Algonquins of Ontario TAGGART GROUP OF COMPANIES CAIVAN COMMUNITIES

TEWIN

Master Servicing Study

Infrastructure Master Plan for the Tewin Community

April 2026

Submitted for City and Agency review

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MASTER SERVICING STUDY
(INFRASTRUCTURE MASTER PLAN FOR THE TEWIN COMMUNITY)

FOR

TEWIN COMMUNITY

CITY OF OTTAWA

PROJECT NO.: 21-1268

ISSUED FOR CIRCULATION APRIL 2026

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.

MASTER SERVICING STUDY
FOR

TEWIN COMMUNITY

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**MASTER SERVICING STUDY
FOR**

TEWIN FUTURE URBAN EXPANSION AREA

**APRIL 2026
CITY OF OTTAWA
PROJECT NO.: 21-1268**

1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) was retained by the Tewin Partners (AOO, Taggart, Caivan) to prepare the following Master Servicing Study (MSS) in support of the Community Design Plan and Secondary Planning Process for Tewin. The MSS (also known as the Infrastructure Master Plan for the Tewin Community) has developed a high-level servicing solution that demonstrates the feasibility of providing the necessary infrastructure for both the study area and external requirements. The MSS recommended servicing scheme sets the stage for future development, serving as a guide for the subsequent stages of planning.

The Tewin study area is illustrated in Figure 1.1 and consists of approximately 838 ha of land in the south east end of Ottawa. The study area is generally bound by Leitrim Road to the north, Ramsayville and Anderson Roads to the west, Thunder Road to the south and Farmers Way to the east.

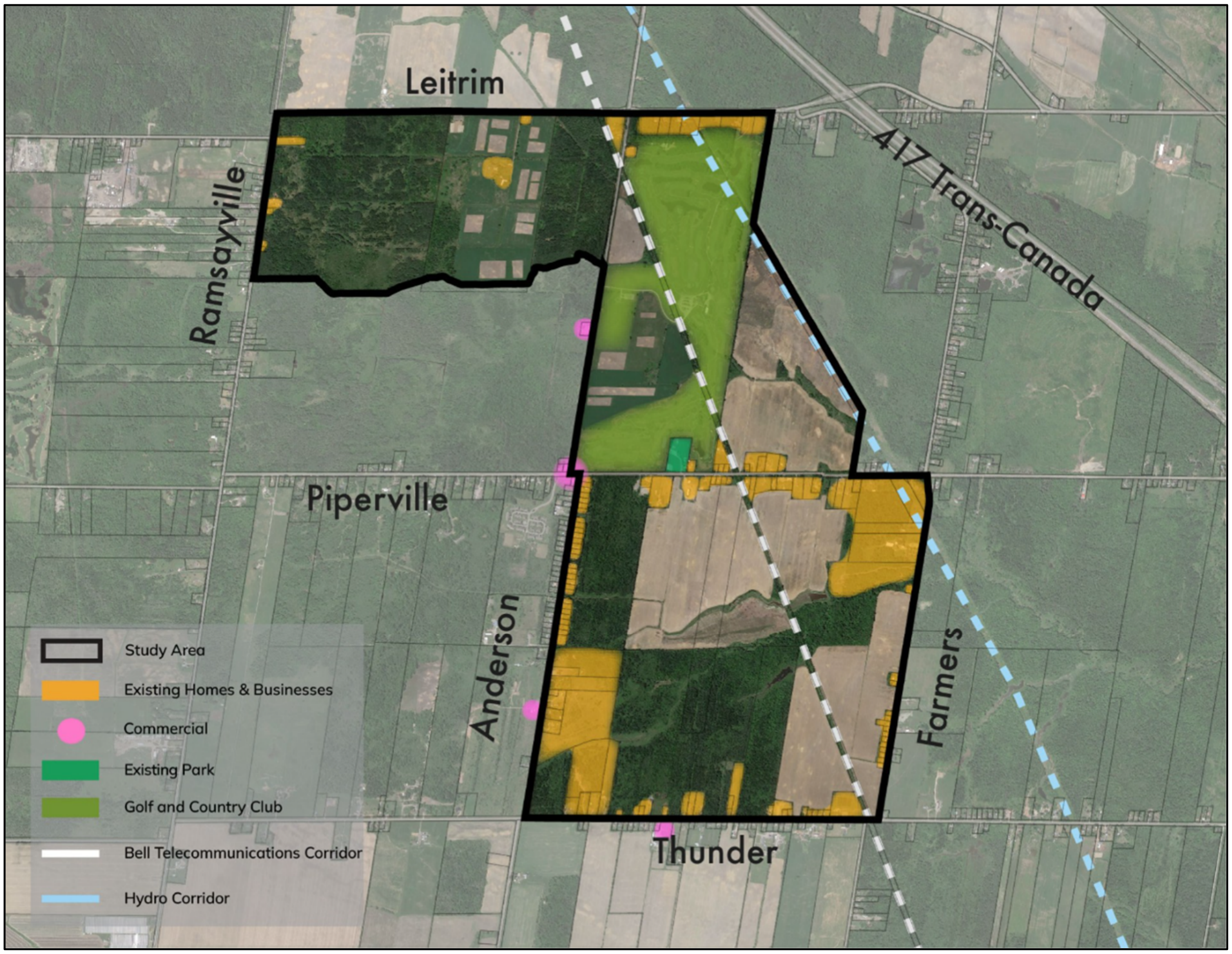

Figure 1.1: Tewin Study Area

Given the size of the site, the report refers to certain areas as "Blocks". These blocks do not represent any specific phasing but are adopted to identify certain areas of the development for ease of review. The boundaries of each of these areas is shown in Figure 1.2 below.

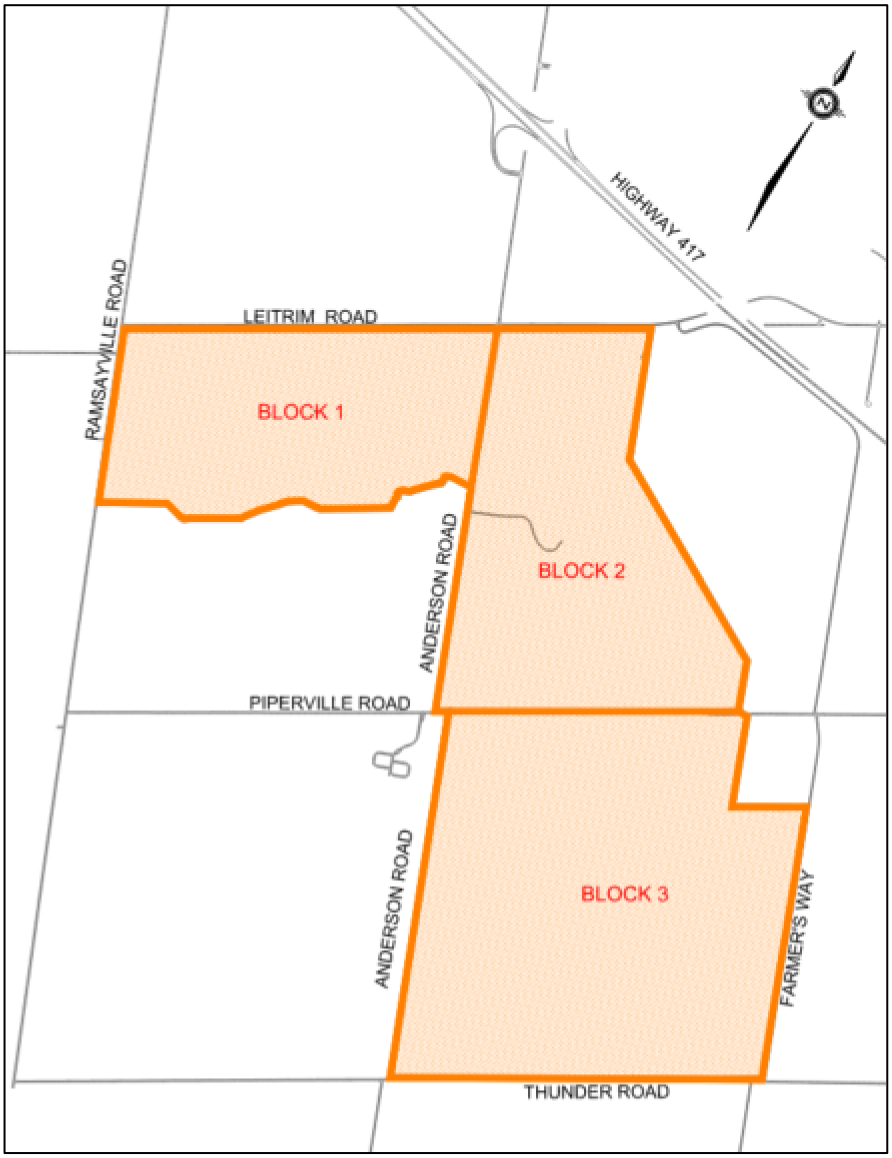

Figure 1.2: Tewin Areas

1.1 Official Plan Review

A comprehensive review of the Ottawa Official Plan, based on a planning horizon to 2046, commenced in 2019; founded on the *Ottawa Next: Beyond 2036* planning study and the *"Five Big Moves"* planning principles.

A future land supply was determined, and, in February 2021, Council directed that 445.35 gross developable hectares of new urban residential lands, to the southeast of the City's existing urban area, should be included as part of the 2046 residential land supply. In October 2021, Council adopted the new Official Plan that incorporated the addition of 445.35 gross developable hectares of land into the urban boundary to support the creation of Tewin through Schedule C17. Council also adopted Annex 10, which identifies the work required as part of the Tewin Community Design Planning process.

The geographic land area established in the adopted Official Plan (Schedule C17) encompasses an area greater than 445.35 gross developable hectares. The detailed study process will identify the appropriate gross developable hectares, and the urban boundary will be finalized through the Secondary Plan.

Preparation of a Secondary Plan, supported by (among other matters) a Community Design Plan, a Master Servicing Study, Transportation Plan, Environmental Management Plan, a Community Energy Plan, Financial Implementation Plan and adopted by Council as an Official Plan Amendment, is required as a first step to support the future development of these lands.

1.2 Tewin Study Area

Through the interdisciplinary work plan, the development of the Tewin Secondary Plan recognizes adjacent areas outside the designated urban development lands that may be affected by the proposed development. In the sections that follow, each discipline has defined a relevant study area for its analysis and determined whether areas beyond the Study Area shown in Schedule C17 should be examined to assess potential impacts.

1.3 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.

The expected benefits of coordinating processes with the *Planning Act*, as per Section A.2.9 of the MCEA, include:

- **Approval Framework** – A single review/approval schedule assists in ensuring that infrastructure and development are comprehensively considered.
- **Coordinated Consultation**– Consolidating the *Planning Act* and MCEA consultation helps to ensure consistent responses and notification to the public and media. If the Secondary Plan process and associated *Planning Act* application (i.e., the Official Plan Amendment which implements the Tewin Secondary Plan) and MCEAs were not coordinated, there could potentially be several different notices for meetings and public review periods in order to meet the requirements of both processes.
- **Harmonized Review** - Review agencies and the public will have an opportunity to review the MCEA documentation and the Secondary Plan documentation as an inclusive package, which can foster a better understanding of the decision-making processes.

This MSS, together with the Tewin Transportation Plan and Environmental Management Plan, will identify 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.

1.4 Coordinated Federal Approvals

In addition to the Provincial and Municipal approvals, the proximity to federal lands may trigger federal planning and environmental approvals.

The National Capital Commission (NCC) is the main federal planning and coordinating agency for Ottawa for federal lands. Under the *National Capital Act*, it has approval authority over some projects in the region, and has a role to coordinate the development of federal lands in the National Capital Region as proposed by either public or private undertakings. The approval process is known as the Federal Land Use, Design and Transaction Approval (FLUDTA). This approval would be required for any proposed projects on federal lands or privately owned land subject to NCC covenants. The approval process is intended to:

- coordinate land use, development and other works on federal lands to reinforce and contribute to the character, identity and quality of the Capital;
- ensure that federal properties and buildings are effectively planned and developed in accordance with their location and context in the Capital; and,
- implement federal legislation and NCC approved plans, and other environmental and heritage policies.

The Tewin development is proposed adjacent to NCC lands within the Mer Bleue and Pine Grove Sectors of the Greenbelt. These areas are primarily comprised of wetlands, natural areas, active agriculture, and recreational uses. Any potential impacts within or to features in this area will require review and approval by the NCC.

Federal *Impact Assessment Act* (IAA) requirements may also apply, as the NCC would need to ensure compliance with the IAA prior to the issuance of any federal approval that would enable a project to proceed. Decisions must consider impacts to Indigenous Peoples and the natural and social environments. Once a determination of adverse environmental effects is made, projects generally require a minimum 30-day posting on a public registry.

The IAA and FLUDTA requirements can be coordinated with the MCEA and *Planning Act* requirements. For example, where design details, consultation or existing conditions overlap, information will be shared. Further, the identification and evaluation of alternatives can be used to support the decision-making processes for any federal project(s).

