3.2 Control Hierarchy Step 1: Retention

Stormwater retention can be achieved via infiltration, reuse or evapotranspiration. While opportunities for reuse and enhanced evapotranspiration are available on a lot-level basis, these measures are not considered to achieve the stormwater criteria. Therefore, this first step assesses the potential for infiltration-based LIDs. It is noted that only LIDs that are to be included within the City CLI-ECA are to be evaluated. Therefore, only LIDs in the public realm (ROWs, parks, municipal lands) are to be evaluated.

Infiltration

Due to the site constraints and the guidance provided in Appendix 10 of the City of Ottawa Sewer Design Guidelines there are no opportunities for infiltration type LID measures.

Reuse

Reuse facilities within the City of Ottawa right-of-way would be a substantial deviation from standard City Operating Practices.

Evapotranspiration

Tree canopy and vegetation within municipal ROWs and public blocks will provide some evapotranspiration benefit. The Environmental Management Plan (EMP) identifies a target tree canopy coverage of approximately 32% over developable land, which reflects existing conditions.

5.4.3.3 Control Hierarchy Step 2: Filtration

Filtration-based low impact development (LID) measures, such as bioretention cells, media filters, and enhanced swales, can provide water quality benefits; however, opportunities within current approved municipal rights-of-way cross-sections are limited. Local road allowances must accommodate travel lanes, sidewalks, utilities, and street trees, leaving limited space for filtration systems that require meaningful surface area and filter media depth. In addition, subsurface utility setback requirements further limit placement.

Runoff conveyed through the roadway system includes drainage from streets, front and rear yard areas. Due to the limited opportunities for filtration-based LIDs, it is not expected that the inclusion of filtration-based LIDs will make a large enough impact to reduce the proposed SWM facility blocks. Therefore, it is assumed at this stage that no filtration-based LIDs are proposed with respect to the design of the SWM facilities.

The following constraint, extracted from Table A2 of Appendix A of the CLI-ECA is considered:

N) Economic considerations set by infrastructure feasibility and prioritization studies undertaken at either the local/site or municipal/system level.

The site requires stormwater quantity controls to limit post-development peak flows and achieve erosion targets. Given the footprint required to achieve these quantity control objectives, it is logical to incorporate water quality treatment within the end-of-pipe stormwater management facilities. Implementing filtration-based LIDs within constrained rights-of-way, only to route flows to centralized quantity control facilities, would introduce additional maintenance requirements with limited, if any, incremental benefit.

An opportunity exists within Block 1 where flows are directed toward a headwater feature that serves ecological functions and cannot be used for water quality treatment. The drainage area contributing to this feature is relatively small and consists primarily of private development parcels. For this area, a treatment train approach is proposed, consisting of isolation rows with upstream oil-grit separator (OGS) units to provide pre-treatment prior to discharge.

5.4.3.4 Control Hierarchy Step 3: Conventional Stormwater Management

Stormwater management facilities will be required for storage, regardless of any potential use of filtration LIDs. Considering the land area these facilities occupy, incorporating water quality control measures (permanent pools) within them presents the most practical and effective solution for achieving the required level of treatment.

Stormwater management ponds are the most common type of facility in Ontario and can be designed to meet City of Ottawa, MECP, and RVCA requirements. Their use is considered the most appropriate solution for the Tewin development.

5.4.4 Quantity Controls:

5.4.4.1 Ramsay Creek

Quantity control requirements were determined by JFSA by matching pre-development flow rates for design events up to and including the typical 100-year design event and considering a post-development imperviousness value of 66%. See ***Appendix F*** for additional details.

An erosion threshold and exceedance assessment was undertaken to identify if additional considerations were required to ensure downstream erosion (existing or potential) is not impacted or exacerbated by development on the Tewin Lands. Stormwater is expected to outlet to the easternmost culvert under Leitrim Road. Additionally, an 8.4 ha natural channel corridor will remain unaltered.

Geomorphological field observations were collected along Ramsay Creek within and downstream of the Tewin Lands to determine the reaches most sensitive to future upstream land use changes. A drainage characterization study determined that downstream impacts from the Tewin Lands were unlikely to extend beyond Reach RC1 at Hwy 417, which is located approximately 400 m upstream of Reach RCB. Detailed geomorphological assessments were completed along downstream receiving reaches RC1 and RCB to inform erosion threshold modelling. Erosion threshold results are summarized above in Section 4.2.1.

A pre- to post-development erosion exceedance analysis was completed using the erosion thresholds defined for Reaches RC1 and RCB and the results from a continuous hydrological simulation provided by JFSA (2026). Four relevant erosion indices were modelled; cumulative effective discharge volume (CEV), cumulative effective work index (CEWI), and the cumulative number and duration of exceedance events. The most relevant erosion index is the cumulative effective work index, as it reflects both the magnitude and duration of erosion exceedance events.

The erosion exceedance analysis results indicate that the implementation of a moderate overcontrolling of the flows out letting from the Tewin Lands adequately addresses the potential for erosion concerns, as shown in **Table 9**. Under post-development conditions, the most relevant erosion index, CEWI, will remain within 5% of existing conditions, indicating negligible changes in erosion potential.

An additional climate sensitivity analysis was completed to evaluate whether changes in runoff associated with forecast changes in daily precipitation under future climate scenarios would affect the conclusions of the erosion exceedance assessment for Ramsay Creek. The a continuous hydrological simulation provided by JFSA (2026) was rerun with adjusted precipitation inputs to represent potential climate-related changes. Two sensitivity scenarios were modeled: a warm/wet case with higher runoff volumes and storm magnitudes (20% increase in daily precipitation) and a warm/dry case with reduced runoff (20% decrease in daily precipitation).

The analysis indicates that the proposed SWM strategy remains effective under both low- and high-precipitation scenarios. Post-development changes in the key erosion metric (CEWI) remain within ±5% of pre-development conditions at both sites and in both scenarios. The results indicate that the proposed SWM strategy for the Tewin UEA is expected to remain effective in mitigating erosion risk across a wide range of future precipitation scenarios.

Please refer to GEO Morphix Reports in ***Appendix F*** for additional details.

A portion of the Ramsay Creek tributary is proposed to be deepened and will be designed to ensure an improvement to ecological condition and connection, and to accommodate future flows from development.

Table 9: Ramsay Creek Erosion Exceedance Assessment Results

EROSION EXCEEDANCE SUMMARY – CUMULTIVE EFFECTIVE WORK INDEX (N/m^2)		
Reach	**RC1**	**RCB**
PRE Cumulative (1967-2016)	**1.36×10^4**	**2.18E+04**
POST Cumulative (1967-2016)	**1.33×10^4**	**2.13E+04**
Change (%)	**-2.30**	**-2.31**

5.4.4.2 Bear Brook

Quantity control requirements were set by JFSA in the Cumulative Impact Study for the Bear Brook tributaries (See ***Appendix I***). JFSA evaluated the cumulative hydrologic impacts of the proposed development within the Bear Brook and Tributaries watershed, specifically assessing whether

stormwater management (SWM) controls for the Tewin Lands, and potentially other nearby expansion areas, are adequate to prevent increased peak flows downstream. A third analysis was undertaken in 2026 that assessed the impacts of a long-term full city of Ottawa Build out. These analysis focused on the Bear Brook watershed and considered the cumulative impact of development within the Tewin Lands using HEC-HMS (Hydrologic Modeling System) as the primary tool, with models derived from the 2022 South Nation Conservation's (SNC) flood hazard mapping study.

The baseline hydrologic modeling framework used for the Tewin Lands cumulative impact assessments are founded on the original 2022 SNC HEC-HMS models for both summer and spring conditions. These models were used as the foundation but required minor modifications to align with the development boundaries and support the cumulative impact analysis. These models form the baseline for assessing the hydrologic impacts of future development.

The future development cumulative impact analysis used the updated SNC 2025 HEC-HMS Spring and Summer events. In addition to accounting for the Tewin lands and planned future expansion areas, this study considered all potential future development lands within the city boundaries except for lands identified by long-term constraint designations such as prime agriculture, provincially significant wetlands, aggregate resources and natural hazards. The 70% imperviousness criteria was applied to all the future development lands as is the same stormwater management strategy proposed for the Tewin development. The results found that applying the proposed Tewin stormwater management (SWM) control criteria across all potentially developable lands in the Bear Brook watershed (≈11,528 ha; 41% of watershed) resulted in future-controlled peak flows that do not exceed existing annual (spring or summer) peak flows at any of the 20 model nodes evaluated. (See **Appendix F**)

A geomorphological assessment was conducted by GEO Morphix to establish the erosion thresholds for on-site and downstream sensitive reaches within the range of influence for the Tewin Lands. To support the erosion exceedance analysis, a continuous model is required, negating the use of the event-based SNC HEC-HMS model. To address this limitation, in 2026 JFSA produced a continuous model in SWMHYMO which was validated with a monitored event in October 2025. Using the 2026 JFSA SWMHYMO model and GEO Morphix's erosion thresholds, GEO Morphix assessed changes in pre- and post-development erosion potential.
Results of the analysis indicate that by including the required storage capacities, the implementation of the wet pond stormwater management strategy will mitigate erosion potential through a reduction in discharges. Following development, erosion potential is expected to decrease along all six assessed reaches, as demonstrated by a reduction in cumulative effective work outlined in **Table 8**.

An additional study assessed the potential impact of the Tewin lands development on erosion within the Bear Brook watershed under future climate change scenarios. The 2026 JFSA SWMHYMO model was rerun with adjusted precipitation inputs to represent potential climate-related changes. Two sensitivity scenarios were modeled: a warm/wet case with higher runoff volumes and storm magnitudes (20% increase in daily precipitation) and a warm/dry case with reduced runoff (20% decrease in daily precipitation).

Following the same methodology used for the primary erosion exceedance assessment, the adjusted precipitation dataset was used for both pre- and post-development conditions to isolate the effect of development across the range of potential precipitation conditions.

The results demonstrated that both low- and high-precipitation scenarios do not meaningfully alter the conclusions of the erosion exceedance assessment. At both sites and in both scenarios, post-development flow conditions are not expected to increase erosion potential in the receiving watercourse. These results further demonstrated that the SWM strategy effectively mitigates increases in erosion potential associated with the development of the Tewin lands.

The stormwater management strategy will ensure existing erosion conditions and sensitive reaches are protected and, in some areas, may reduce existing erosive impacts on the receiving watercourses. Refer to GEO Morphix Erosion Threshold and Exceedance Reports in ***Appendix F*** for additional details.

Table 10: Bear Brook Erosion Exceedance Assessment Results

EROSION EXCEEDANCE SUMMARY – CUMULATIVE EFFECTIVE WORK INDEX (N/m^2)						
Reach	**BB5-5A-3**	**BB5-5**	**BB6**	**BB5**	**BB1**	**dBB1**
PRE Cumulative (1967-2016)	**5,262**	**4,321**	**10,624**	**3,613**	**1,862**	**1,011**
POST Cumulative (1967-2016)	**4,544**	**3,880**	**10,357**	**3,471**	**1,856**	**996**
Change (%)	**-13.64**	**-10.20**	**-2.51**	**-3.91**	**-0.35**	**-1.48**

6 Recommendations

6.1 Natural Heritage Features and Wildlife Corridor

The natural heritage features and wildlife corridor shall be contained within the **Ecological Corridor** (see Section 6.5) and are buffered by the surrounding complementary land uses, as shown in **Figure 52**. Specific features require special considerations to thrive and ensure sustainability over the long term. Due to the size and long term build out expected for the Tewin Lands, details on these measures are to be provided in the Implementation Guide (see Section 7.2).

Figure 52: Conceptual Ecological Corridor and Community Open Space System

6.1.1 Watercourses

As shown in **Figure 53**, watercourses will be preserved in place where they reflect the legacy drainage corridors from the 1908 survey. Additional constructed watercourses with natural channel design will be created to ensure the length of watercourses, by watershed, is replicated on-site. Watercourse lengths are shown in **Table 11**. The importance of these constructed watercourses is to reinstate the functions of natural channels in supporting habitat, wetland, floodplain connections and downstream water quality which has been lost through anthropogenic alterations for agricultural drainage over time.

Tile drains, where they exist, and the connected former agricultural drainage ditches will be removed and abandoned through the development process.

Figure 53: Retained Existing Watercourses

Table 11: Watercourse lengths

WATERCOURSES				
Watershed	Historic	Retained	Created	Total
Ramsay Creek	**2,130 m**	**294 m**	**1947 m**	**2241 m**
Bear Brook	**9,727 m**	**8265 m**	**2290 m**	**10555 m**

Water quality is protected with conventional stormwater management facilities achieving enhanced treatment (80% TSS removal) prior to entering the **Ecological Corridor**. Stone core wetlands co-located with stormwater management outlets provide additional quality polishing and thermal mitigation, as does extensive tree planting and/or preservation around the stormwater management ponds and within the **Community Open Space System** and **Ecological Corridors**.

Hydration of watercourses will be maintained at or below pre-development peak flows through stormwater management controls and hydrated from upstream inputs and site-specific measures

where required. Baseflow from deep groundwater does not play a significant role in maintaining the hydrological regime.

Municipal Drain status on the Smith-Gooding and Johnston is expected to be maintained, however opportunities to establish improved watercourse habitat and stewardship through implementation of natural channel design and maintenance access treatment/configuration will be explored through a concurrent but separate Municipal Drainage Act coordination process. **Figure 54** provides conceptual wetland and watercourse designs.

All watercourses and their associated ecological corridors shall be conveyed to the City of Ottawa through the subdivision process.

6.1.2 Wetlands

Although wetlands exist on the Tewin Lands, they have been assessed as low quality and generally unsupportive of the habitat diversity aspired to in the Tewin Intent and One Planet Living approach. Two existing wetlands are being retained and supported/enhanced. The first is adjacent the Smith-Gooding Drain, and the other is adjacent the mature woodland south of Piperville Road. Through out the **Ecological Corridor**, wetland cells of high quality, open marsh and pond wetlands shall be either retained or constructed. Constructed wetlands perform many functions within the ecological corridor, adding diversity, retaining water, providing habitat and buffering watercourses – all without the need for standard municipal maintenance. Hydration of the wetlands shall be supported by connection to the adjacent watercourse, purpose-built clean water storm pipes or adjacent stormwater management ponds.

Setback distances are not conventionally established for Tewin wetland features. Rather, the wetlands are embedded into the **Ecological Corridor**, with complementary adjacent land uses. All areas within the ecological corridor will be established with existing, planted or constructed features of vegetation, wetland and water. The choice is to connect features and make every square foot ecologically rich rather than reduce the quality and create standardized isolating setback distances. The **Ecological Corridors** are dense and abundant with mutually supporting features and widths vary according to features and location. Water quality is protected within these corridors by appropriately managing runoff from adjacent lands and ensuring that water features contain and are bounded with substantial vegetation and hydrated with clean water.

Protection of these features is to be achieved by conveyance to the City of Ottawa through the subdivision process.

6.1.3 Amphibian and Turtle Habitat:

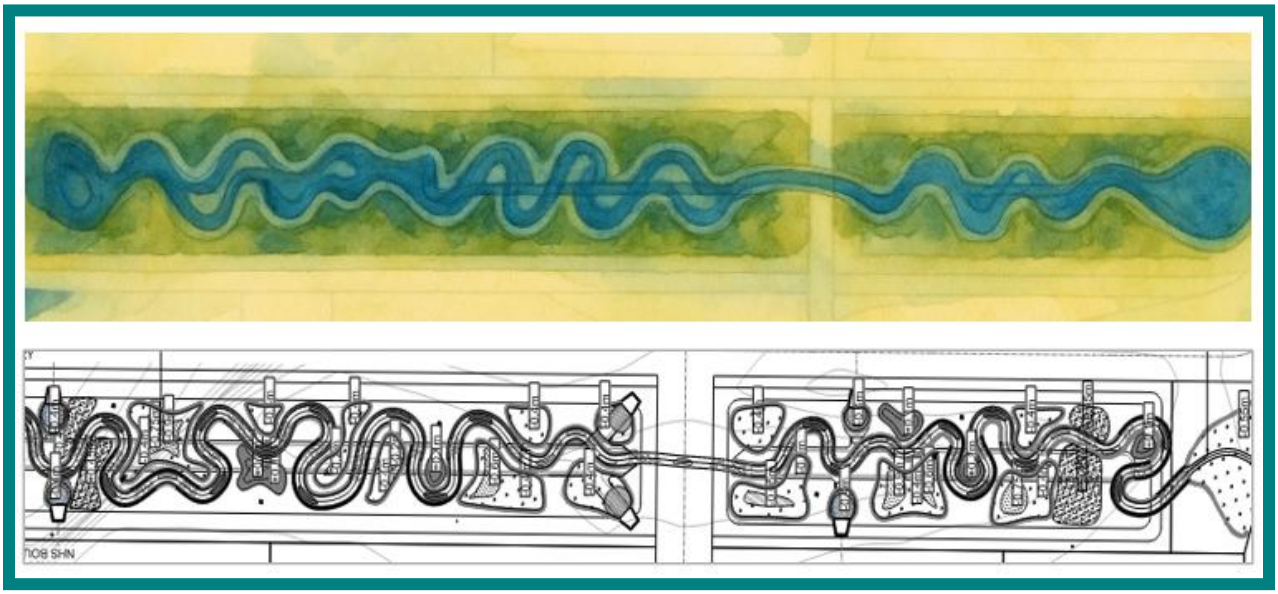
Ambitious objectives for diversity and population growth of turtles, frogs and salamanders are an important component of the Tewin ecological system. This is to be achieved through the creation of numerous high-quality wetlands - marshes, pool and vernal pools, throughout the **Ecological Corridor**. For supporting habitat functionality, the following design targets have been established for constructed wetlands:

- 25 metres diameter minimum
- Pools 1 metre minimum depth

- Natural and hydrological connections to watercourses
- Periodic hydrologic flushing to prevent build up material on floor
- Installation of organic bottom materials

Conceptual designs of wetland and watercourse features have been prepared GeoMorphix. These shall be designed in detail and implemented with each phase of associated development to ensure habitat is created consistent with the specific needs of the biological communities targeted.

Figure 54: Conceptual Wetland and Watercourse Designs



6.1.4 Terrestrial habitat

The wildlife corridor function supports the terrestrial habitat and connectivity of the following species.

Birds

Birds are expected to benefit from the high canopy targets established for the Tewin Lands, and adjacent open space areas with low maintenance ground cover.

It has been established that a heron rookery is located in the adjacent land to the east of Tewin. This area is generally protected from development by the over 560 ha designated provincially significant wetlands and is likely to become part of the Algonquin Natural Land Trust. The Tewin Lands will have no impact on the established heron rookery.

Bats

Bat house installation should be a component of all stormwater pond construction in the perimeter landscaping. These areas are part of the **Community Open Space System** and are collated with the adjacent **Ecological Corridor** and treed areas.

Snakes

A reptile hibernaculum is proposed in the upland area of the **Ecological Corridor** near the outlet of the Bear Brook tributary, to the west of Farmers Way in the vicinity of the existing property at 4660 Farmers Way. Excavation and backfilling an area with rubble in accordance with protocols established by the document 'Best Management Practices for Identifying, Managing and Creating Habitat for Ontario's Species at Risk Snakes' is recommended.

Small mammals

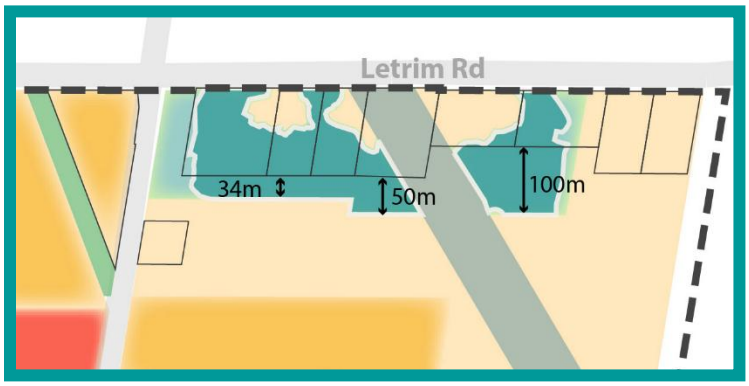
The corridor widths established for the **Ecological Corridors** and supporting **Open Space System** lands in Section 6.2 are expected to support small local mammal life cycle needs.

6.1.5 Mature woodlands

Mature woodlands must be buffered from their dripline plus 5 metre horizontal distance measurement to any grade change, excavation or structure.

One exception is the polygons east of Anderson Road, fronting on Leitrim Road, as shown in **Figure 55**. In this single location, the integrity of the consolidated feature is currently compromised by the multiple private individual properties, hydro cut through, and golf course facilities. Preservation of the entire feature has been balanced with realistic expectations and manageable boundaries. Southern edges of the polygons containing the woodlands shall be affected to support the following dimensions. These dimensions include the 5-metre dripline setback. No grading is to occur within this setback.