This MSS, together with the Tewin Transportation Plan and Environmental Management Plan, will identify any individual projects that may require additional approvals under the IAA and FLUDTA.

2.0 STUDY PROCESS

For this Master Servicing Study, the Tewin Partners have retained the following consultants:

- **David Schaeffer Engineering Ltd** to complete this Master Servicing Study;
- **J.F. Sabourin and Associates Inc.** to complete the stormwater management analysis;
- **Cima +** to complete the watermain analysis;
- **Geomorphix,** to complete the fluvial geomorphological assessments
- **Paterson Group Inc.** to complete the geotechnical and hydrogeological investigations;
- **Kilgour and Associates** to complete the natural environment investigations; and;
- **Dillon Consulting Ltd.** to complete hydrogeological investigations.

The purpose of this Master Servicing Study (MSS) report is to develop the technical aspects of the proposed servicing strategy for the Tewin study area. This includes assessing and detailing the proposed water supply, sanitary collection system, storm drainage system, stormwater and groundwater management, grading, and utility network. The MSS utilizes environmental assessment planning principles to assess various servicing options for the proposed community, ultimately leading to the selection of a preferred servicing plan that includes measures to mitigate potential adverse environmental impacts.

The MSS forms part of a suite of integrated reports prepared to facilitate the development of the Tewin lands. It has been developed concurrently with the Transportation Master Plan, the Tewin Community Development Plan (CDP) and Environmental Management Plan (EMP). The overarching objectives and scope of these comprehensive reports are discussed in Section 5.1.

In conjunction with the MCEA process, and the area-specific Terms of Reference (TOR), the MSS follows standard steps outlined in the Guideline for Preparing Terms of Reference for a Master Servicing Study provided in Appendix C of the Infrastructure Master Plan:

i) Preparation and approval of an area-specific Terms of Reference;
ii) Documentation of existing conditions;
iii) Documentation of future development conditions;
iv) Identification of servicing design constraints and evaluation criteria;
v) Development of water, wastewater, and stormwater servicing alternatives and compatible grading plans;
vi) Evaluation of alternative servicing plans and identification of preferred water, wastewater, and stormwater servicing plans;
vii) Development of Implementation Plan including phasing and financial plans; and

viii) Securing all required planning approvals.

The Master Servicing Study has been undertaken to satisfy the requirements outlined above. The specific sections which address the above-noted criteria are listed below:

1. **Preparation and approval of an area-specific Terms of Reference** has been developed with input from City staff and finalized in a separate document.

2. **Documentation of existing conditions** is provided in Section 4.0

3. **Documentation of future development applications** is provided in Section 13.1

4. **Identification of servicing design constraints and evaluation criteria** is provided in Section 5.6.

5. **Development of water, wastewater, and stormwater servicing alternatives and compatible grading plans** is provided in Section 5.5.

6. **Evaluation of alternative servicing plans and identification of preferred water, wastewater, and stormwater servicing plans** is provided in Section 5.6.

7. **Development of Implementation Plan including phasing and financial plans** are provided in Section 13.0.

8. **Securing required planning approvals**, a roadmap is provided in Section 13.1.

Concurrently with the MSS, the City of Ottawa will lead a class EA study to support the planning and implementation of major off-site, water and sanitary servicing infrastructure required to accommodate growth in the Tewin urban expansion area and the broader South Urban Community.

3.0 CONSULTATION

The Tewin project was advanced under a coordinated *Planning Act* and Municipal Class Environmental Assessment (MCEA) process (Approach #3).

The MCEA officially commenced with the issuance of the *Notice of Commencement* on October 12th, 2023.

Key steps in the MCEA process can be summarized as:

1. Existing Conditions and Preliminary Opportunities
2. Alternative Design Solutions

3. Preferred Design Solution

The MCEA outlines specific Public Meeting requirements, where information is presented to the public for feedback. Tewin MCEA Public Meetings occurred on the following dates:

1. Existing Conditions and Preliminary Opportunities (Webinar), October 26th, 2023
2. Alternative Design Solutions (Open House), June 19th, 2024
3. Preferred Design Solutions (Open House), January 9th, 2025

Public Notices for each meeting were circulated and posted as required by the *Environmental Assessment Act.*

A *What We Heard* report was drafted and published on the Tewin website and City of Ottawa Tewin webpage following each meeting, explaining how feedback obtained informed the direction of the project.

In addition, engagement has been ongoing throughout the project with City of Ottawa staff, South Nation Conservation Authority, Rideau Valley Conservation Authority, the National Capital Commission, Hydro Ottawa, local environmental groups, local community representatives, residents and businesses, and various other interest holders. The full extent of consultation for the project is detailed under separate cover in the *Consultation Summary Report* to be submitted as part of the MCEA.

4.0 EXISTING CONDITIONS AND SITE CONSTRAINTS

The subject property is located within the City of Ottawa, nearby to highway 417. The site currently consists of a mixture of agricultural lands, forested area, the Anderson Links Golf & Country Club and existing dwellings located along Anderson Road, Farmers Way, Piperville Road and Ramsayville Road. The site is under of the jurisdiction of the Rideau Valley Conservation Authority (RVCA) and the South Nation Conservation Authority. Additionally, although the site does not include NCC Greenbelt lands, it is located adjacent to them, and off-site services will need to be installed within the City of Ottawa right of ways that traverse the Greenbelt.

A suite of reports was prepared to document the existing conditions within the subject site. The existing conditions of the site, as documented in the reports, are used to establish the opportunities and constraints for the site. The following section provides an overview of the conditions found on the site and is informed by the following reports that have been approved by the City of Ottawa:

- **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 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 September 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 – 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

4.1 Existing Residential Dwellings and Servicing

The existing residential dwellings within the Tewin lands are serviced by private septic systems for wastewater management and a city trickle feed system for potable water. Stormwater management is achieved through a network of roadside ditches that outlet to surface watercourses.

4.2 Existing Trickle Feed System

The existing Carlsbad Trickle Feed System is designed to meet the potable water needs of the Carlsbad Springs rural community in Ottawa, Ontario. This system was put into place in 1997 to address longstanding challenges associated with groundwater quality and quantity for potable water use. It's designed to serve 829 "unit equivalents" through a network of small-diameter pressurized pipes that deliver a continuous, low flow of potable water. Each service connection includes a storage tank that accumulates the trickle-fed water, ensuring a steady supply for domestic use. The system does not support high-demand applications such as irrigation or fire suppression. According to a 2014 Carlsbad Trickle Feed System report, the system is spatially limited for expansion.

4.3 Site Topography

The site features a predominantly flat topography with ground slopes varying but generally under 5%, 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.

- 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.

4.4 Watercourses and Drainage Boundaries

There are two watersheds present within the Tewin study area: Ramsay Creek and the Upper Bear Brook. The majority of the site is tributary to the Upper Bear Brook while the northern portion of the site west of Anderson Road is tributary to Ramsay Creek. The existing watershed boundaries are presented in Figure 4.1.

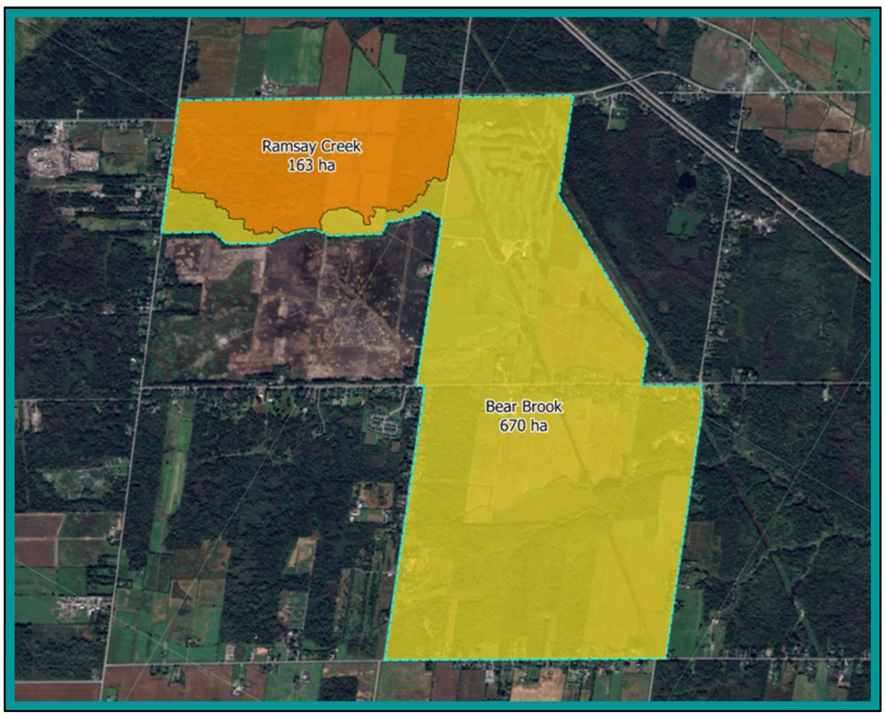

Figure 4.1: Watershed Boundary

4.4.1 Ramsay Creek

In the northern portion of the Tewin Development west of Anderson, there is approximately 3.7 km of low-gradient stream channels, primarily remnant agricultural drainage ditches, that drain to Ramsay Creek. These channels are 4-6 m wide and 0.2-0.5 m deep with portions that flow intermittently through forested areas.

North of Leitrim Road, two unconfined, straightened channels flow through agricultural fields before merging approximately 600 m downstream. The western channel is 4-6 m wide, 1.5 m deep, with a slope of ~0.2% and a riparian zone 9-13 m wide. The eastern channel is ~5 m wide, 2.0 m deep, with a slope of ~0.3% and a riparian zone 17-19 m wide. The eastern channel's riparian buffer is considered 'highly altered' as a result of agricultural land uses, as identified in the RVCA Ramsay Creek 2019 Catchment Report.

Ramsay Creek functions as the drainage outlet for the site's northern area, with two culverts on Leitrim Road conveying flow from on-site tributaries 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 Greens Creek, which eventually outlets to the Ottawa River. The Ramsay Creek tributaries at Leitrim Road are notably high relative to the site's topography.

4.4.2 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, outside the study boundary. The watercourses eventually cross Highway 417 and connect to the Bear Brook River.

4.5 Geotechnical Conditions

Paterson Group have undertaken geotechnical investigations in support of their existing conditions report. The summary of their findings was presented in the approved September 2024 Existing Conditions – Geotechnical, Tewin Lands, Report PG5827-1 rev.5. Information contained in the approved existing conditions report was used to establish constraints for this MSS.

4.5.1 Overburden

The Paterson report analyzes 98 boreholes with a maximum depth of 58.0m which indicates that subsurface profile across the test hole locations generally consists of topsoil, underlain by a sequence of silty sand, brown silty clay, and a deeper deposit of grey silty clay. These layers are further underlain by a glacial till deposit and, ultimately, the bedrock formation.

4.5.2 Bedrock

Based on the information provided in the Paterson report, bedrock elevation is expected to be between 25m and 100m in depth. Given these depths, bedrock is not expected to be a major constraint for the design of infrastructure reported in the MSS.

4.5.3 Ground Water

The current pre-development long-term groundwater table, as determined by Paterson, generally ranges between 1m to 2m beneath the existing ground surface throughout the study area. The groundwater flow system is 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.

4.5.4 Permissible Grade Raise Recommendations

The investigation performed by Paterson Group identified clayey silt and silty clay deposits in various areas, which are prone to consolidation under additional loads. A preliminary grade raise restriction of 0.5 to 0.6 meters above the existing ground surface per the approved report was recommended for the majority of the site. Adjustments to these recommendations will depend on the results of further investigations and settlement monitoring, to be advanced as part of future development applications. Certain localized areas are anticipated to support higher grade raises, which will be assessed during the development's design phase. To mitigate these risks, the report recommends lightweight fill, pre-loading techniques, and the implementation of settlement monitoring programs in critical areas.

4.6 Hydrogeological Conditions

As described in Dillon Consulting's Existing Conditions Hydrogeological Study, the study area consists of a thin, somewhat discontinuous silty sand unit overlying a thick clay layer, which is divided into a more permeable brown silty clay and a low-permeability grey silty clay. The silty sand is the most permeable but not extensive enough to be a major groundwater flow path. Groundwater is mainly shallow and responds to seasonal changes, with temporary water table rises after rainfall. Due to the underlying grey clay's low permeability, groundwater flow is primarily lateral and discharges to local surface water features, though baseflow discharge is limited.

4.7 Existing Wetland Features

There are no Provincially Significant Wetlands on the Tewin Lands or within 100 metres of the site boundary. However, portions of the site are classified as wetland features under the Ecological Land Classification system. Wetlands support local ecological functions and form part of the broader natural heritage system extending across urban and rural landscapes and into adjacent municipalities.