Figure 55: Preserved Woodland Dimensions (source: USI)



Surface and shallow groundwater inputs must be supported for the mature woodlands. This will be achieved though collection and direction of surface water and stormwater to meet the predevelopment water budget requirements as identified for each mature woodland polygon in the existing condition Report 'Feature Specific Water Budget Analysis' prepared by JFSA Canada Inc April 2025 in ***Appendix E***.

Each mature woodland polygon has a feature-specific water budget identifying the individual surface water drainage areas, established to ensure the long-term viability of the collective feature and individual species, as shown in **Figure 56**. Deep groundwater is not expected to be impacted significantly by the development of the Tewin Lands, nor has its contribution to the water budget of any mature woodland been calculated as significant enough to measure and replicate. A feature-based water budget summary in provided in **Table 12**.

Infiltration, evapotranspiration and transpiration within the woodland blocks are not to be altered under post-development conditions with no development occurring within 5 metres of the driplines. Grading on adjacent land, with specifically selected appropriate land uses, under post-development conditions shall ensure that clean direct surface runoff is maintained towards the woodlands from rear yards, greenspace, and/or overland flow routes. All woodlands with the exception of A and B are expected to retain their contributing surface water drainage area in an undeveloped state. For A and B (north polygon), where the surface water catchment area is being

reduced in post-development conditions, a monitoring plan shall be implemented. Should the condition of the woodlot be found to deteriorate, modifications to the drainage corridor outlet retain or release more water shall be implemented.

Figure 56: Mature Woodland External Drainage Areas

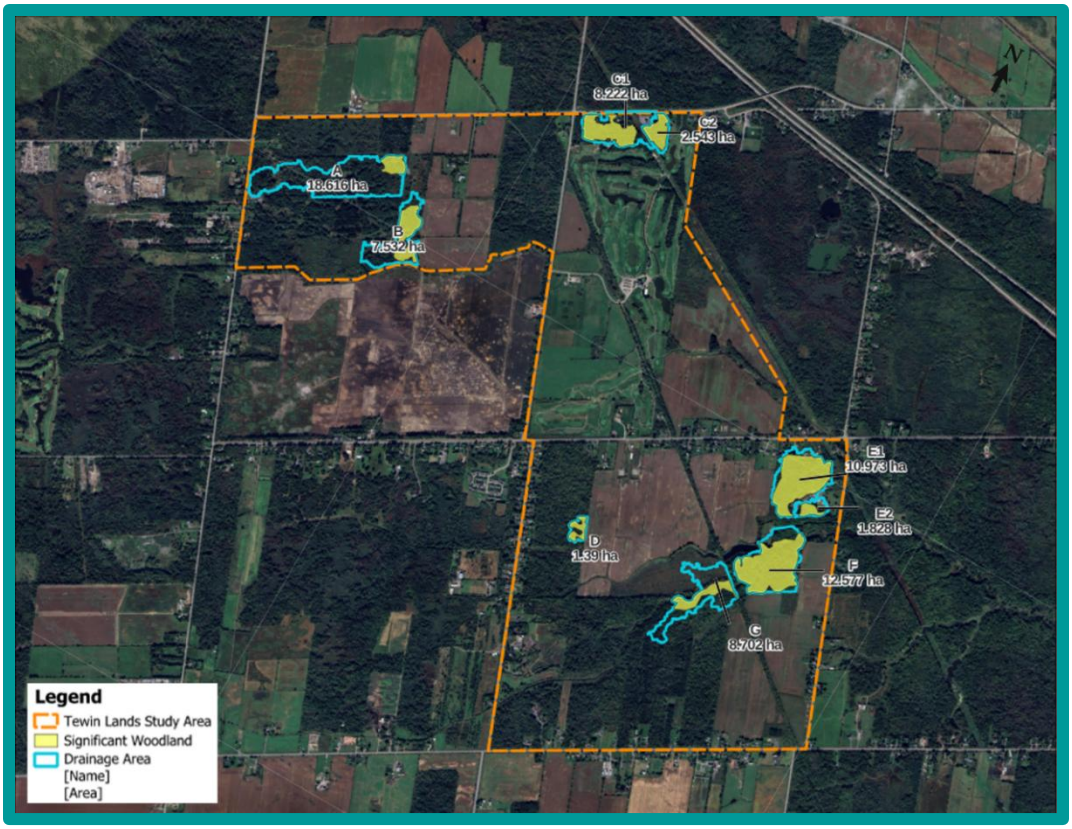


Table 12: Feature-Based Water Budget Summary (External Drainage Areas)

Feature	Total Evaporation	Total Transpiration	Total Direct Surface Runoff	Total Infiltration (Interflow+Baseflow+Deep Aquifer)
Woodland A	27%	26%	33%	14%
Woodland B	25%	27%	33%	14%
Woodland C1	32%	23%	31%	13%
Woodland C2	35%	22%	30%	13%
Woodland D	36%	21%	30%	13%
Woodland E1	26%	26%	33%	14%
Woodland E2	17%	27%	44%	11%
Woodland F	32%	23%	32%	13%
Woodland G	30%	23%	31%	14%
Average	29%	24%	33%	13%

6.1.6 Vegetation

Tree and plant species choices must emphasize local species and those of cultural significance.

- Wìgobimij / American Basswood - not near water
- Wìgwàs / White Birch - short life, SWMF
- Kìjik / Eastern White Cedar - residential, SWMF
- Ininatig / Sugar Maple - not near water
- Azàd / Trembling Aspen - grow fast along corridors, add sugar maple and basswood grow under further from water
- Minahig / White Spruce - residential, SWMF
- Mashkigwàtig / Tamarack- SWMF

All land uses are expected to plant trees to achieve canopy coverage objectives stated in Section 6.2. Additional ground cover in low maintenance areas should emphasize the use of Algonquin Sacred Medicines such as:

- Sweet Grass - SWMF, fields, community facilities, schools
- Sage - fields, community facilities, schools

Guidance for planting conditions to ensure the best chance of survival for the recommended tree species is provided in **Table 13**.

Table 13: Native Tree Planting Guidelines

Plant	Optimal Growth Conditions	Preferred planting locations in the community	Planting Guidance
American Basswood	Moist, well-drained loam (tolerates clay); fertile, slightly acidic to neutral. Natural Habitat: rich hardwood forests, ravines and sheltered slopes (often near but not in wetlands).	Within the natural corridors and parks or in larger parcels near corridors	Plant in spring or fall in full sun to part shade. Water weekly for the first 1–2 seasons and mulch to keep roots cool; allow ample room (large canopy) and avoid compacted, droughty sites.
White Birch	Well-drained, light sandy or rocky soils; prefers acidic to neutral soils; avoid heavy, poorly drained clay.	Scattered throughout the community	Plant in full sun on well-drained sites; avoid hot, paved/compacted locations. Keep soil evenly moist the first 2 years and mulch; space away from

	Natural Habitat: open woods/forest edges and disturbed sites in cooler, upland settings.		buildings/lines and monitor for bronze birch borer (reduce drought stress).
Eastern White Cedar	Moist to wet, calcareous (lime-rich) soils; tolerates shallow/rocky soils; neutral to alkaline pH. Natural Habitat: swamps, fens, wetlands margins and cool, shaded mixedwoods.	Within the natural corridors but can also be distributed through the community.	Plant in spring or early fall; best survival with small stock and consistent watering in year 1. Mulch and protect from deer/rabbit browse; avoid salty roadside spray and very dry, exposed sites.
Sugar Maple	Deep, well-drained, fertile loam; evenly moist (not waterlogged); slightly acidic to neutral. Natural Habitat: mature upland hardwood forests and rich slopes.	Parks and larger open areas	Plant in spring or fall; prefers part shade when young and consistent moisture. Mulch and water during dry spells for 2–3 seasons; avoid compacted soils and high-salt roadside sites.
Trembling Aspen	Adaptable; best on well-drained loam to sandy loam; tolerates clay if not waterlogged. Natural Habitat: early-successional forests after disturbance; edges, open mixedwoods and upland sites.	Within the natural corridors. especially where tree cover is currently limited. Add Sugar Maple and Basswood in the understory there	Plant in spring in full sun to light shade; use groups/clumps if you want a natural stand. Expect suckering—keep away from lawns/bed edges; water to establish and consider protection from deer/browse.
White Spruce	Moist, well-drained loam; slightly acidic to neutral; tolerates heavier soils if drainage is good.	Residential areas and SWMF	Plant in spring or early fall; place in full sun where air can circulate. Water deeply during the first 2 seasons and mulch; avoid heavy

	Natural Habitat: cool, moist mixedwoods and conifer forests; sheltered sites.		pruning and keep away from road salt/winter spray.
Tamarack	Wet to saturated, acidic organic soils (peat/muck); full sun; tolerates flooding. Natural Habitat: bogs, fens and swamps; wet lowlands and peatlands.	SWMF and low portions of natural corridors	Plant in spring as container stock or plugs into wet soils; full sun is best. Keep roots consistently wet (do not plant on upland sites) and space to allow a mature crown; minimal pruning needed.
Sweet Grass	Moist to wet, organic soils; tolerates periodic flooding; prefers full sun to partial shade. Natural Habitat: wet meadows, stream/lake edges, marsh margins and low swales.	SWMF, fields, community facilities, schools	Plant plugs/divisions in spring on moist sites; full sun to part shade. Keep evenly moist until established and weed regularly early on; harvest lightly after year 2–3 to maintain vigour.
Sage	Dry, well-drained sandy or gravelly soils; low fertility; neutral to alkaline; full sun. Natural Habitat: open, prairie/grassland and dry, exposed sites.	fields, community facilities, schools	Plant in spring in full sun on dry, well-drained soil; do not overwater or over-fertilize. Space for airflow and cut back annually; avoid wet/poorly drained sites (winter rot risk).

6.1.7 Pathways and Transportation Corridors

Pathways shall be located outside of the boundary of the **Ecological Corridor**, woven through the **Open Space System**. Multi-use pathways that are required to support equitable public access and education shall be permitted within the Ecological Corridor in strategic locations, preliminarily identified on in Section 3 of the CDP. Where provided, pathways within the Ecological Corridor require an environmental review and report by a qualified professional to ensure location, materials, construction methods and timing will limit interference with the ecological functions, species and integrity of the corridor. Pathways forms and materials shall be designed to be suitable to their environment, such as boardwalks near or through wetlands.

Pathway crossings to traverse the ecological corridor to support mobility connections may be accommodated with appropriate design and construction and in acceptable locations advised by a qualified environmental consultant. Preliminary locations for crossings over the Ecological Corridor are demonstrated in Section 3 of the CDP.

Transportation crossings are to be limited to existing Roads and the Community Spine and shall be situated in narrower Ecological Corridor sections to minimize impacts.

Culvert crossings will be required to span existing watercourses throughout the site to accommodate pedestrian and/or vehicular access. Several concrete and CSP culverts already exist along adjacent roads, as well as the Bell corridor. Culvert sizing will be provided at the time of detailed design for each crossing, based on contributing flow rates and in accordance with applicable fish and wildlife passage requirements. Designs will generally follow the Credit Valley Conservation Guidelines for Fish and Wildlife Crossings. New culverts are expected to be equal to or larger in diameter than the existing downstream culverts currently in place.

6.2 Corridor Width Requirements

To support species mobility, migration and sustainability, design targets were established for the connected **Ecologica**l **Corridor and Open Space System.**

6.2.1 Ecological Corridors

Tewin- wide watercourse setbacks distances are not proposed for the Tewin Lands. Rather, the watercourses are embedded as part of the **Ecological Corridors**, with complementary buffering land uses. The **Ecological Corridors** are packed with rich, mutually supporting features such as trees, unique habitat features and wetland cells. The width of the **Ecological Corridor** varies according to:

- habitat requirements
- hazard constraints
- protection of surface water quality
- features within the **Open Space System**
- adjacent land uses

The boundaries of the **Ecological Corridor** are established by this document and provided in the digital files in ***Appendix J***. **Ecological Corridor** widths range widely, generally far exceeding conventional 30 metre horizontal distance measurement from top of bank along the mainstem watercourses. As this corridor delineation has been established based on a wide range of considerations and through a holistic process incorporating features and a systems approach, no additional studies are required to delineate the corridor.

Minor adjustments to the final boundaries of the Ecological Corridor may be introduced through future development applications, as advised by a qualified environmental consultant, provided there is no net loss to the function and the area of the Ecological Corridor.

Along the Bear Brook system, the **Ecological Corridor**:

- Varies in width along its length.
- Provides a minimum distance of 120 metres north of the Smith-Gooding Drain centreline and extends out to wider areas where adjacent wetlands or mature woodlands are incorporated.
- Accommodates, where available, a 150 metres wide ecological corridor or larger.
- Where the corridor is narrower, adjacent land uses such as stormwater ponds, parkland, schools and community facilities are expected to contribute to the buffer by establishing treed, low maintenance understorey vegetation as part of the **Open Space System**.
- Limited narrow pinch points are accommodated at specific locations associated with crossings and identified in the Implementation Section.
- The conveyance of additional private lands within the Tewin ownership south of the Smith-Gooding Municipal Drain to increase corridor width to 120m is required west of Anderson Road.
- Incorporates mature woodlands with 5 metres buffer beyond drip line.
- Includes all natural hazard lands.

- Implements a target of 90% canopy cover in the **Ecological Corridor.** This will entail ensuring the presence of medium to large tree species throughout the entire area of the corridors except within marsh and open pond features. Pathway planning adjacent to corridors should include abutting tree species with the potential to extend canopy over pathways at maturity.
- New and replacement culverts must target an openness ratio of 0.25 (e.g., for every 4 metres length, they must be 1 metres diameter), with the exception of the Mobility Spine which is a 26-metre ROW. Alternatives elsewhere may be considered if supported by a qualified environmental consultant.
- Pathways must be outside the **Ecological Corridor**, with limited crossings where specified. Exceptions include requirements under the *Drainage Act* for the Municipal Drains, such as on the south side of the Smith-Gooding Drain where vegetation is cleared and maintained as part of the municipal drain maintenance access.
- A wildlife strategy is recommended.

Within the Ramsay Creek watershed, the **Ecological Corridor** consists of:

- The East Ramsay constructed wetland/watercourse feature running north, connecting under Leitrim Road in a 75-metre-wide block.
- The West Ramsay constructed wetland/watercourse feature running north between the central woodland and Leitrim Road contained in a minimum 60-metre-wide block.
- Mature woodlands with 5 metres buffer beyond drip line.

6.2.2 Tewin Open Space System

The **Open Space System** is composed of a collection of mutually supporting elements in both the Ramsay Creek and Bear Brook watersheds:

- Linear corridors through the site
- Connectivity to external lands
- Limited infrastructure crossings
- Complementary adjacent land uses such as parks and community facilities with transitioning adjacent greenspace
- Stormwater Management Facilities
- Pathways
- Above and below-ground infrastructure corridors
- Community energy infrastructure (such as battery storage, solar PV, etc.)
- Succession planting with species of cultural significance and tree canopy encompassing the **Ecological Corridor**

The outside boundaries of the **Open Space System** are not fixed at the locations shown in this document. Rather, each phase of development will need to assign appropriate adjacent uses advised by a qualified environmental consultant and ensure the transition between these land uses is designed accordingly.

6.2.3 Boundaries and Fencing

Boundaries between the adjacent open space system/development area and ecological system corridor need to be established help protect important undergrowth and habitat. These boundaries should provide visual clues that the ecological corridor is not the same use as the recreational and development lands.

Markers such as large boulders, intermittent split rail, or page wire fencing to delineate the sensitive areas for both the general public and maintenance activities are suggested. Signage is also advised. Chain-link fencing or other non-permeable boundary marking is not recommended to ensure stewardship and the relationship with natural environment is preserved.

6.3 Canopy Cover Preservation, Protection, Restoration

Currently, the Tewin Lands have approximately 32% canopy cover. The Tewin Lands will meet or exceed the 32% of existing canopy to support terrestrial species habitat, offset the “urban heat island effect”, reduce community energy use, support public health and mitigate against climate change.

In an urbanizing environment this challenge will leverage parks, private residential and commercial property, public facilities, schools and infrastructure in addition to natural spaces. Design of the new community at Tewin will contribute to city-wide goals for urban forest canopy cover through a combination of retention of existing forested and natural areas and the introduction of new trees. Several areas featuring natural areas, woodlands, habitats and watercourses today will be improved and re-naturalized, maintaining or improving their suitability to support healthy canopy growth. This strategy will be reflected in the subsequent development stages through the tree conservation report and landscape plan. Future detailed development plans must maximize tree planting opportunities by:

- Ensuring natural and recreational **Open Space System** are fully planted, shaded connections.
- Protecting mature woodlands.
- Residential areas- tree planting requirements, front and rear yard.
- Requiring commercial development to plant within parking lots and provide green roofs where appropriate.
- Ensuring institutional developments maximize opportunities in parking lots, recreational areas, greenspace, and roof space.
- Designing parkland with an emphasis on planting around the periphery, within play structure areas, resting areas and passive recreation spaces to provide shade, evapotranspiration, and habitat.
- Accommodate planting around municipal and private infrastructure, including the mobility spine, the harvest walk, and stormwater ponds, despite minor maintenance requirements.

The canopy coverage at 40 years is expected to be maximized above traditional development areas through establishing the minimum coverage percentages required by land use to achieve the overall coverage, as identified in **Table 14**.

Municipal Drains shall limit maintenance access to one side only and support the re-establishment of native grasses and shrubs within that access area between maintenance activity periods.

Table 14: Canopy coverage requirements by Land Use to achieve 32% coverage

Land Use	Expected Canopy Coverage at 40 years
Neighbourhood Zone	20 %
Community Corridor/Transition Zones	15 %
Core Area/Neighbourhood Centres	15 %
Schools/Community Facilities	20 %
Parks and Open Space	50 %
Roads	15 %
Stormwater Management blocks	18.5 %
Constructed wetland & watercourse feature blocks	25 %
Hydro Corridor	40 % (assumed to remain as is)
Mature Woodland	90 % (assumed to remain as is)
Ecological Corridor	90 %

The City of Ottawa has specific guidelines in place at the time this EMP was prepared for clay soils. Should these guidelines change in future, additional efforts must be made to establish large tree species in in ROWs, etc.

6.4 Development Concept

The vision of Tewin (**Figure 57**) is linked directly to the land and AOO teachings, which have fundamentally guided the Open Space System. The detailed understanding of the natural systems, spaces and features on the site and beyond, tracing the story from early-settlement to today, has formed the approach of establishing a core ecological corridor along the watercourses which connects and transitions out to the developed community. The Open Space System establishes a diverse, sustainable ecological system by restoring watercourses to their historical density and function. It reintroduces a rich blend of native plants and trees, and diverse terrestrial features to rebuild a sustainable, resilient and vital natural system that will thrive for generations to come.

The **Ecological Corridor**, comprised of natural features, forms the core which is expanded and buffered by adjacent **Community Open Space** elements, including stormwater management facilities, parks and privately owned public spaces (POPS), schools and community facilities, and trails. The **Community Open Space System** expands beyond Tewin with the Natural Land Trust to the east of the site, the Greenbelt to the north and rural lands to the east and south.

Figure 57: Development Concept (source: USI)

6.5 Natural Heritage System – Ecological Corridor

The Tewin Natural Heritage strategy is a holistic, system-based approach which places a high value on connectivity and functionality, rather than feature by feature-by-feature-based protections. It is comprised of an **Ecological Corridor** of natural features and functions, nested within the **Tewin Open Space System** comprised of complementary land uses.

This ensures the features of significance on the site retain their integrity by protecting them within the **Ecological Corridor,** which links them together into a rich and high-quality functional system. The surrounding **Open Space System** of complementary land uses buffers and in some cases expands the **Ecological Corridor** and connects through the Tewin lands and the adjacent landscape.

The Official Plan shall designate the **Ecological Corridor** as Urban Natural Feature on Schedule C11C to implement the highly protected status it requires.

In combination, these support a large, robust natural system, promoting connectivity through the site with people, places and efficient land use while protecting the natural features and functions. This system-based approach of connected natural elements within the **Tewin Open Space System** is designed with a priority on diversity, resilience, and the embodiment of the Algonquin cultural values.