Wetlands present on the site consist primarily of marsh and meadow marsh (40 ha), thicket swamp (24 ha), marsh swamp (13 ha), and deciduous swamp (87 ha). Tree cover is largely associated with rowed coniferous plantation areas within swamp habitats (71 ha). Although groundwater conditions maintain wet to saturated soils, surface water depths within these swamps are often shallow, limiting their habitat suitability for fish, turtles, and amphibians. Beyond the spring freshet period—typically brief due to the flashy drainage characteristics of the area—accessible surface water is generally restricted to a small marsh area located downstream of the Johnston Drain.

4.8 Geomorphological Assessment

Ramsay Creek and Bear Brook within the Tewin Lands have shown limited historical planform change, with most reaches originally straightened for agriculture and only localized adjustments due to beaver activity and outlet modifications associated with the Anderson Links Golf Course. Terrain assessments indicate slope variability near dams, crossings, and confluences, with depositional areas typically forming upstream of beaver ponds. The area lies within the Russell and Prescott Sand Plains, where coarse sands are more erosion-susceptible and finer silts and clays provide greater cohesion. Based on empirical modelling and field observations, unconfined reaches exhibit narrow, generally straight channels with meander belt widths ranging from 6 to 48 metres, while confined reaches near valley slopes require a 5–8 metre toe erosion allowance to define natural hazard boundaries.

Field and desktop assessments were completed for Bear Brook, Ramsay Creek, and their key tributaries to define the study area and evaluate potential downstream impacts. These assessments identified erosion thresholds for six sensitive reaches along Bear Brook and two within Ramsay Creek.

4.9 Wildlife

A total of 67 bird species were recorded on the Tewin Lands in 2022 through breeding bird surveys and incidental observations, including six Species at Risk. Eastern Wood-pewee was widespread across larger forest blocks, while Bobolink, Eastern Meadowlark, and Barn Swallow were mainly associated with active agricultural lands north of Piperville Road. Grasshopper Sparrow and Wood Thrush were each detected only once, indicating marginal or transient use of the site, and no Eastern Whip-poor-will or Common Nighthawk were observed despite suitable survey conditions. Amphibian monitoring identified four frog species, with Spring Peeper and Wood Frog occurring most frequently—particularly near wetlands connected to the Johnston Municipal Drain—while American Bullfrog and Green Frog were present in low numbers across individual wetland pockets. Fish sampling within the Bear Brook watershed indicated a community dominated by tolerant warm-water species, with no invasive or at-risk fish detected. Most fish presence was limited to larger creeks and municipal drains east of Anderson Road, while isolated habitats influenced by beaver dams temporarily supported low densities of baitfish species but would not sustain fish communities without those impoundments.

4.10 Existing Utilities and Easements

The Tewin development area currently lacks major civil infrastructure, with existing utility corridors and easements reflecting its rural setting. Residential properties around Tewin typically rely on private septic systems for wastewater management and a city trickle feed system for potable water. Existing corridors and easements in the area are primarily for utility access and maintenance, including small-diameter water lines and private utility connections.

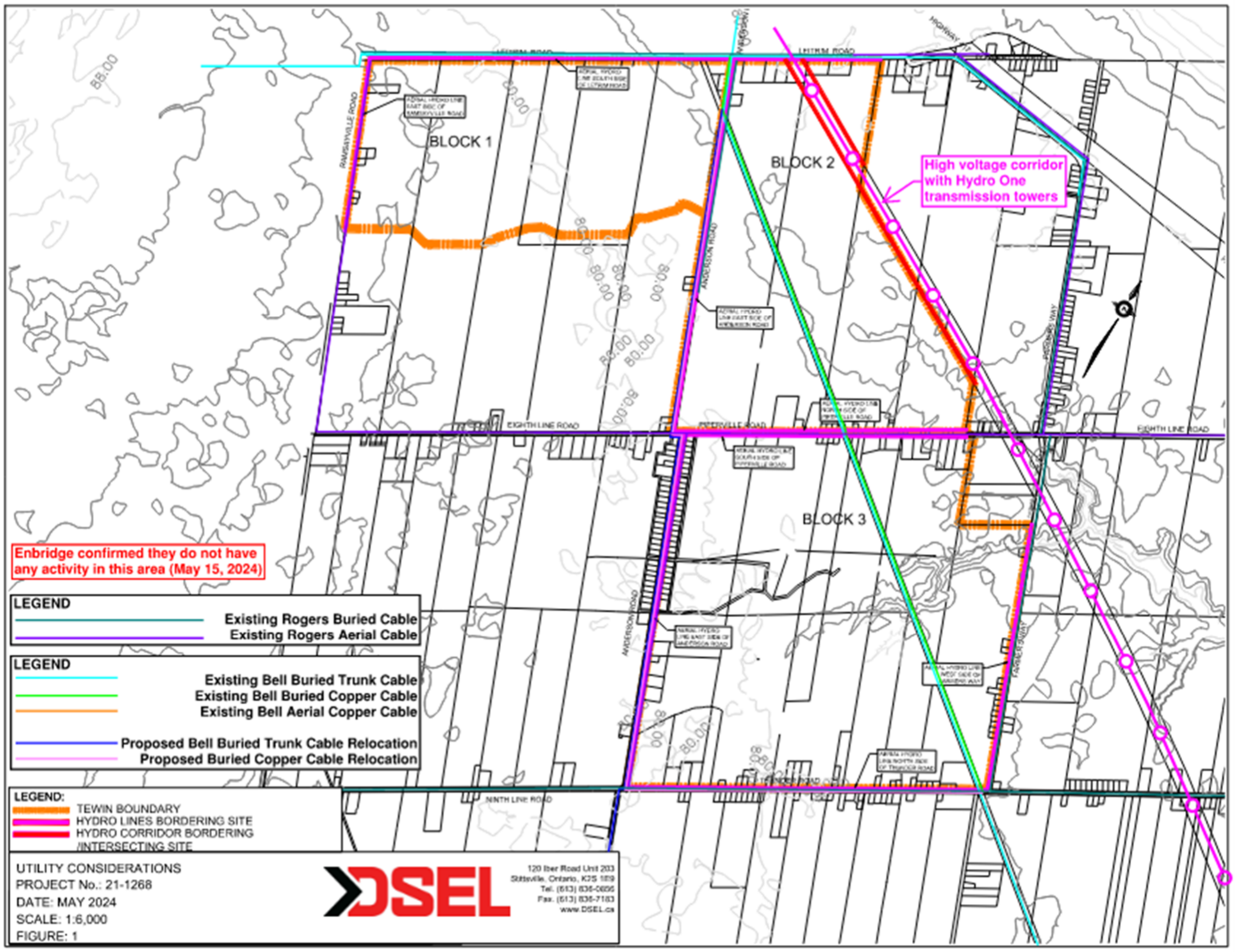

Figure 4.2 Existing Utilities and Easements

A bell corridor crosses through the Tewin development area. This corridor stretches from the east portion of Block 1 and continues to cross south-east through blocks 2 and 3. Additionally, a hydro corridor runs through a small corner of block 2 and 3 and borders the eastern side of Block 2. The area is not currently serviced by natural gas. Overhead hydro wires are located along Letrim Road, Ramsayville Road, Anderson Road, Farmers Way, Piperville Road and Thunder Road.

4.11 Summary of Key Opportunities and Constraints

Based on the information provided in the existing conditions reports and subsequent Environmental Management Plan:

- There is an opportunity to develop the subject area with municipal services.
- Natural area restoration across the Tewin Lands provides opportunities to create habitat that supports existing species at risk and enhances overall biodiversity. However, evolving species listings will require site-specific consideration and adaptive approaches as development proceeds.

- The EMP recommends locating future stormwater facilities near existing watercourses to act as compatible land uses that support the natural corridor while offering open space, vegetation, aesthetics, and buffering. In combination with utility corridors, these features can create recreational linkages, assuming pond outlets are positioned as far upstream as possible to help sustain watercourse hydration and aquatic habitat.

- The general urbanization of the subject area will increase runoff and could increase erosive forces in the downstream receivers. Generally speaking, post-development flows will need to be restricted to pre-development levels to mitigate any downstream effects on existing watercourses.

- The infiltration potential is considered to be low and generally unsuitable for the implementation of infiltration-based low-impact development features.

- There is an opportunity to contribute valuable canopy, habitat, and natural environmental values through preservation of the few mature woodlands across the site. In addition to landscape value, there are hydrological benefits, with precipitation contributing to woodland assisting in stormwater management through natural means.

- A preliminary grade raise restriction of 0.5m above existing ground level surface has been approved for the site. The grading plans will need to consider this constraint with the understanding that there may be an opportunity to improve the permissible grade raise with additional study and programs such as long-term settlement plan or lightweight fill.

- Existing privately owned lands exist across the future Tewin Lands development area. These properties are serviced by the municipally owned Carlsbad Trickle Feed potable water system as well as private septic systems. Legacy private wells of unknown status also still exist across the area. Any abandoned wells on Tewin Lands are required to be decommissioned.

5.0 EVALUATION OF SERVICING ALTERNATIVES

5.1 Vision and Goals for the CDP

Tewin is envisioned as a vibrant, mixed-use community. It will be more compact and dense than existing suburbs in Ottawa, with new urban areas integrated alongside valuable natural areas. Tewin will be an inclusive community, anchored in Algonquin wisdom and place keeping principles, and welcoming to all. The community will have a meaningful mix of land uses and support active mobility, to achieve a complete, future-ready community. The Tewin Project Team and City of Ottawa have committed to exploring appropriate 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.

5.1.1 Tewin Intent: A Forward-Thinking Framework

Development at Tewin will explore new approaches to planning, design and development, finding successful options and alternatives to implement the key community objectives, in some cases likely going beyond what current development standards would allow for. The Tewin Project Team and the City of Ottawa have articulated these in the “Tewin Intent” which sets out the following:

1. Bold and Innovative Thinking:

Tewin is about creating a new kind of community, a future-focused model for smart, healthy and sustainable development. It will be a people-centred place that seeks to create the conditions for well-being. The Tewin Project Team will be open to bold ideas, innovative approaches, creative solutions, efficient use of land and resources, emerging technologies, smart city infrastructure that advances the City’s goals and objectives, and other future-forward ideas and opportunities that will enable Tewin to reach its full potential.

2. Integrating Algonquin Values and Principles:

Algonquin principles, values and teachings will guide the planning, consultation, design and development process for Tewin. The integration of Algonquin principles and design intentions will ensure the community is nature-based and sensitive to Mother Earth while creating capacity-building and economic development opportunities for the Algonquin people.

3. Sustainability and Resilience:

Tewin will be a model community that will position Ottawa as a leader in integrated sustainable design with the goal of being a resilient and holistic community. Tewin will be guided by the One Planet Living framework and Algonquin values of respect for the earth.

The Community Design Plan will respond to the City's High Performance Development Standard and Climate Change Master Plan and will result in a Community Energy Plan. A Community Energy Plan and performance-based sustainability metrics that address climate mitigation and adaptation, and the other categories of the High-Performance Development Standards will be established from the start and monitored over time.

4. Systems-Based Environmental Planning

Tewin's organization and functions will be designed to respect nature and integrate natural features and landscapes into its form, character, and spirit. To that end, the Tewin Project Team is committed to pursuing a systems-based approach to natural heritage protection, environmental management, and water management in a way that is inclusive and integrated and encourages stewardship and a positive relationship with the natural world. Natural features are regarded as opportunities rather than constraints, will be woven into the fabric of the community, and will be central to its design and character.

5. Alternative Design Solutions

Designing a community of the future requires progressive and forward-thinking infrastructure solutions. The Tewin Project Team is committed to being solutions-oriented and will consider alternative design and engineering standards that prioritize natural systems, pedestrians, cyclists and transit users, and which efficiently use available land and resources.

Surface water management strategies that achieve quality, conveyance and storage objectives will be based on the fundamentals of natural cycles, green/soft infrastructure, and multi-use opportunities that complement the human realm. Infrastructure design will consider the needs of those involved in the construction, operation and maintenance of municipal services to find opportunities to efficiently service the community and showcase sustainable practices while meeting the community's needs.

A framework for assessing alternative design standards will be established to consider and review alternatives against existing standards within the context of goals and objectives for the City and Tewin.

6. Cost-Effectiveness and Efficiency

Tewin will demonstrate best practices in efficient and compact development. As a dense, mixed-use community of scale, Tewin will achieve a critical mass of people and jobs to support new infrastructure investments.

The Tewin Project Team is committed to exploring opportunities to optimize the community's efficiency through a range of strategies, including prioritizing space- efficient modes of transportation, use of technology, green infrastructure, innovative construction practices, shared-use agreements, and mixed-use forms of development that will promote the efficient use and optimization of land; housing affordability; and supporting the long-term financial viability of the community and city resources.

7. Integrated Planning Process

We are committed to advancing Tewin through a comprehensive and integrated planning and environmental assessment process where possible or applicable. The process will bring together various planning, environmental, transportation, urban design, infrastructure, economic, financial, social and technical considerations. The process will be underpinned by engagement with the Algonquin people, other stakeholders, and the public.