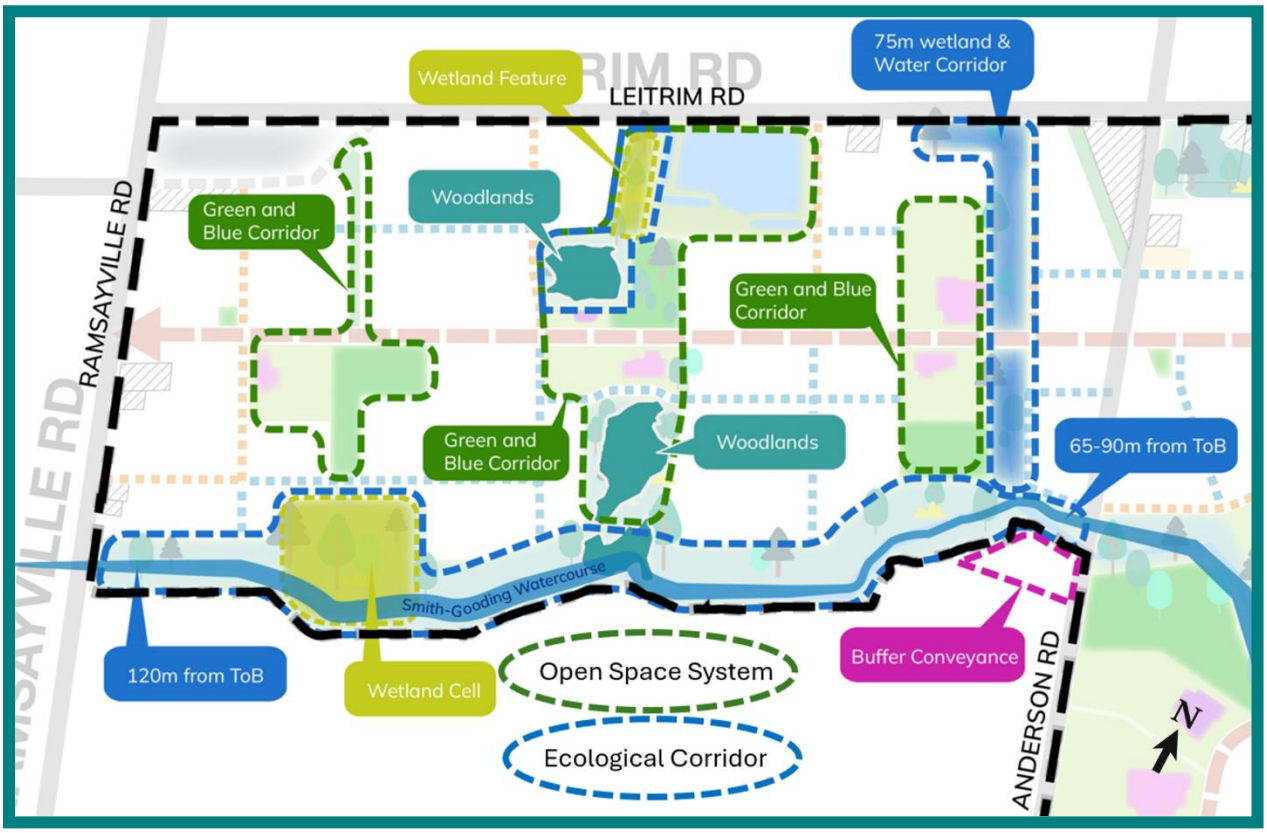
The **Ecological Corridor** collection of natural and constructed features, combined with natural hazard constraint lands, should be considered the protected area with an emphasis on the ecological features and functions which support habitat and species on-site and downstream.

- Existing legacy watercourses and riparian areas
- Existing mature woodlands
- Existing and constructed wetlands
- Constructed headwater features
- Turtle and amphibian habitat and overwintering areas
- Hazard lands (slope stability, meander belt, floodplain)
- Constructed snake hibernacula
- Fish and aquatic habitat
- Habitat for diversity and target species

6.5.1 The TEWIN BLOCK 1 Natural Heritage System

An overview of the natural heritage system in Block 1 is shown in Figure **58**.

Figure 58: BLOCK 1 Natural Heritage System (source USI)



Ecological Corridor Components:

- Smith-Gooding watercourse along the south boundary
- Fish and aquatic habitat
- West/East corridor minimum 120 metres horizontal distance from top of bank (ToB)
- Width deviation at extreme east end between East Ramsay water corridor feature and Anderson Road
- Existing wetland cell (245 metres horizontal distance from ToB)
- Wetland / water feature running north out-letting under Leitrim Road within minimum 75 metre block
- Mature woodlands with 5 metres buffer beyond drip line
- Hazard lands
- Conveyance to the City of Ottawa a rural land parcel south of the Smith-Gooding Drain to widen the corridor to achieve a minimum 120 metres width centred over the watercourse.

Tewin Open Space System Components:

- North/south supporting green corridors
- Bat boxes
- Succession planting with species of cultural significance
- Parks, Institutional and Community facilities with adjacent greenspace
- Pathway connections
- Stormwater Management Pond
- Limited transportation crossings
- Community energy infrastructure (such as battery storage, solar PV, etc.) could be accommodated within open spaces

6.5.2 The TEWIN BLOCK 2 Natural Heritage System

A graphical representation of the block 2 natural heritage system is provided in **Figure 59**.

Figure 59: BLOCK 2 Natural Heritage System (source USI)

Ecological Corridor Components:

- Smith-Gooding watercourse (main stem) approximately centred between hazard land boundaries on either side
- Fish and aquatic habitat
- Constructed stone core wetland features
- Constructed multicell wetland features
- Mature woodlands with 5 metres buffer beyond drip line
- Turtle nesting areas
- Overwintering habitat for turtles and amphibians

- Hazard lands

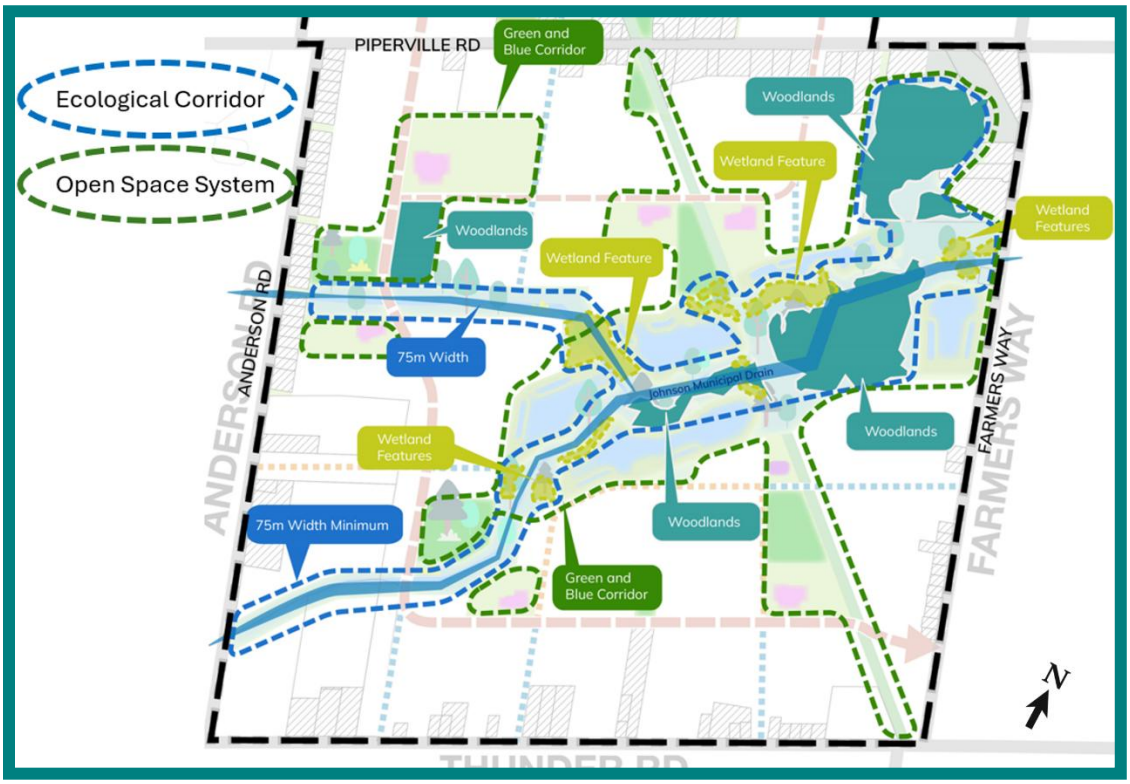
Tewin Open Space System Components:

- Bat boxes
- Succession planting with species of cultural significance
- Parks, Institutional and Community facilities with adjacent greenspace
- Pathways
- Stormwater Management Ponds
- Above and below-ground infrastructure corridors
- Limited transportation crossings
- Community energy infrastructure (such as battery storage, solar PV, etc.) could be accommodated within open spaces

6.5.3 The TEWIN BLOCK 3 Natural Heritage System

A graphical representation of the block 3 natural heritage system is provided in **Figure 60.**

Figure 60: BLOCK 3 Natural Heritage System (source USI)



Ecological Corridor Components:

- Johnston Municipal Drain watercourse
- Bear Brook South tributaries watercourses naturalization minimum 75 metre corridor
- Fish and aquatic habitat
- Constructed wetland features
- Turtle nesting areas
- Snake hibernacula
- Hazard lands
- Mature woodlands with 5 metres buffer beyond dripline

Tewin Open Space System Components:

- Above and below ground infrastructure corridors
- Limited transportation crossings
- Bat boxes
- Succession planting with species of cultural significance
- Parks, Institutional and Community facilities with adjacent greenspace

- Pathways
- Stormwater Management Ponds
- Community energy infrastructure (such as battery storage, solar PV, etc.) could be accommodated within open spaces