8. Collaboration and Problem Solving

The Tewin Project Team and City of Ottawa Project Team are committed to working collaboratively together to move Tewin forward in an expedited way. We will plan with a spirit of collaboration and joint problem-solving to ensure that the development of Tewin meets the best interests of the City of Ottawa and the Algonquins of Ontario.

9. Communication and Transparency

The Tewin Project Team and the City of Ottawa Project Team commit to open and transparent communication throughout the project. This will require proactively sharing information between the groups as decisions are made and ensuring relevant communication materials are distributed in a timely manner.

The Tewin Project Team and the City of Ottawa Project Team will ensure that all parties, including City Council, residents, and other stakeholders, are provided with pertinent details. Effective information sharing will ensure the project achieves outcomes that are, to the greatest extent possible, known by all involved.

5.2 Tewin Community Design Plan Summary

Tewin presents an opportunity to accommodate planned growth within the City of Ottawa through the development of a sustainable new community, rooted in the values, teachings, and design principles of the Algonquins of Ontario. The proposed preferred Community Design Plan in Figure 5.1 sets out a framework for phased evolution of the 838-hectare Study Area into a people-centred place that seeks to create the conditions for wellbeing and embed progressive approaches to sustainable community design. The Plan has been informed by a coordinated Planning and Municipal Class Environmental Assessment (MCEA) process, which launched in 2023 to bring together various technical and community planning considerations and included a responsive engagement process to capture community ideas and respond to concerns.

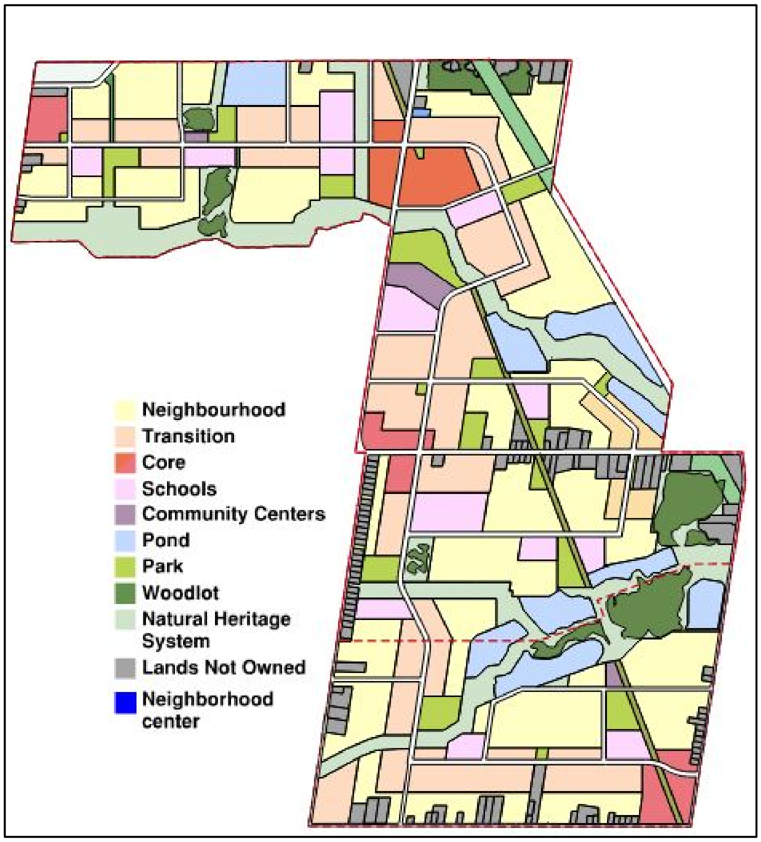

Figure 5.1: Community Design Plan

To realize this vision, the Community Design Plan is guided by five overarching principles: 1) anchored in Algonquin wisdom, principles, and placekeeping; 2) driven by a nature-first approach which protects, enhances and integrates valuable natural areas and agricultural lands 3) mobility-oriented and supportive of a broad range of active forms of movement; 4) defined by a meaningful mix of housing, amenities, jobs and services to achieve a complete, future ready community; and, 5) affordable, inclusive, healthy, welcoming, and accessible to all.

Collectively, these guiding principles set the stage for a series of complete and connected neighbourhoods with access to homes, businesses, schools, parks and open spaces, and other community services, all linked through an interconnected natural and open space system and the Community Mobility Spine. The street pattern on either side of the Community Mobility Spine will extend out to the natural system and support the development of sustainable neighbourhoods, which utilize land efficiently through a diversity of housing forms.

The Community Design Plan is defined by its following key components:

1. **Parks and Open Space System.** Tewin is organized around an interconnected network of parks and open spaces which have been located and structured to complement and extend the site's natural systems, including watercourses, wetlands,

and woodlots. These systems together will provide connections to nature for residents, workers and visitors, and will protect wildlife habitats. The parks and open space network will feature a variety of spaces for recreation, including a large, centralized community park. Parks and open spaces will be linked together by trails that run along and through natural areas. Parks will range in size and type and be distributed throughout Tewin with the intent of maximizing the number of residents, workers and visitors within a short walking distance to a park.

2. **The Community Mobility Spine.** The Community Mobility Spine will serve as an urban road and the central main street of Tewin. This area will be lively and people-oriented, featuring a diverse mix of uses and higher-density developments, while also supporting a variety of mobility options, including transit, walking, cycling, and driving. Although driving will be permitted along the Community Mobility Spine, it will be given less priority than sustainable modes.

3. **Neighbourhood Collectors.** A series of neighbourhood collector streets will complement the Community Mobility Spine, providing access to residential areas, natural spaces, and surrounding concession roads. These streets will be neighbourhood-scaled and lined with various land uses and housing types, enhancing connectivity throughout the community. The Collector Loop will be designed with transit potential to seamlessly connect with the Community Mobility Spine.

4. **Core Area and Neighbourhood Centres.** Tewin’s Core Area and Neighbourhood Centres will contain a mix of building types organized to establish walkable centres with a mix of residential, commercial, retail and services uses. The Core Area will be a hub of civic and recreational uses and the primary focus for retail and the highest residential densities in support of vibrancy and animation. The Core Area will be complimented by three, secondary Neighbourhood Centres dispersed throughout the Study Area, comprised of higher-density residential and neighbourhood-serving retail and services to support a series of self-sustaining neighbourhoods throughout the Tewin community. Built form typologies could include mid- and high-rise buildings, as well as higher-density townhomes.

5. **Transition Areas.** Primarily focused along the Community Mobility Spine and Collector Loop, Transition Areas will be comprised of urban, transit-supportive developments focused on residential uses with punctuations of retail and services in appropriate locations. Built form typologies could include low- to mid-rise apartments as well as a range of townhomes.

6. **Neighbourhood Areas.** Lower density neighbourhoods are planned throughout the Study Area, which will be focused on delivering a range of diverse, context-responsive housing, with nearby access to nature, transit and services. Built form

typologies could include a mix of single- and semi-detached homes and low-density townhomes, as well as Transition Area housing types in key locations.

Tewin is designed as a community with a level of density high enough to sustain transit, schools, community services, and retail. The development of Tewin and its supporting infrastructure will occur gradually, not all at once. Community development and the necessary infrastructure will be implemented in phases, beginning at the northern part of the study area and progressing southward to extend City services over time.

5.2.1 Development Statistics of Preferred Land Use Plan

The following development statistics were established based on the preferred land use plan and form the basis for sizing and evaluating the infrastructure required to service the community. The unit counts and population estimates applied in the MSS reflect the upper range of anticipated demand for the Tewin Study Area, providing a conservative basis for engineering analysis.

The values presented in Table 5-1 use unit densities derived from the City of Ottawa sewer design guidelines. As these assumptions are developed specifically for servicing design, they may differ from the demographic projections used for broader land-use planning or policy analysis. The statistics presented below are for the full Tewin build-out (615 ha).
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Table 5-1: Development Statistics

Zone	Gross Area (ha) ***	Net/ Gross Area *	Total Net Area (ha)	Avg. Unit Per Net Ha *	Avg. Pers. Per Unit **	Tot. Units	Pop.	Pop/ Gross Ha
Core (High – Mid Density)	16.38	75%	12.29	148	2.4	1818	4364	266
Neighbourhood Centres	20.11	90%	18.10	126	2.5	2280	5701	284
	5.20	100%	5.20	-	-	-	-	-
Community Corridor (Transition)	122.99	85%	104.55	97	2.6	10141	26366	214
	6.74	100%	6.74	-	-	-	-	-
Neighbourhood	225.43	80%	180.35	41	3.3	7394	24401	108
Lands Not Owned (Low Density)	101.37	80%	81.09	36	3.1	2919	9050	89
Commercial	0.45	100%	0.45	-	-	-	-	-
Parks	33.95	-	33.95	-	-	-	-	-
Community Centre	6.32	-	6.32	-	-	-	-	-
School	47.44	-	47.44	-	-	-	-	-
Total	**586.38**	**-**	**496.47**	**-**	**-**	**24553**	**69882**	**170**

Notes:
Highlighted cells represent commercial spaces within mixed use blocks
* Average based on projects with similar land use
** Based on similar land use, this column averages 1.8 people/unit for mid-high density, 2.7 people/unit for stacked towns, b2b towns and townhomes, and 3.4 people/ unit for single family homes
*** Areas based on March 10, 2025 Land Use Plan

In comparison the CDP provides population and density projections for both the 445 ha Secondary Plan Area and the 615 ha full study area. The 445 ha area corresponds to the lands within the Secondary Plan and represents the portion of Tewin that is being actively planned and serviced in the near term. The 615 ha area represents the full Tewin Study Area.

Table 5-2: Summary of CDP Development Scenarios

Item	445 ha (Secondary Plan)	615 ha (Full Study Area)
Net Developable Area	445 ha	615 ha
Net Residential Area	215 ha	315 ha
Planned Units	14,000 to 17,850	20,200 to 25,500
Planned Population	36,950 to 44,900	53,750 to 64,700
Planning Purpose	Near-term Secondary Plan	Ultimate buildout for long-term servicing

5.3 Servicing Problem Statement

Tewin has been added to Ottawa’s land supply through the Official Plan to address a critical housing need. A comprehensive servicing strategy is required to support wastewater collection, water supply, storm drainage, and stormwater management for the new community. This strategy must align with the Provincial Planning Statement (PPS), comply with City of Ottawa standards, and satisfy the requirements of relevant approval agencies, including the Ontario Ministry of the Environment, Conservation and Parks (MECP), the Ontario Ministry of Natural Resources and Forestry (MNRF), South Nation Conservation, and the Rideau Valley Conservation Authority. Additionally, the strategy must reflect sound engineering principles to ensure public safety, environmental protection, and long-term operational sustainability.

5.4 Municipal Class Environmental Assessment (MCEA) Expected Schedule Screening

The following infrastructure components have been screened for preliminary purposes under the *Municipal Engineers Association’s Municipal Class Environmental Assessment (MCEA)* document (2024). Each component has been categorized based on its expected type, location, and anticipated impact, in accordance with the standard project schedules under the MCEA process.

The final Notice issued for completion of the MCEA process and the final versions of supporting studies shall confirm project schedules and list the individual projects for which the MCEA process is deemed to be completed.

Sanitary Servicing

- **Gravity Sewer System**
  Schedule: Exempt (22a)
  Establish, extend, or enlarge a sewage collection system and all necessary works to connect the system to an existing sewage outlet, where it is required as a condition of approval on a site plan, consent plan of subdivision or plan of condominium which will come into effect under the Planning Act prior to the construction of the collection system.

- **Sanitary Pumping Station**
  Schedule: B (24d)
  A new sanitary pumping station not located within or adjacent to environmentally sensitive features, cultural heritage sites, or sensitive land uses will follow the Schedule B process.

Water Distribution and Storage

- **Water Distribution System**
  Schedule: Exempt (4a)
  Establish, extend or enlarge water distribution system and all necessary works to connect the system to an existing system, where it is required as a condition of approval on a site plan, consent, plan of subdivision or plan of condominium which will come into effect under the Planning Act prior to the construction of the extension of the distribution system.

- **Water Pumping Station and Reservoir**
  Schedule: B (5d/6c)
  A new water booster station and storage reservoir not located in environmentally sensitive or heritage areas will be assessed under a Schedule B process.

Stormwater Management

- **Stormwater Management Facilities Approved Under the Planning Act**
  Schedule: Exempt (44)
  Stormwater management facilities (including Low Impact Development features) that are required as a condition of development approval (e.g., plan of subdivision, site plan) under the *Planning Act* are exempt from further MCEA requirements.

5.5 Identification and Evaluation of Alternative Servicing Solutions

The following section outlines the evaluation of various servicing options for water distribution, wastewater collection, and stormwater management in the Tewin development. Each servicing component has been assessed based on its feasibility, alignment with regulatory requirements, and ability to meet the planned development targets. The preferred solutions have been selected based on their capacity to support the anticipated growth while ensuring compliance with the Provincial Planning Statement, City guidelines, and environmental regulations.

5.5.1 Water Distribution

- **Do Nothing:** Without building any water infrastructure, the problem statement will not be addressed, and the approved development targets for Tewin won't be achievable. Therefore, this option **has not been pursued**.

- **Expand Trickle Feed System:** Expanding the current Trickle Feed System is not expected to support the demands in water supply for the approved Tewin development. The trickle feed system would not adequately supply not only the size of the development but also the demands of medium and high-density residences. This solution does not align with the Provincial Planning Statement (PPS), which indicates that municipal services are the preferred method for water supply in urban areas. The problem statement will not be resolved by this option and therefore, this option **has not been pursued.**

- **Connect to Central Services:** According to the Provincial Planning Statement, municipal water services are the preferred method of servicing urban areas in Ontario. Currently, there are no municipal services adjacent to the Tewin development, so these services will need to be expanded to adequately serve the area. Municipal services can support the planned variety of residential housing types and densities, community facilities, and commercial areas outlined in the guiding principles. Expanding the city's water services will also ensure that peak and fire flows can be accommodated. As this option provides the most reliable and adequate servicing for the needs of Tewin, **connecting to central services is the preferred water servicing solution.**

5.5.2 Wastewater Collection

- **Do Nothing:** Without building any wastewater infrastructure, the problem statement will not be addressed, and the approved development targets for Tewin won't be achievable. Therefore, this option **has not been pursued**.

- **Private Septic System:** Private septic systems are not anticipated to handle the wastewater generated by the approved level of development. This approach does not align with the Provincial Planning Statement (PPS), which specifies that municipal sewage services are the preferred method of servicing in urban areas. It further states that private systems should only be used "for new developments of five or fewer lots or private residences where municipal sewage services are unavailable and site conditions support the long-term provision of such services."

Consequently, this option does not address the problem statement and **has not been pursued**.

- **On-site Treatment:** On-site treatment would involve treating the wastewater directly on-site, potentially through a new municipal wastewater plant and its associated systems. While this solution aligns with the PPS, which recommends that urban areas be serviced by municipal sewage systems, the process of constructing, operating and maintaining a new treatment plant is not deemed to be an efficient option given the scale of development. The City of Ottawa has an existing wastewater treatment facility, and the City's IMP indicates that there is sufficient capacity to accommodate the Tewin community. As such this option **has not been pursued.**

- **Connect to Municipal Services:** Municipal sewage systems are considered the ideal choice for urban servicing in Ontario, according to the Provincial Planning Statement. The current City sanitary sewer infrastructure is anticipated to have the capacity to handle the proposed mix of residential housing types, densities, community facilities, and commercial zones outlined in the guiding principles. The existing ROPEC wastewater treatment plant is also projected to manage the anticipated wastewater volumes. Extending the system would efficiently utilize the available capacity and is **the preferred option.**

5.5.3 Stormwater Collection and Management

- **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 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 **has not been pursued.**

  Stand-Alone Low Impact Development (LID) Measures: Techniques, such as bioswales, infiltration trenches, rain gardens, and permeable pavements, can be 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 would be ineffective due to site specific limitations, including soil permeability and high groundwater table. In addition, LID features typically require large surface footprints and distributed maintenance responsibilities that are not well suited to higher-density, urban land use patterns. For these reasons, 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.**

- **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. **As such, this option will be evaluated using the MECP Consolidated Linear Infrastructure – Environmental Compliance Assessment (CLI-ECA) framework.**

- **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 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. **As such, this option will be evaluated using the CLI-ECA framework.**

5.6 Identification and Evaluation of Servicing Alternatives

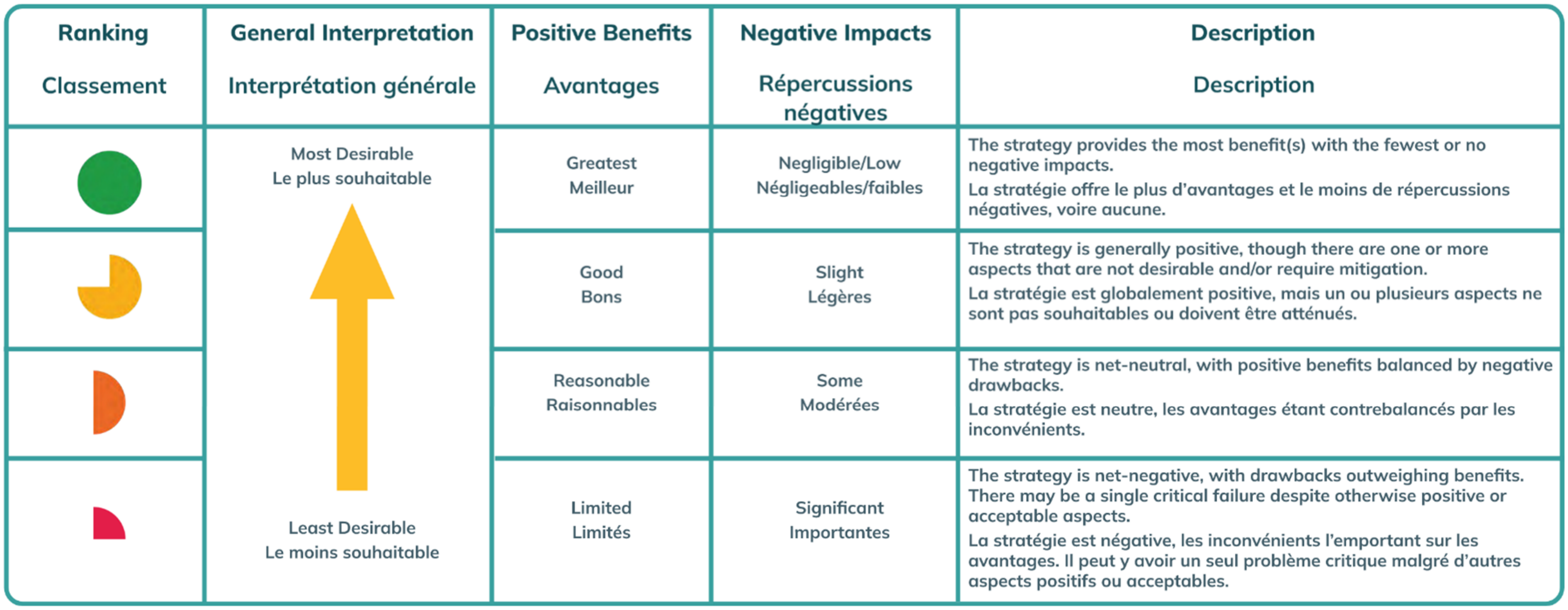
A set of evaluation criteria was developed and approved for use to evaluate the social, environmental and economic impacts of the community design and servicing strategies. The evaluation criteria are presented in Table 5-3 below.

Table 5-3 Tewin Evaluation Criteria for Community Design Strategies

Category	Evaluation Criteria for Alternative Community Design Strategies
A. DEVELOPMENT & LAND USE	1. Planned and designed to support a sustainable future in accordance with AOO values and Design Guidelines as well as One Planet Living Principles (built form, land use, transit, densities, biodiversity, health and wellbeing, etc.)
	2. Creates vibrant mixed-use centres that are a focus for community activity
	3. Accommodates a mix of land uses that support convenient access to a range of services and amenities
	4. Integrates with existing homes and businesses
B. TRANSPORTATION & MOBILITY	5. Creates a transportation network that facilitates efficient transit operation and coverage
	6. Supports complete streets and active mobility, including pedestrian and cycling connectivity
	7. Centres the Tewin community on natural systems including watercourses, wetlands, trees and plants

C. NATURAL SYSTEM, PARKS, RECREATION & OPEN SPACES	8. Supports a connected network of parks and natural areas that provide access for residents, protects wildlife habitat and connects future Algonquin Natural Land Trust east of the site
	9. Allows for watercourse naturalization to support a resilient natural system
	10. Delivers parks and community facilities that are highly usable, accessible and activated
D. SERVICING	11. Enhances the natural environment and ecological system for future generations 12. Optimizes stormwater management techniques that contribute to the character of the Tewin Community
	13. Supports the efficient delivery of servicing
E. PHASING & IMPLEMENTATION	14. Reduces capital costs
	15. Reduces operating costs
	16. Optimizes the phased delivery of infrastructure and amenities, including in the early phases

These criteria are also associated with a ranking, as presented in Figure 5.2 below. The figure illustrates a four-tier ranking system used to evaluate the desirability of strategies based on their positive benefits and negative impacts. The rankings range from most desirable (green circle) to least desirable (red quarter circle). A strategy ranked as most desirable offers the greatest benefits with negligible or low negative impacts. As rankings decline, benefits decrease and negative impacts increase. The least desirable ranking reflects limited benefits with significant drawbacks.



Ranking / Classement	General Interpretation / Interprétation générale	Positive Benefits / Avantages	Negative Impacts / Répercussions négatives	Description / Description
	Most Desirable Le plus souhaitable	Greatest Meilleur	Negligible/Low Négligeables/faibles	The strategy provides the most benefit(s) with the fewest or no negative impacts. La stratégie offre le plus d'avantages et le moins de répercussions négatives, voire aucune.
		Good Bons	Slight Légères	The strategy is generally positive, though there are one or more aspects that are not desirable and/or require mitigation. La stratégie est globalement positive, mais un ou plusieurs aspects ne sont pas souhaitables ou doivent être atténués.
		Reasonable Raisonnables	Some Modérées	The strategy is net-neutral, with positive benefits balanced by negative drawbacks. La stratégie est neutre, les avantages étant contrebalancés par les inconvénients.
	Least Desirable Le moins souhaitable	Limited Limités	Significant Importantes	The strategy is net-negative, with drawbacks outweighing benefits. There may be a single critical failure despite otherwise positive or acceptable aspects. La stratégie est négative, les inconvénients l'emportant sur les avantages. Il peut y avoir un seul problème critique malgré d'autres aspects positifs ou acceptables.

Figure 5.2 Evaluation Criteria and Ranking System for Strategy Desirability

5.6.1 Water Servicing:

A new water distribution network will be implemented to service the Tewin community. Clean water will be drawn from the existing City of Ottawa 2C pressure zone and transmitted via new watermains within the Tewin boundary per the City's IMP. Water will be stored on-site using a storage reservoir and pumped to the community to provide adequate supply and pressures to residents. Three different leading options for backbone watermain routing were evaluated using the criteria presented in Table 5-3. Figure 5.3 displays the routing options that were evaluated. A pump station and reservoir are required to ensure that the water servicing needs are sufficiently met. Three options for the location of the pump station were also evaluated to determine the most suitable location.

Table 5-4 and Table 5-5 outline the potential options and evaluate each option.