6.6 Stormwater Management Recommendations and Mitigation

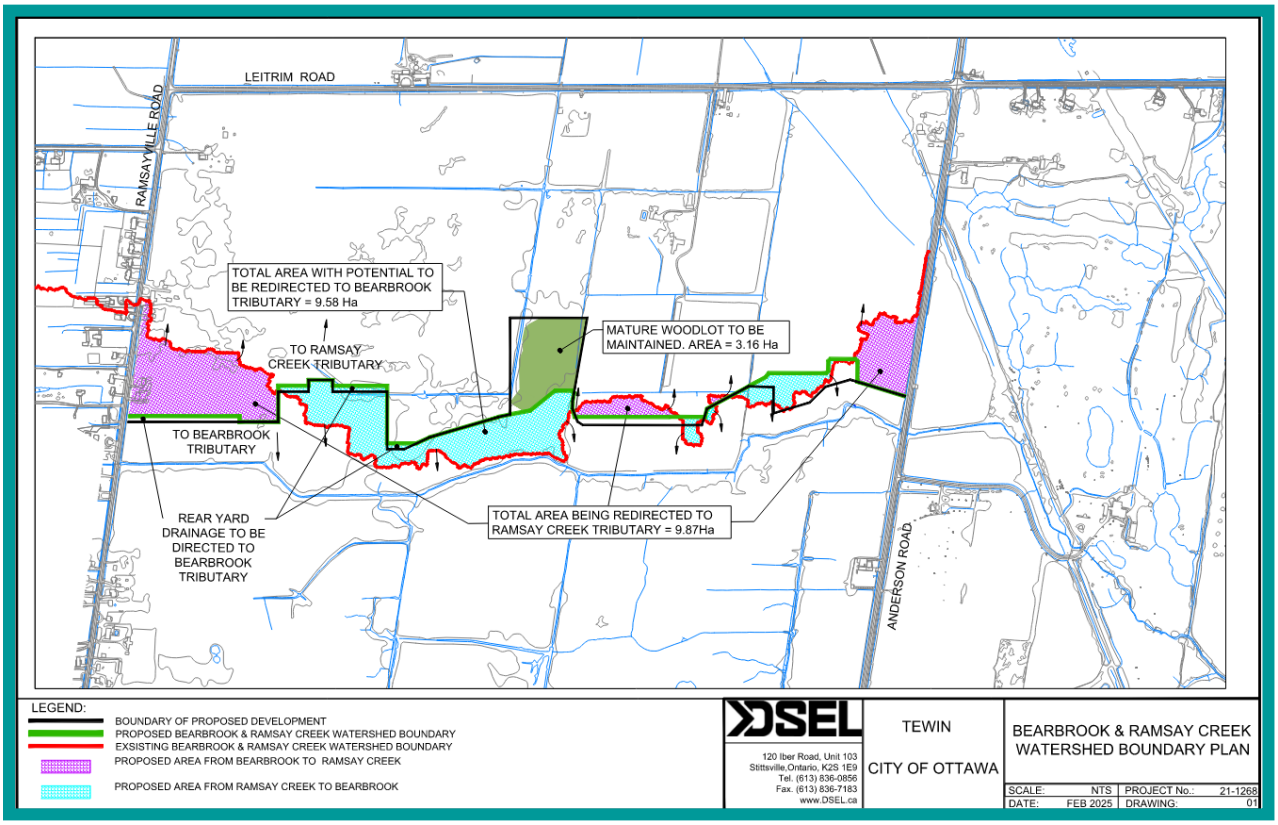
New community infrastructure planning is governed by the Master Serving Study (MSS), for which the stormwater management is designed and aligned with the EMP and Community Design Plan. The EMP and MSS are coordinated efforts to ensure that infrastructure is located appropriately, and the stormwater management elements effectively mitigate the potential impacts of post development runoff on existing environmental features such as watercourses and wetlands, and prevent the exacerbation of natural hazards such as flooding and erosion.

6.6.1 Watershed Divides and Subcatchment Areas

The watershed divide between Bear Brook and Ramsay Creek has been respected with limited deviation to regularize development fabric, manage grade constraints and plan logical stormwater infrastructure layout. The traded watershed areas are less than 10 ha and have been balanced within 0.3 ha, as shown in **Figure 61**.

The watershed boundary between Ramsay Creek and Bear Brook was examined in detail by South Nation Conservation, the City of Ottawa and JFSA Canada in preparation for the South Bear Brook Subwatershed Study. Discrepancies due to changing infrastructure, road fabric and drainage works and different resolutions of topographic mapping have resulted in various boundaries being reflected in reports, mapping and Conservation Authority jurisdictions. The Tewin consultants have deferred to the conclusive boundaries as determined by the City of Ottawa and South Nation Conservation established by their work on the Bear Brook Watershed and South Bear Brook Subwatershed studies.

Figure 61: Post development boundary between the Bear Brook and Ramsay Creek Watersheds (Source: DSEL)



6.6.2 Evaporation and Infiltration

Soils analysis and direction from the municipality have established that the Tewin Lands may not rely on infiltration as a management for stormwater quality in infrastructure planning. However, the significant tree canopy target of 32% coverage minimum, **Open Space System and Ecological Corridors**, large wet pond areas and development of wetland features is expected to support evapotranspiration sitewide.

6.6.3 Site-wide Water Budget

The pre-development water budget established that most precipitation on site is generally evenly divided between evapotranspiration and runoff.

The urbanization of undeveloped lands routinely alters the pre-development water budget by increasing imperviousness and reducing evapotranspiration/evaporation mechanisms. Characteristically this results in a higher percentage of runoff. In the case of the Tewin Lands, this is true as shown in the **Tables 15** and **16**, and as detailed in ***Appendix E***. However, due to the massive clay unit underlying the site, deep groundwater recharge experiences very little impact. Runoff above existing conditions is controlled by appropriate stormwater management strategies and

extensive canopy coverage, and the significant ecological corridor lands and generous open space which provide some mitigation and climate change resilience.

Table 15: Pre-development Water Budget

PRE-DEVELOPMENT WATER BUDGET			
Watershed	Runoff	Evaporation/Evapotransiration	Deep Groundwater Recharge
Ramsay Creek	**53%**	**47%**	**0.05%**
Bear Brook	**52%**	**48%**	**0.05%**

Table 16: Post-development Water Budget

POST-DEVELOPMENT WATER BUDGET			
Watershed	Runoff (Surface + Shallow Groundwater + Baseflow)	Evaporation/Evapotranspiration	Deep Groundwater Recharge
Ramsay Creek	**68 %**	**32 %**	**0.03%**
Bear Brook	**64 %**	**36 %**	**0.04%**

A post-development groundwater assessment was prepared (***Appendix H***) using conservative assumptions about development techniques to understand any potential impacts to predicted changes to shallow groundwater in post-development conditions. The assessment found that the proposed development and its associated stormwater management strategy will not have significant impacts to the water table elevation and the groundwater flow system in general (i.e., less than 1 metre rise or fall predicted, generally within existing seasonal fluctuations), and where there are changes, the lateral extent will be limited to within a range of 1 to 15 metres of the stormwater system controls and not measurably beyond the development.

6.6.4 Mature Woodlands Feature Specific Water Budget

The mature woodland areas that are being preserved on the Tewin Lands require surface water inputs to be maintained for the long term. The stormwater management design must employ additional measures such as collection and redirection of clean water to these areas in sufficient quantities. This may include stormwater from residential rear yards, school open spaces and parkland, as well as considering other alternatives to convey sufficient clean water to the mature woodland polygons.

6.7 Stormwater Management Solutions

A combined solution prioritizing land use efficiency and natural system support has been chosen using conventional wet ponds with constructed wetland cells associated with their outlets and constructed natural features to contribute to quantity control.

The series of cumulative hydrological impact assessments considering additional future planned and long-term land development scenarios during the Spring and Summer events, 2-year to 100-year peak flows determined that applying the Tewin stormwater management design across all potentially developable lands in the Bear Brook watershed results in future-controlled peak flows that prevent increases in annual flood risk, and, in general, reduce peak flows for the 2-year to 100-year design events at the model nodes evaluated. (See **Appendix F**)

Further, the 1:350 year storm event was assessed as a flooding metric associated with climate change. The SNC model was run under post development conditions and compared to pre-development conditions. Peak flows indicated a reduction in flows at three representative locations, including the McKinnon's Creek confluence. (See **Appendix F**)

Robust and dense tree planting is expected around the periphery of ponds to contribute to the Tewin Lands tree canopy objective and provide supporting adjacent land to the Ecological Corridor.

A detailed presentation of the individual stormwater management service areas and pond facilities is provided in the MSS.

6.7.1 Bird Hazard Mitigation

Wet Pond Stormwater Management Facilities are considered to pose less risk to aircraft when constructed in a Secondary Bird Hazard Zone as compared to the Primary Zone. However, mitigation measures should still be implemented for Ponds 1, 2A, and 2B in consultation with the airport authority. They may include:

- Feeding of birds should be discouraged around SWM features.
- Public waste disposal features such as garbage cans should not be used near SWM features to reduce attractiveness to birds.
- Ponds should have all exposed banks graded to a minimum of 4:1 (vertical to horizontal) slopes, as steep banks will discourage waterfowl usage by blocking their line of sight and making them feel threatened by possible predators.
- Ponds shall reduce the amount of surface water area available for birds to the extent possible.
- Linear or round wet SWM features are less attractive to birds than irregular shaped ones.
- A high density of vegetation around the periphery reduces the use of features by birds.
- Water level fluctuations in wet SWM ponds should be controlled such that the water level is maintained at a depth (less than 0.5 m or greater than 1.0 m) that will not promote aquatic plant life.
- Plants used in wet SWM features should be those least attractive to wildlife species and also resistant to periods of flooding and drought.
- Vegetation in wet SWM features should have low species diversity to reduce attractiveness for birds.

- No islands or other features that are attractive to waterfowl for nesting should be incorporated.

6.7.2 Lowering of Ramsay Creek Tributary

The Tewin BLOCK 1 development area is currently drained by two distinct watercourses, each with culverts crossing at Leitrim Road. North of Leitrim Road, both watercourses transition into straightened and unconfined channels that flow through agricultural areas, eventually converging approximately 600 meters downstream. The existing outlets for these tributaries are at elevations of 78.0 meters for the western tributary and 77.1 meters for the eastern tributary.

The eastern portion of Block 1 has low existing grades and grade raise exceedances across the site pose a design challenge, necessitating adjustments to the existing drainage infrastructure. It is recommended to lower the eastern tributary of Ramsay Creek to alleviate these exceedances.

By re-grading approximately 1km the eastern tributary, the outlet elevation at Leitrim Road could be reduced by up to 1.6m. Future field work and design is needed to confirm the length of tributary to be regraded to maximize the overall benefit. This proposed adjustment minimizes work on NCC property by focusing on a single outlet and allows for a significant reduction in final grades across Block 1.

This work would also improve riparian buffering, add ecological functions, address undercut banks, establish shading vegetation and diversify the morphology of this reach of Ramsay Creek.

The opportunity to undertake instream improvements will be facilitated outside of the EMP.