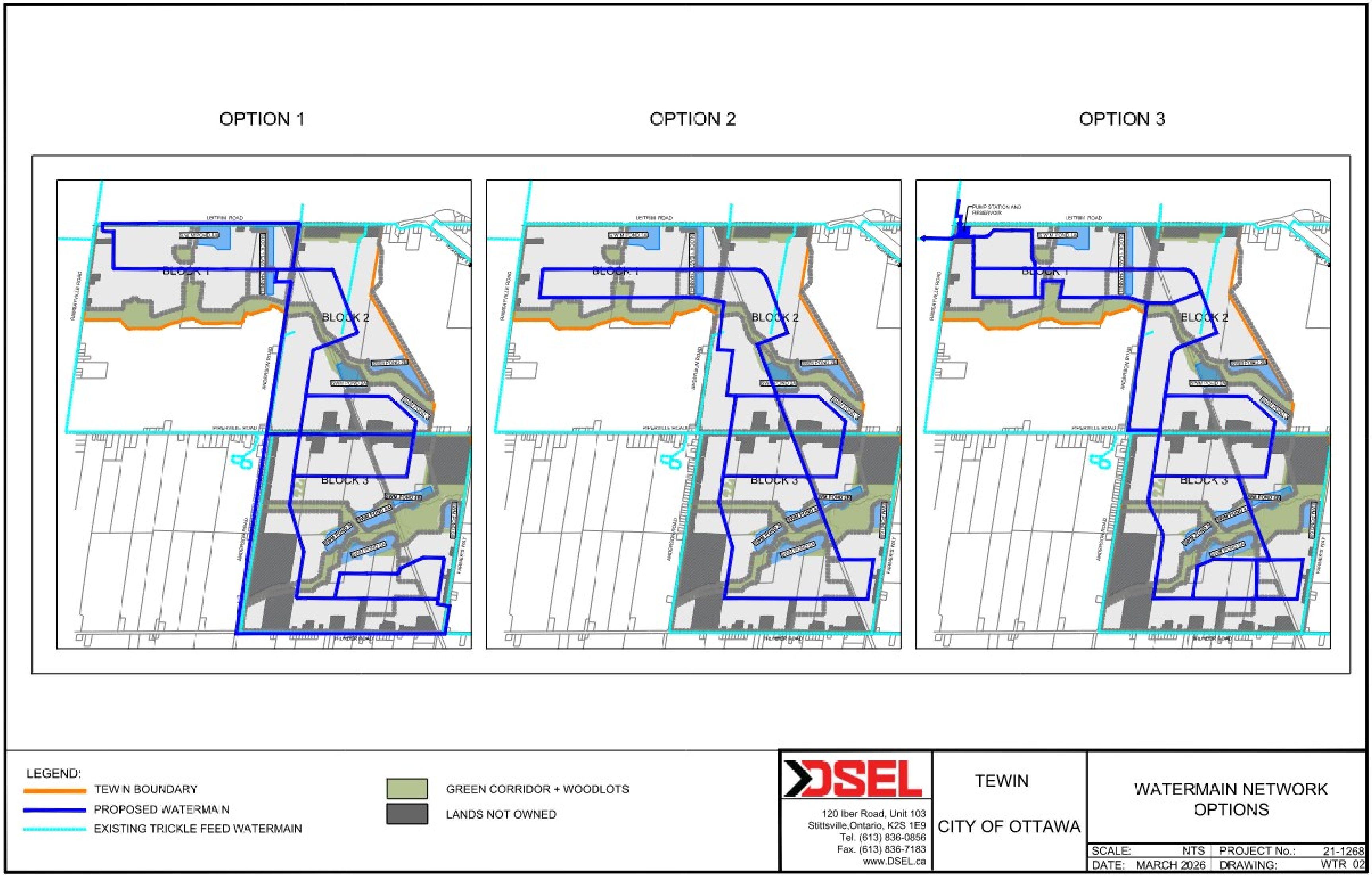
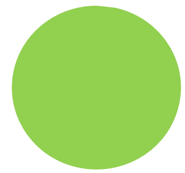
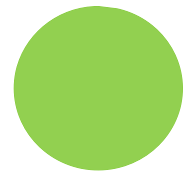
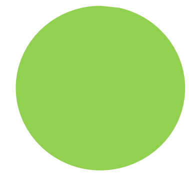
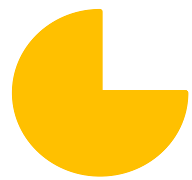
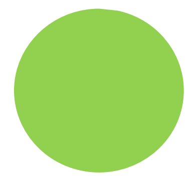
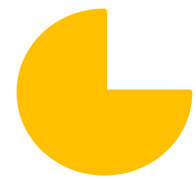
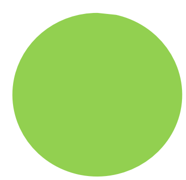
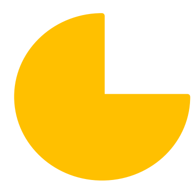
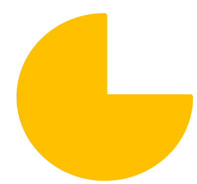
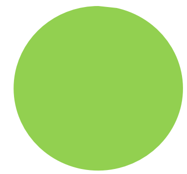
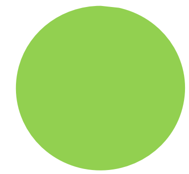
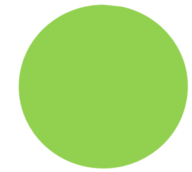
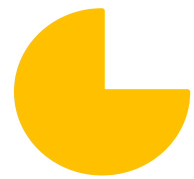
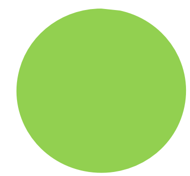
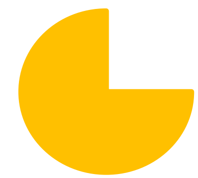


Figure 5.3: Backbone Watermain Routing Options

Table 5-4: Evaluation of Municipal Servicing Alternatives – Backbone Watermains

Category	Summary	Option 1	Option 2	Option 3
A. DEVELOPMENT & LAND USE	All three options support the creation of vibrant, mixed-use centers that provide convenient access to services and amenities, integrating with existing homes and businesses.			
B. TRANSPORTATION & MOBILITY	In terms of transportation, all options aim to create a connected network that supports efficient transit, pedestrian, and cycling access. Option 1 uses existing roads for watermain routing, which could affect local traffic and transportation networks during construction. Option 2 reduces these impacts by routing the watermains primarily through greenfield areas, thereby minimizing disruption. Option 3 falls in between, combining elements of both approaches with moderate effects on transportation infrastructure.			
C. NATURAL SYSTEM, PARKS, RECREATION & OPEN SPACES	Option 1 minimizes environmental impact by reducing the number of crossings through natural corridors, whereas Options 2 and 3 involve an additional crossing, requiring more mitigation to restore ecosystems post-construction.			

D. SERVICING	All options include a looped watermain network, which ensures reliable water service and provides redundancy.			
E. PHASING & IMPLEMENTATION	In terms of cost and implementation, Option 1 incurs the highest capital costs due to the complexity of working within existing rights-of-way. Option 2 is the most cost-effective, as construction takes place in greenfield areas, simplifying the process. Option 3 strikes a balance with moderate costs by combining existing roadwork with greenfield installations. All options support efficient infrastructure phasing, ensuring services are delivered in line with community growth.			

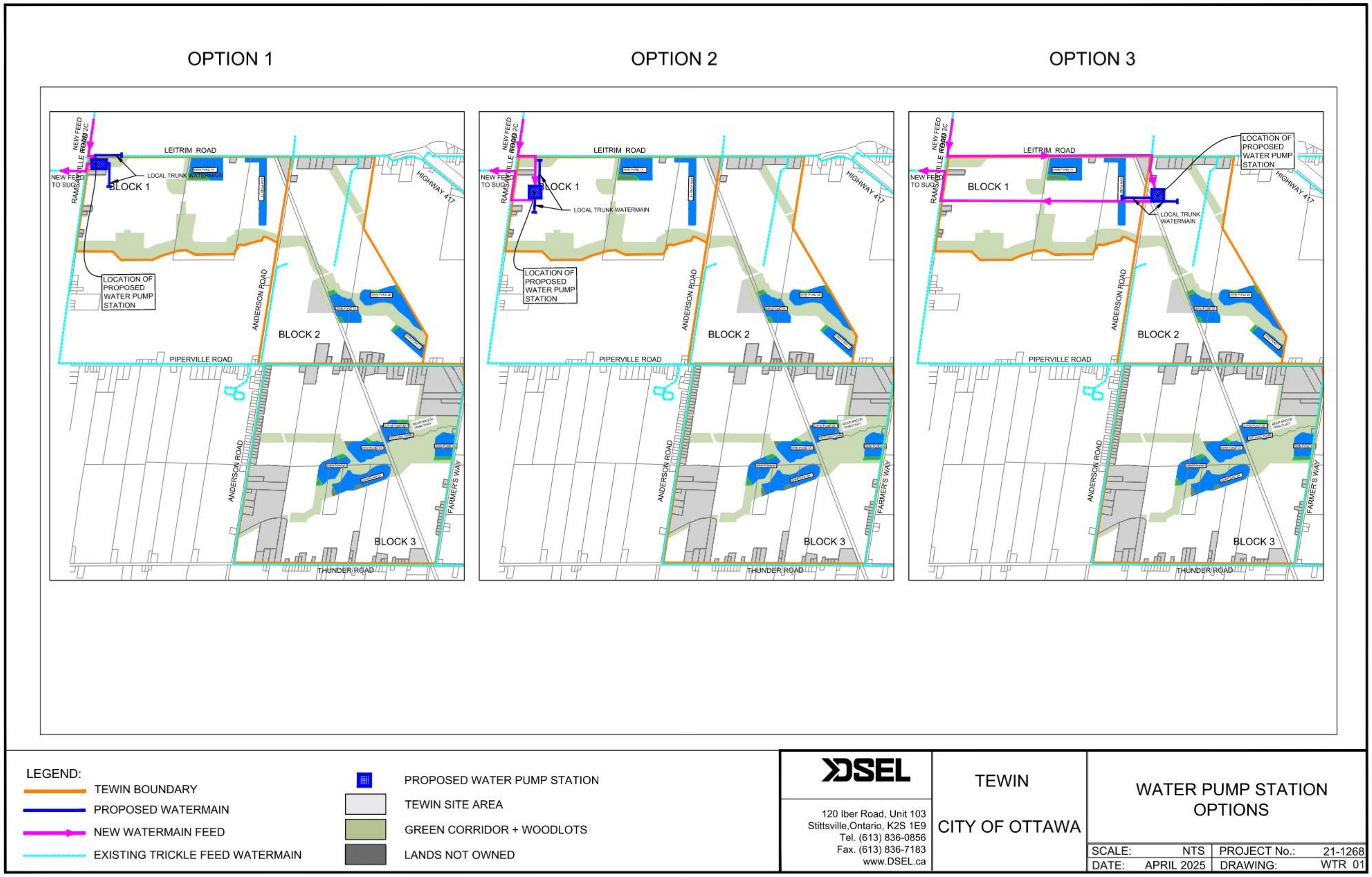
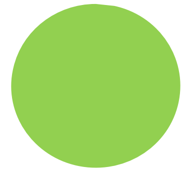
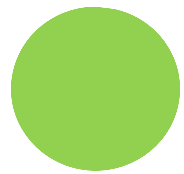
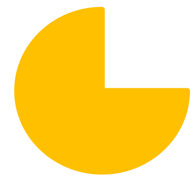
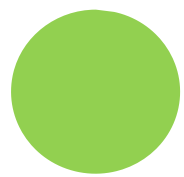
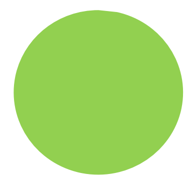
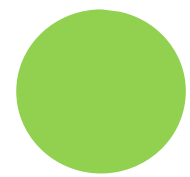
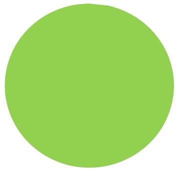
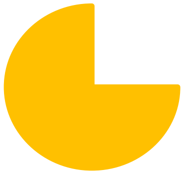
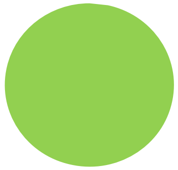
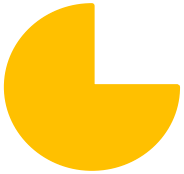


Figure 5.4: Water Pump Station Evaluation

Table 5-5: Evaluation of Reservoir and Pump Station Location

Category	Evaluation Criteria for Alternative Community Design Strategies	Option 1	Option 2	Option 3
A. DEVELOPMENT & LAND USE	Option 1 minimizes impact on new development by locating the pump station away from the community spine; Option 2 introduces more development constraints due to its proximity to the spine; and Option 3 places the infrastructure within the highest-density area, presenting the greatest potential for land use conflict.			
B. TRANSPORTATION & MOBILITY	Option 1 has minimal impact on future transportation networks due to its location outside the community core; Option 2 may affect circulation within the community spine area during construction and operation; and Option 3 could create the most disruption, as the pump station is situated within the highest-density area with the greatest transportation demands.			
C. NATURAL SYSTEM, PARKS, RECREATION & OPEN SPACES	Option 1 has the least impact on natural features due to its peripheral location; Option 2 may interact with planned open spaces near the community spine; and Option 3 poses the highest potential for disruption as it is located within an area planned for high-density development and community amenities.			

D. SERVICING	Option 1 places the infrastructure away from the community spine, minimizing disruption to development and benefiting from a high elevation that lowers capital and operating costs. Option 2 is closer to the community spine, resulting in greater development impacts. Option 3 situates the pump station within the highest-density area, but its lower elevation and location result in reduced overall efficiency.			
E. PHASING & IMPLEMENTATION	Option 1 may be more complex to implement due to its remote location but offers long-term efficiency and lower costs; Option 2 allows for easier integration with early phases of development; and Option 3 is the least favorable for phasing due to higher costs and inefficiencies associated with its central, low-elevation location.			

5.6.1.1 Backbone Watermain Servicing Conclusion:

Option 2 minimises disruption to the existing residents by locating infrastructure outside of existing ROWs, while providing a redundant system. All three options support the creation of vibrant, mixed-use centers that provide convenient access to services and amenities with the opportunity to integrate with existing homes and businesses. Option 1 poses some challenges due to disruptions to existing roads during construction, affecting local residents and transportation networks. Option 2 avoids these disruptions by routing infrastructure through greenfield areas, minimizing impacts on existing communities. Option 3 takes a balanced approach, causing fewer disruptions than Option 1 but not fully minimizing impacts like Option 2.

From an environmental perspective, Option 1 minimizes natural corridor crossing., Option 3 offers a compromise with moderate environmental impacts. Both Options 2 and 3 remain viable provided appropriate mitigation measures are implemented.

All alignments are compatible with the existing trickle feed system currently in place to service the existing residents. Within all options, the opportunities for existing residents to connect remains feasible.

Conclusion: Option 2 is the preferred alternative as it minimizes disruptions to existing communities, simplifies construction and servicing, and offers the most cost-effective solution, while still supporting the goals of the Tewin development.

5.6.1.2 Pump Station and Reservoir System Conclusion

A pump station and reservoir system are required to support the new water distribution system for Tewin, with three sample location options evaluated. These options will be further refined through the separate upcoming off-site watermain Environmental Assessment process.

Option 1 places the pump station away from the Community Mobility Spine, minimizing impacts on new development. Its higher elevation benefits pumping capital and operating costs, and the short bi-directional feed to the South Urban Community (SUC) reduces capital costs. Option 2 locates the pump station closer to the Community Spine, resulting in greater development impacts but maintaining similar elevation and feed advantages. Option 3, within an area planned for the highest densities, faces challenges due to lower elevation, longer distribution feeds, and the highest capital and operating costs.

Option 1 is the preferred preliminary option as it minimizes development impacts, lowers costs, and supports efficient infrastructure delivery.

5.6.2 Sanitary Servicing:

The wastewater servicing strategy for Tewin is to design a gravity-fed sanitary system with an outlet located at the northern boundary of the development. Sewage will be directed towards the City's existing sanitary system, with the most suitable outlet for the development at Leitrim Road.

All ROWs within the development will be designed to accommodate municipal services installations. Given the soil types, there is a potential for deeper excavations to be most efficiently constructed with the use of trenchless methods. The "Existing Conditions – Geotechnical Report" produced by Paterson Group notes the following:

Shear failure of excavation bases is typically rare in granular soils if adequate lateral support is provided. Inadequate dewatering can cause instability in excavations made through granular or layered soils. The potential for base heave in cohesive soils should be determined for stability of flexible retaining systems. As a preliminary precaution, service trench excavations exceeding 4 to 5 m in depth should be assessed for excavation base stability during the design phase to verify the suitability of conventional cut-and-cover excavation techniques.
… Considering the study area is underlain by a relatively firm deposit of silty clay, conditions may be favourable for the use of trenchless excavation methods for service installations.

It is expected that deeper sewers may increase both the complexity and cost of construction without providing substantial operational benefits. Given this constraint, multiple trunk sewer alignments were tested to minimize the depth of the sewers and determine the most efficient network. Trenchless techniques for the sewer installation, replacement, repair, and maintenance remain feasible for deep sewers, utilizing specialized methods such as micro-tunneling and pipe jacking to minimize surface disruption.

5.6.2.1 Evaluation of Routing Configurations for the Deep Sanitary Trunk Sewer

The preliminary layout of the on-site gravity sanitary system is developed by first identifying the preferred outlet location considering works within the site boundary. The outlet must allow for gravity servicing of the development while minimizing overall sewer depths. For the Tewin community, as flows are ultimately conveyed to the City's system located north of the development, the outlet should be positioned along Leitrim Road.

Three routing configurations were evaluated for a deep on-site sanitary trunk sewer, with termination options considered at either Anderson Road and Leitrim Road, or Ramsayville Road and Leitrim Road. These options were assessed to minimize the network's sewer depths.

The following three internal routing configurations were considered for the two outlet locations of (1) Anderson Road and Leitrim Road, and (2) Ramsayville Road and Leitrim Road:

1. **Option 1: Central Sanitary Trunk Block**
   This option involves routing a deep trunk sewer centrally through the community and with deeper sections generally located within a defined block developed for multi-modal use (Harvest Walk). Harvest walk will be designed to allow access to maintenance vehicles. By bisecting the development, this option minimizes the depth of the secondary sewer branches, optimizing the overall depth profile and reducing construction costs.
2. **Option 2: Spine Road Routing**
   In this option, the trunk sewer would be aligned with the spine road.
3. **Option 3: South-to-North Trunk**
   The third option proposes a trunk sewer running from the southern boundary of the development to the northern boundary, bisecting the community. This configuration offers a strategy that centralizes the trunk sewer through the community, similar to Option 1.

5.6.2.2 Sanitary Evaluation

The three routing options presented in Figure 5.5 and Figure 5.6 were evaluated using the criteria presented in Table 5-3. The results of the evaluation are presented in Table 5-6.

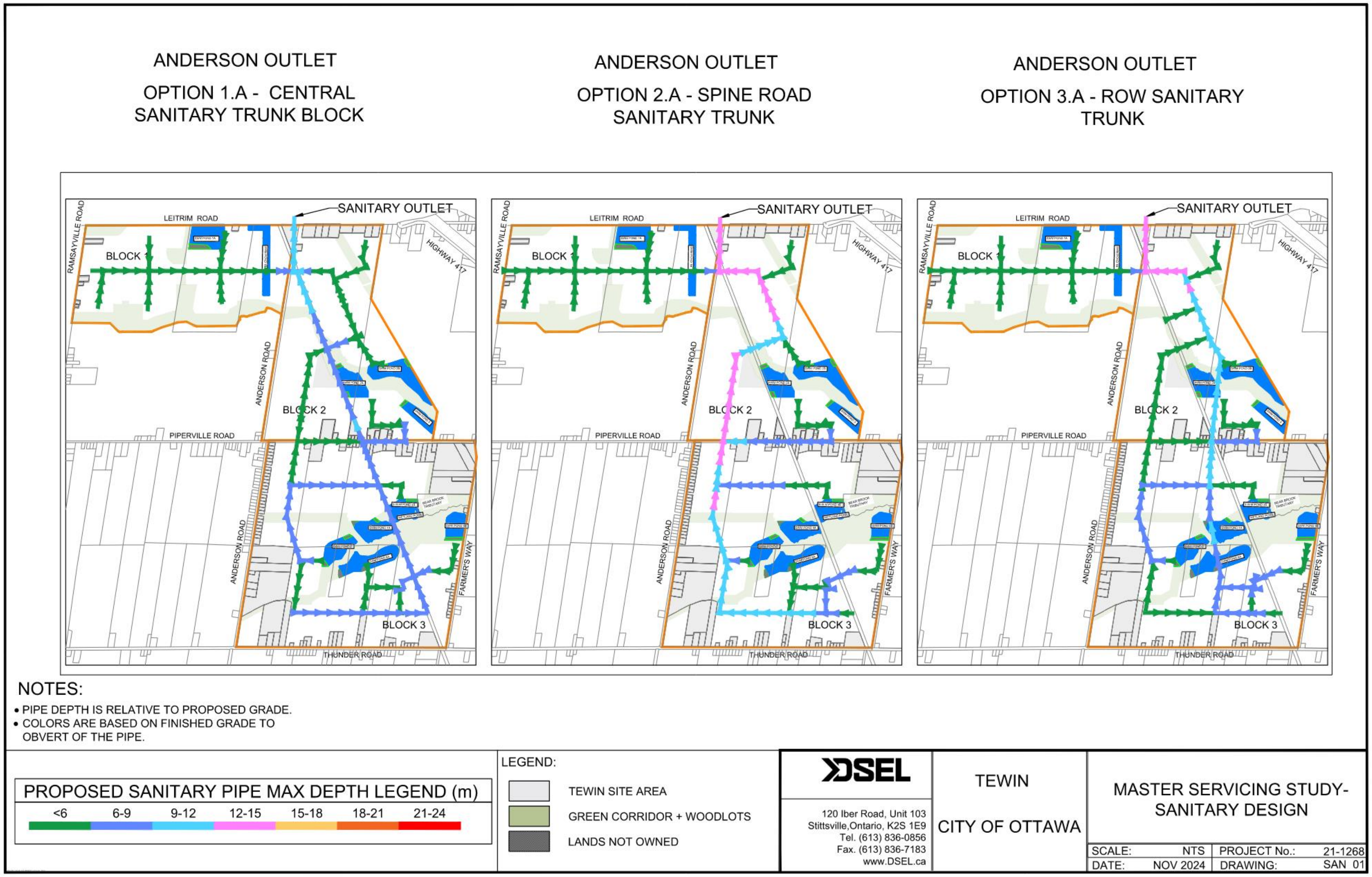


Figure 5.5: Sanitary Gravity System with Anderson Outlet

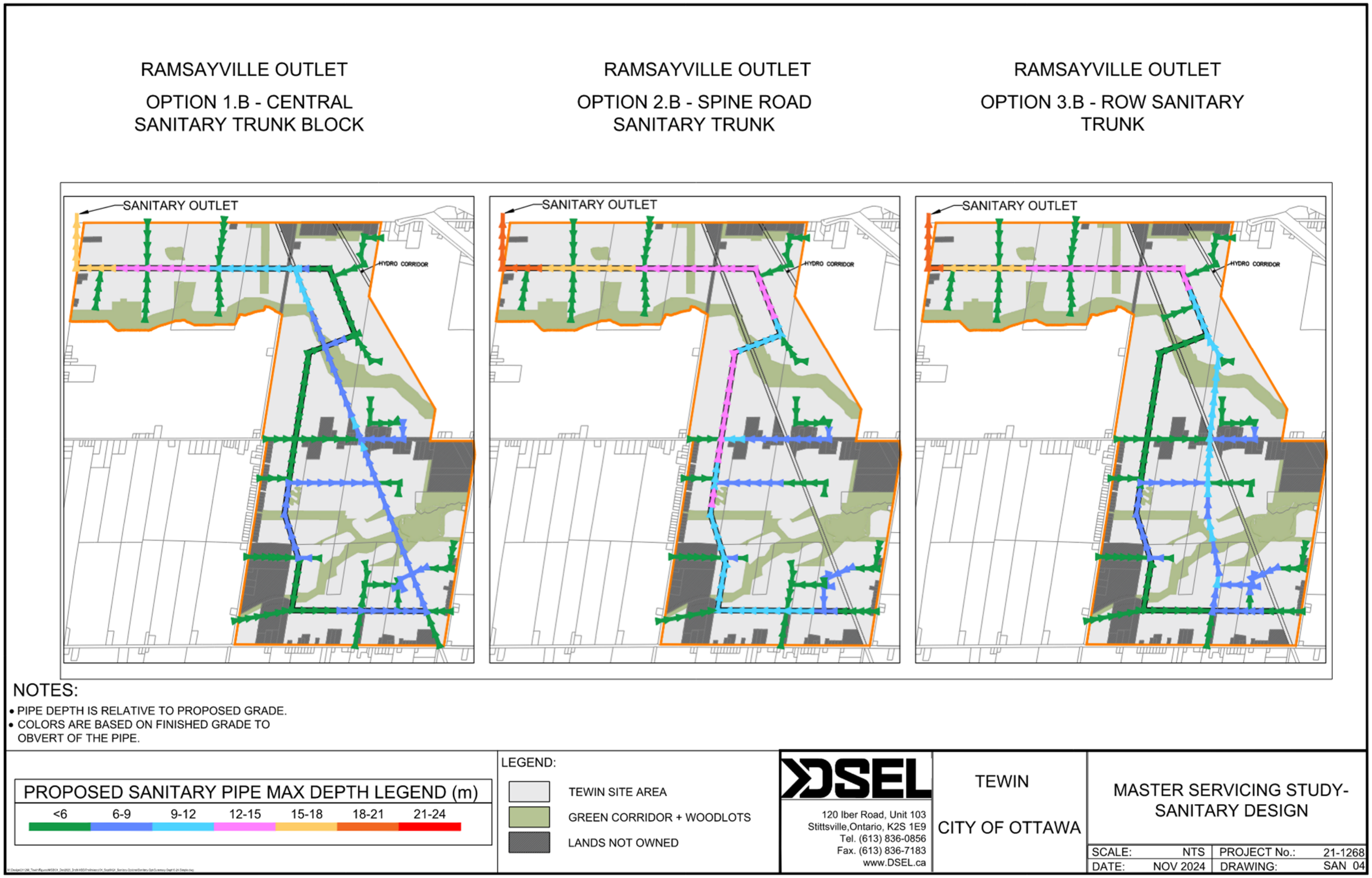
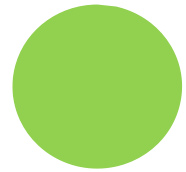
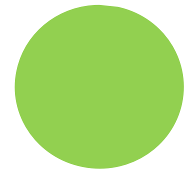
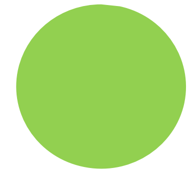
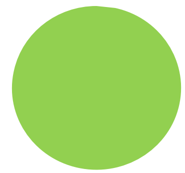
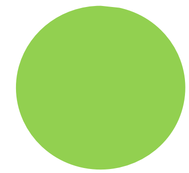
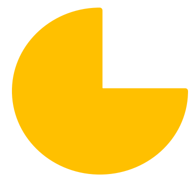
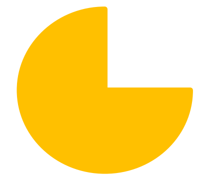
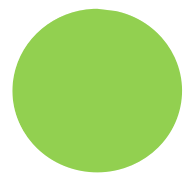
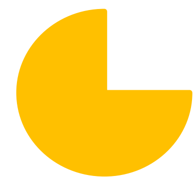
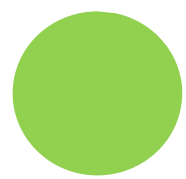
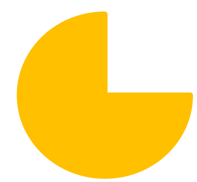


Figure 5.6: Sanitary Gravity System with Ramsayville Outlet

Table 5-6: Evaluation of Municipal Servicing Alternatives - Sanitary

Category	Summary	Option 1	Option 2	Option 3
A. DEVELOPMENT & LAND USE	All options support the development of a sustainable community in accordance with AOO values and One Planet Living principles. Each option accommodates a mix of land uses and provides municipal sanitary services that promote the development of vibrant, mixed-use centers.			
B. TRANSPORTATION & MOBILITY	Each option supports the creation of a transportation network that facilitates efficient transit operations. Option 1 and Option 3 minimize future traffic disruptions by routing the deeper sanitary sewers outside of the mobility spine.			
C. NATURAL SYSTEM, PARKS, RECREATION & OPEN SPACES	All options support the preservation of natural systems and promote a connected network of parks and green spaces. Although sanitary sewers will cross watercourses in all options, appropriate mitigation measures will be implemented to support watercourse naturalization and minimize disruption.			
D. SERVICING	Option 1 offers the most efficient delivery of sanitary services by minimizing the length of over-depth sewers. Option 2 is the least efficient due to the longer and deeper sewer system, while Option 3 falls in between.			
E. PHASING & IMPLEMENTATION	All options allow for the phased delivery of infrastructure with no major differences between them. The development can be implemented incrementally, ensuring that critical services are available as the community grows. Option 1 offers the lowest capital and operating costs, while Option 2 incurs the highest			

	due to the depth of the sewer system. Option 3 falls in the middle in terms of costs.			