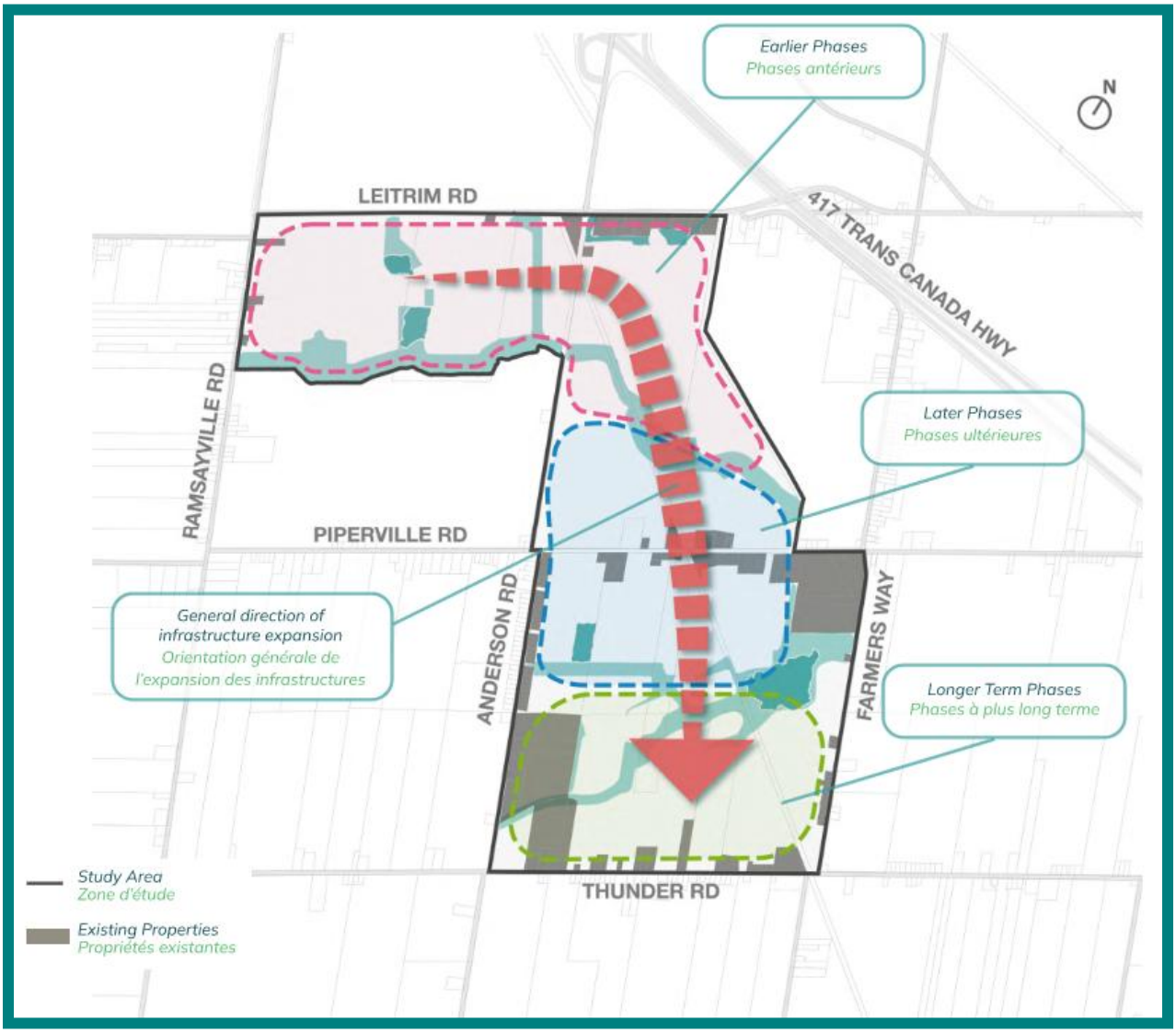
6.7.3 Ramsay Creek Headwater Feature Conceptual Design

A realignment and natural channel design for a headwater feature tributary to Ramsay Creek has been recommended. This headwater feature shall provide ecological functions and serve as an outlet for specific properties in the Tewin BLOCK 1 area. This headwater feature will also provide storage to attenuate flows generated from storms greater than the 2-year return period. Lands tributary to this feature are expected to be private blocks and public Right of Ways. The private blocks will be responsible for quality control as only clean water will be discharged to the feature. The headwater feature will incorporate natural flow attenuation mechanisms that ensure a controlled release rate to the downstream receiver.

7 Phasing and Implementation

The Tewin Lands will be subject to the Tewin Secondary Plan which shall be approved simultaneously with the Community Design Plan, establishing a cohesive plan and development framework for the community. However, subsequent approvals will be completed in phases facilitated through plans of subdivision, zoning and site plan approvals, where applicable. Development will generally be phased from north to south, with the first phases corresponding to the location where municipal services connect to the Site as shown in **Figure 62**.

Figure 62: Phasing Plan (source: USI)



7.1 Development Application Submission Requirements

7.1.1 Subdivision

- Minimum requirements as established by City of Ottawa under the Planning Act
- Tree Conservation report
- Landscape Plan
- Tewin Project website update detailing Tewin Intent, Algonquin Cultural Values, Systems-based Approach, Natural Heritage Corridors, Recreation and Stewardship
- Homeowner Awareness Brochure and website portal supporting stewardship, education and awareness on local – features, how to treat them, access opportunities, support on each lot for natural functions
- No additional environmental/ecological studies are required other than the EIS (see below) for lands adjacent the ecological corridor provided the boundaries established by this EMP are maintained.
- Environmental restoration, enhancement and planting activities will be required through conditions of draft approval and implemented on a logical phased registration basis.
- Lands within the ecological corridor will be conveyed to the City of Ottawa

7.1.1.1 Secondary Plan Policy Recommendations

Due to the large size and expected long build out of the Tewin Lands, the Secondary Plan shall contain policies that require updates to the Environmental Master Plan and Master Servicing Study at the time of a subdivision application if there is a major change to the conditions under which this EMP was prepared. These include:

- New surface water management options became available that are in keeping with the broader objectives of this plan, the One Planet Living framework or the Tewin Intent;
- Regulatory changes affecting the approvability of natural heritage or natural hazard management recommendations come into force;
- Watershed or Subwatershed study recommendations exceed the requirements or standards established by the EMP or MSS; or
- There are changes proposed to the planned servicing infrastructure that relates to surface water management or servicing corridors.

7.1.1.2 Environmental Impact Statement

Required where development is proposed within 30 metres of the ecological corridor or any other Urban Natural Feature (UNF).

The standard City of Ottawa EIS guidelines provide that adjustments or reductions to the existing boundaries of most natural heritage features may be considered to accommodate community development, if the EIS can demonstrate that such changes would not impact the overall ecological functioning of those features. The network of natural heritage features planned for Tewin will ultimately be established/re-naturalized through site development. The network was conceived and designed to provide future natural heritage functions in large part, considering the specifically proposed sizes and locations of feature elements. As such, potential future adjustments to the

natural heritage feature boundaries within Tewin, as identified in this EMP, must be fully subject to the following limitations:

- no net loss to the area of the Ecological Corridor
- hazardous land limits are fully contained
- woodlands, wetland and water features identified in the EMP are not encroached upon
- compensation must occur in the same community area as laid out in the demonstration plan of the CDP
- compensation cannot be provided in area that are already part of the open space system.

Site Plan

- Minimum requirements as established by City of Ottawa under the Planning Act
- Tree Conservation report
- Landscape Plan
- EIS as detailed in 7.1.1.1 where development is proposed within 30 metres of the ecological corridor or any other Urban Natural Feature.

7.2 Implementation

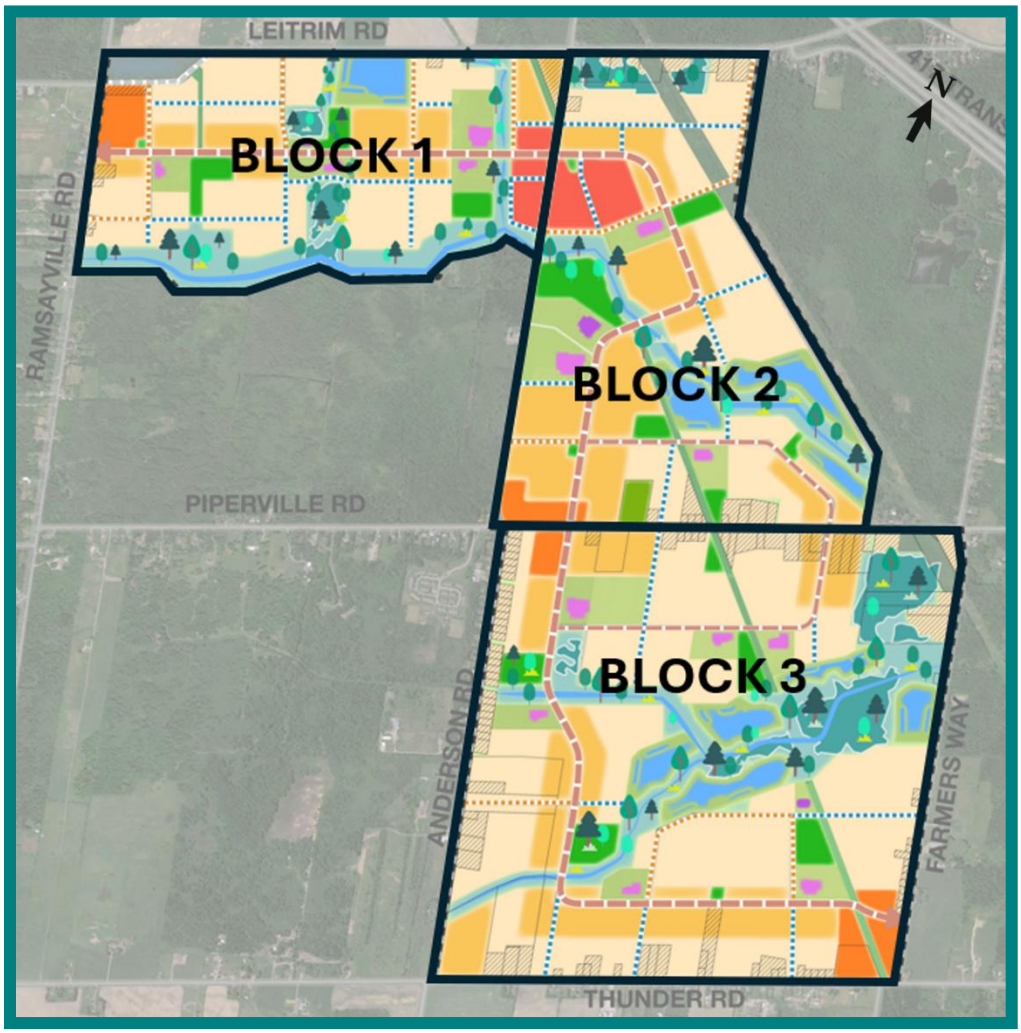
An implementation guide, divided by surface water servicing areas for future development areas, will provide specific direction for each development sub-area in terms of obligations and requirements to complete Environmental Impact Studies and other supporting studies as required These implementation sub-areas are shown in **Figure 63**. This guide provides a list of requirements and detailed directions that are applicable to each development area. These include:

- **Constructed natural features** triggers for construction associated with development in adjacent catchment area.
- Timing windows for **vegetation clearing**. Vegetation clearing windows (which have recently been adjusted for several species groups). Vegetation clearing windows should at minimum be limited to between December 1 and March 15 for trees, and between October 1 and March 31 for open meadows, with future cutting limits to reflect guidance updated if more restrictive containing direction addressing the applicable ecological corridor, tree planting, species, species at risk, wildlife habitat, wildlife safety, creation of constructed wetlands and watercourses, canopy coverage.
- **Environmental Impact Statements**
- **Woodland protection:** The hydrological functions of these areas must be maintained. The multidisciplinary analysis determined there are no expected changes to groundwater conditions, however servicing and grading decisions must mitigate for any surface water drainage area changes. A monitoring plan must be implemented to allow adaptation over time.
- **Pathway locations**
- **Planting requirements/canopy requirements**
- **Planting in Riparian Areas**: All areas within the ecological corridor, which contains the watercourse and associated riparian areas, are to be protected where currently vegetated, or planted where opportunities remain. Pathways are planned outside of these areas, and no uses which would limit planting or prevent naturalization are supported. Municipal drain accesses will be accommodated through alternative planting of easily removed and regrown native bushes.
- **Ecological Corridor** and **Open Space System** constructed and enhanced components
- **Stormwater Management criteria**
- Any additional requirements stipulated in the **South Bear Brook Subwatershed Study and Bear Brook Watershed Study** to be implemented at the subdivision application stage.
- **Existing Conditions monitoring equipment and infrastructure**-proper abandonment of test wells that are not used for subsequent water supply and any existing water supply wells on the subject site that will not be used for water supply in the future or used and maintained as a monitoring well
- Predevelopment activities to protect and prepare existing **private residential properties** including survey of any well owners and sampling and analysis of representative well water prior to construction activities.
- **Drainage Act**: A legal and sufficient outlet for the Tewin development relies on using the Municipal Drain process under Ontario's Drainage Act. The City has requested the appointment of an independent engineer under Section 65(3) to review and verify the

proposed connections to the Bear River and Smith-Gooding Municipal Drains, supported by hydrologic modelling from the project team. Once that review is complete, a formal Section 65(5) application will be made to City Council to authorize the connection, recognizing that approval may come with conditions.

Longer-term, the plan includes submitting a petition (Section 4) or improvement request (Section 78) to extend or establish a municipal drain to the existing Bear River Municipal drain.

Figure 63: Implementation Areas



7.3 Monitoring

Parties responsible for the various types of monitoring will be identified through subsequent development processes, namely through subdivision conditions and related agreements due to the likelihood of required cost sharing.

7.3.1 Erosion Sediment Control (ESC)

All areas subject to construction or redevelopment, whether they will ultimately be infrastructural or fully natural, must be supported by an ESC plan, appropriate to the specific works being undertaken, that mandates regular monitoring of all measures, with additional inspection events during or following heavy rain events.

Site monitoring shall be implemented by each project proponent, with collected ESC monitoring reports to be submitted to the City of Ottawa, and/or for work directly associated with watercourses, to the Conservation Authority for the relevant catchment, at a frequency of not less than once per month.

In the event of sediment discharge or spill of a pollutant, deleterious material or other such material or substance that would or could cause an adverse impact to the natural environment, the contractor shall:

- Immediately notify the appropriate federal, provincial and local government ministries, departments, agencies and authorities of the incident in accordance with all current laws, legislation, acts, by-laws, permits, approvals, etc.
- Take immediate measures to contain the material or substance, and to take such measures as they deem appropriate to mitigate against any adverse impacts to the natural environment.
- Restore the affected area to original condition or better, all to the satisfaction of the authorities having jurisdiction.

7.3.2 SWM Ponds

Each SWM pond/facility will be subject to a Consolidated Linear Infrastructure Environmental Compliance Approval and will include a monitoring program as dictated by the terms of the ECA to evaluate general pond performance and identify potential negative impacts to receivers and/or local wildlife associated with unanticipated operational issues.

7.3.3 Species at Risk

While the ESA was in effect at the time of writing for the EMP, Ontario's Bill 5: Protect Ontario by Unleashing our Economy Act, 2025, was enacted on June 5, 2025. This Act introduced numerous changes to the ESA, including altering the definition of "habitat" for various species groups. At the time of writing for this EMP, however, many standing policies managing the implementation of the ESA have not yet been updated. As such, recommendations within this report related to the ESA consider existing ESA-related policies, but also recognize upcoming changes to the extent feasible. The most significant such change will be the full replacement of the ESA with the Species Conservation Act (SCA), likely in early 2026 (Species Conservation Act, 2025). The Species

Conservation Act was enacted as part of Bill 5, but is not yet in force as of the date of this EMP. However, permitting processes required/employed to ensure a net benefit for SAR under future site works will most likely be managed under the SCA rather than the ESA. Regardless, the actual mitigation and/or compensation measures that would ultimately be imposed or employed through permits issued under either act are anticipated to be largely similar. As such, any recommended actions within this report associated with the ESA, are proposed to apply equally under the SCA.

7.3.4 Fish Habitat

Where development work will interfere directly with existing fish and/or fish habitat in a manner that cannot be fully mitigated against causing harm (in the opinion of the DFO as documented through a Request for Review process), such work can only proceed under a Fisheries Act Authorization to be negotiated with the DFO. A monitoring program to assess the effectiveness of the implemented mitigation strategy, and/or the functionality of any prescribed offsetting work will be established in consultation with DFO, either initially through the Request for Review process (for mitigation) or subsequently through the Fisheries Act Authorization (for offsetting). The review of the details of such monitoring plans and/or any monitoring reports generated would be managed directly by DFO.

7.3.5 Retained Significant Woodlands

Retained Significant Woodlands are to be subject to a review of conditions in Years 1, 3, 5 and 10 following the commencement of land development works within 50 metres of their boundaries. Monitoring reports for woodland monitoring and adaptive outflow management are to be submitted to and reviewed by City forestry staff and must include recommendations for additional tree planting the following year and/or other appropriate measures to be implemented as soon as possible if significant changes in tree community structure or general tree health are evident.

Woodland monitoring and adaptive outflow management: To detect potential hydrologic impacts to a significant woodland, the monitoring shall undertake repeat vegetation community mapping using consistent Ecological Land Classification (ELC) methods at defined 1, 3, 5 and 10 years post-development. Woodlands at Tewin constituting "Significant Woodland," generally comprise a mix of moist-forest and swamp ecotypes. Monitoring Reports shall include the mapping of Ecotype boundaries and documentation of indicator species, substrate/organic soils, and the extent and duration of standing water, supplemented by fixed-point photographs and comparison to baseline mapping. Analysis shall discuss any shifts in ecotype distribution or boundary position alongside recorded water level and discharge information at the primary outflow(s) to distinguish natural variability from disturbance-related change. If monitoring identifies changes in forest vs. swamp areas or undesirable community shifts (e.g. tree die-off, increase in invasives) attributable to altered drainage, adaptive mitigation focused on controlling outflow—such as repairing, reinforcing, or re-setting the downstream invert/check-dam or other grade-control features to the target elevation to adjust water levels—and, where feasible and permitted, modifying flow routing or discharge (e.g., diverting a portion of flow toward the wetland rather than bypassing it and/or reducing outflow) to restore target hydroperiod conditions.

7.3.6 Constructed and Enhanced Wetlands and Watercourses

New/renewed aquatic habitat features to be developed within the Tewin area will each be designed to support specific taxonomic communities (e.g. anurans, turtles, aquatic birds, etc). Each such feature should be subject to a review of presence and general health of the biological communities for which they were designed, and the physical conditions of the feature-specific and the maintenance of those communities in Years 1, 3, and 5 following the completion of their construction. Requirements for monitoring reports will be established at subdivision level and will be submitted to and reviewed by City staff and must include recommendations for additional measures to be implemented the following year if the intended community is not sufficiently present, where feasible.

7.3.7 Groundwater

7.3.7.1 Post Development Levels

Ongoing and post development water level monitoring proximal to the proposed stormwater management ponds shall occur in existing, or where required, new, monitoring wells installed in locations adjacent to the ponds (i.e., ideally within 5-20 metres) that will remain undisturbed post-development. The data logger monitors shall be installed to a depth sufficient to measure changes in the shallow water table relative to the water level in the ponds to ensure the ponds will operate properly and that impacts on the water table are consistent with expectations established in the hydrological investigation and recommendations. The midpoint of the well screen (assumed to be 10 feet in length) shall be roughly equal to the proposed elevation of the pond bottom for collecting this data. Where the pre-development water table elevation is significantly different than the proposed pond elevation, and/or significant changes in the water table elevation are anticipated, specific well designs shall be advised by a professional hydrogeologist.

7.3.7.2 Local Private Wells

Prior to construction activities, a water quality survey and sampling program can be completed for nearby interested properties with existing water supply wells. Given that the area surrounding Tewin is serviced by the Carlsbad Trickle Feed potable water system, the number of impacted wells is expected to be minor or non-existent. The survey would include questions regarding existing water quality and quantity, as well as compiling construction details of the water supply wells and any water treatment systems. Representative water quality samples could be collected at participating properties and submitted for analysis of general chemistry parameters, metals, and bacteria.

7.3.7.3 Additional Considerations

Should additional monitoring requirements be established by the Bear Brook Watershed Study and South Bear Brook Subwatershed Study, both underway, recommendations and programs will be coordinated with the development process and phased development of the Tewin Lands.

8 Maps and Figures

All Figures in this EMP are contained in full size in Appendix A for detail and scale. GIS and CAD files are also available for most features and boundaries.

9 List of Appendices

A) Full Size Report Figures

B) Detailed 2025 Policies

C) The Tewin Intent

D) Field/Site Visit Tables

E) Water Budgets and Canopy

F) Erosion Thresholds and SWM

G) PSW Impact Assessments

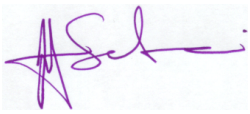
H) Groundwater

I) Existing Conditions Reports

J) Modelling and GIS file information (Including Ecological Corridor boundaries)

10 Professional Consultants

Surface Water Engineering (Hydrology, Hydraulics and Water Budget) – JFSA Canada Inc.



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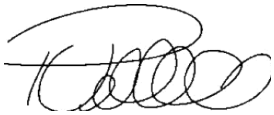

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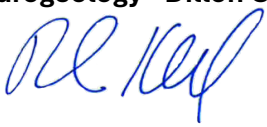

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