5.6.2.3 Optimal Routing for the Tewin Lands

The analysis indicates that the **Central Sanitary Trunk Block (Option 1A)** offers the most efficient routing solution for minimizing sewer depths and overall costs. The main trunk would be positioned within or adjacent to the Harvest Walk Block, with the primary outlet located at Anderson Road. This alignment allows for a shallower sewer depth, reducing installation costs and facilitating phased construction. All of the options presented above are technically feasible.

5.6.2.4 Off-Site Considerations

Sanitary sewers for lands servicing east of Anderson Road are routed north towards Leitrim and Anderson. Utilizing the Harvest Walk Block provides an efficient alignment for a major trunk sewer, minimizing the number of local connection points, facilitating maintenance access, and bisecting the community. This approach enables shallower local sewer systems compared to alternative routings.

Lands west of Anderson Road generally have higher elevations towards Ramsayville Road, with lower elevations near Anderson Road. Given that grade raises are constrained, the proposed grading plan reflects these natural patterns, with lower grades to the east and higher grades to the west. The optimal sanitary design for this area is to install a shallow collector sewer bisecting the community and directing flows toward the low-lying areas to minimize sewer depths. With the primary sanitary sewer in Block 1 running below the heavily urbanized spine road, consideration needs to be given to limiting cost and impact of future maintenance, supporting a shallow collector in this area.

As demonstrated in Figure 5.5 and Figure 5.6, a sanitary outlet located at Ramsayville Road would require the outlet to be approximately 5 metres deeper than one located at Anderson Road, making Anderson Road the preferred outlet location. This increased depth would require local collectors to run above the deep trunk, increasing the on-site servicing cost and further complicating future maintenance costs and impacts.

The preliminary alignments presented in the Infrastructure Master Plan (IMP) propose the large-diameter off-site trunk sewer terminating at one of three locations: the intersection of Leitrim Road with Hawthorne Road, Anderson Road, or Ramsayville Road (see Figure 7.2). Based on the on-site servicing analysis, Anderson Road is the preferred outlet to service the Tewin development. Should the Municipal Class Environmental Assessment (MCEA) for the off-site works identify Ramsayville or Hawthorne as the preferred trunk sewer alignment, a gravity sewer could be constructed on Leitrim Road from Anderson Road to the off-site trunk sewer. This would reduce impacts to the existing development without increasing overall servicing costs.

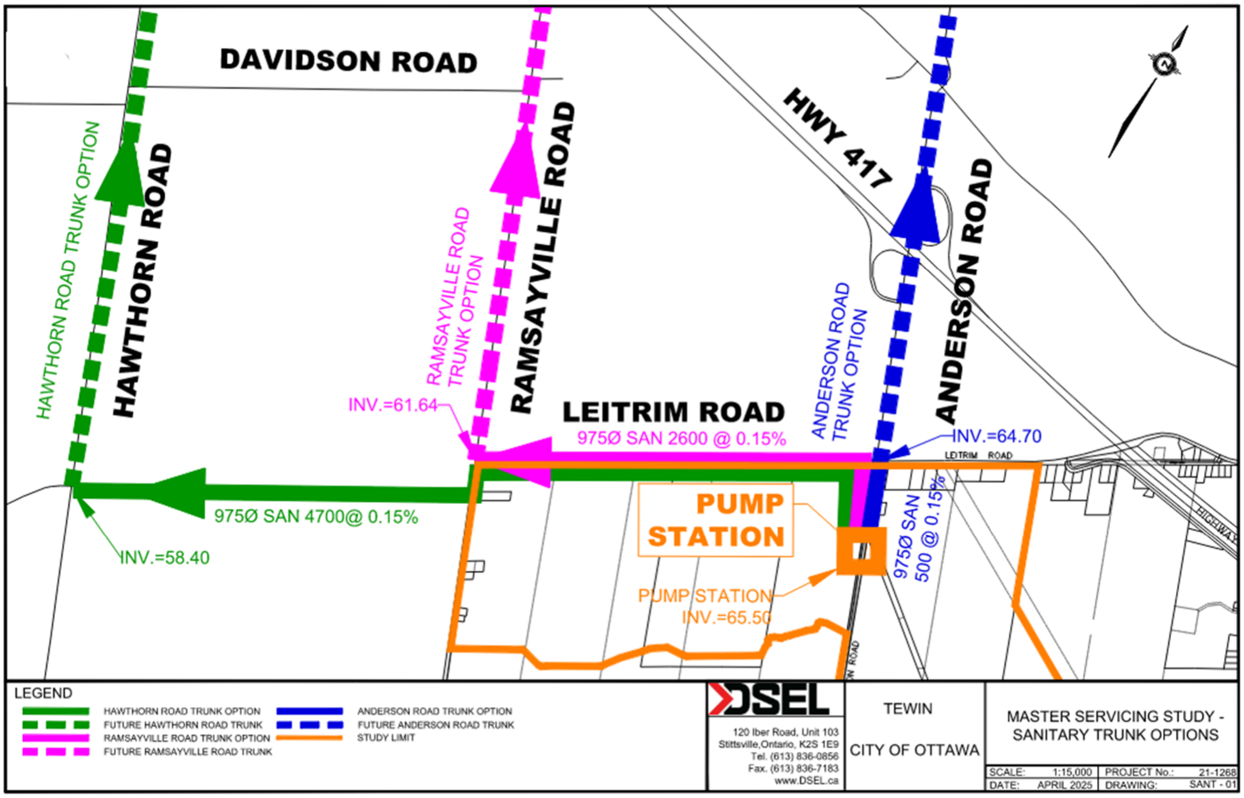


Figure 5.7: Alternate Off-Site Sanitary Connections

5.6.2.5 Sanitary Servicing Results

The on-site sanitary servicing strategy remains consistent regardless of the final off-site corridor selected for the IMP trunk sewer. Local sanitary systems should be maintained as shallow as possible, with minimal reliance on deep trunk connections. If the off-site trunk sewer ultimately terminates at Ramsayville or Hawthorne, a dedicated deep trunk sewer may be required to extend from Anderson Road to the IMP trunk along Leitrim Road. While routing this trunk along the planned mobility spine road is technically feasible, it is not recommended. The spine road is intended to function as a major transit corridor and will be flanked by higher-density land uses, including mixed-use blocks and mid-rise residential development. Local service connections to deep sanitary trunks are generally not recommended. Long-term maintenance or rehabilitation of a deep sewer in a transit-oriented corridor would also present operational challenges. Repairs at these depths would likely require costly excavation or specialized trenchless methods to limit disruption to established land uses. These risks could impact both transit service reliability and adjacent land use functionality. For these reasons, locating deep linear infrastructure within this critical corridor should be avoided where alternative alignments are available. Leitrim Road is the preferred location as the large right of way and bordering uses permit lower-impact maintenance without the need for deep local service connections.

Conceptual gravity sewer networks were designed along major roads within the proposed Tewin development plan. The minimum depths at the outlets and throughout the network are shown in Figure 5.5 and Figure 5.6. The figures demonstrate that placing the gravity system outlet at Anderson Road generally reduces the depth of the on-site gravity system, minimizing the need for trenchless installation and, ultimately, reducing costs. Option 1, which includes a central sanitary trunk that bisects the development, was found to result in the shallowest gravity system. The results indicate that the outlet at the Tewin boundary would need to be 2.36 meters deeper if located at Ramsayville. This deep connection makes this option less optimal as it is a more costly solution. Therefore, the outlet at Anderson is the preferred sanitary outlet for the Tewin community.

5.6.2.6 Preferred Sanitary Servicing Solution

The Anderson Road routing option is recommended as the most efficient solution for Tewin development's wastewater servicing. It minimizes sewer depths, reduces installation costs, and provides flexibility for phased development. Whether the ultimate outlet is located at Anderson Road or Ramsayville Road, careful consideration of routing alternatives ensures that the wastewater infrastructure will serve the community effectively and cost-efficiently.

Based on the analysis, the preferred sanitary servicing solution is to use the Anderson Road outlet in combination with the routing along or adjacent to the Harvest Walk Block, as it offers the most efficient and cost-effective option for wastewater servicing in Tewin.

5.6.3 Stormwater Management Facility Configuration

To manage stormwater effectively within the Tewin development, several configurations of stormwater management facilities have been considered. 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, and provide sustainable solutions for stormwater quantity control.

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

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.

5.6.3.1 Evaluation of Options for Stormwater Management Facility Configuration:

The purpose of comparing the servicing options is to evaluate and optimize the stormwater servicing strategy at a conceptual level. Each option represents a logical system layout intended to manage stormwater across the site. While multiple permutations of each layout are possible (e.g., pipe submergence, detailed grading adjustments, or inlet/outlet configurations, use of sump pumps), the intent of this exercise is not to test every possible variation. Rather, the objective is to compare a set of reasonable and technically viable layouts to understand their relative performance across key evaluation criteria. Once a preferred layout is identified based on this comparative assessment, the selected configuration is further refined and optimized later in this report.

For the purposes of this analysis, three stormwater servicing layouts were evaluated. Each layout was conceptually designed without the use of submerged pipes or sump pumps. Keeping these criteria consistent for the evaluation allows for a direct comparison between options.

As part of the evaluation, the Ramsayville outlet was lowered by approximately 1.4 m. While the lowering is subject to NCC review and approval as discussed later, this approach is considered appropriate given the site's limited permissible grade raise; lowering the outlet elevation provides greater flexibility in achieving optimized grading across the development lands. If the outlet elevation cannot ultimately be lowered, the relative comparison between options would remain unchanged. A separate scenario without lowering the outlet was therefore not evaluated, as it would simply result in higher pond elevations within Block 1, higher sewer elevations, and increased finished grades across the site. Given that the evaluated scenarios already identify localized grade raise exceedances, maintaining the existing outlet elevation would only exacerbate these conditions without altering the relative performance of the servicing options.

Grading plans were developed for each scenario to maintain minimum cover requirements and to provide defined overland flow routes to the stormwater ponds. The grading plans were compared against the grade raise recommendations provided by Paterson Group. Grade raise exceedances within right-of-way areas were extracted and compared across all scenarios.

The conceptual sewer sizing was also reviewed, and the total length of pipe exceeding 1950 mm in diameter was reported. Large-diameter pipes require special consideration when installed within 18 m right-of-ways therefore the length of pipe exceeding this diameter should be minimized.

Cut and fill quantities were evaluated to assess the earthworks associated with each option. The results of the analyses are presented in Figure 5.8 and Figure 5.9.

Figure 5.8: Stormwater Management Facility Options Evaluation

OPTION 1 - MINIMIZE FACILITIES	OPTION 2 - MIMIC EXISTING DRAINAGE PATTERNS	OPTION 3 - MAINTAIN TRIBUTARY OUTLETS

Length of Storm Sewer above 1950								
OPTION 1 POND IDS	Pond 1	Pond 2	-	-	Pond 3	Pond 5	Pond 4	Total
OPTION 1 ≥1950	2092.0	2064.0	0.0	0.0	3531.0	218.0	2212.0	10117.0
OPTION 2 POND IDS	Pond 1A + 1B	Pond 2B	Pond 2A+3	Pond 4A+4B	Pond 2A+3+4A+4B	Pond 5	Pond 6A + 6B	Total
OPTION 2 ≥1950	1137.0	2064.0	580.5	1163.5	1744.0	218.0	720.0	5883.0
OPTION 3 POND IDS	Pond 1	Pond 2	Pond 3	Pond 4	Pond 3+4	Pond 5	Pond 6A + 6B	Total
OPTION 3 ≥1950	2092.0	2064.0	1590.5	1214.0	2804.5	218.0	720.0	7898.5

LEGEND: DRAINAGE BOUNDARY; SITE BOUNDARY; POND; GREEN CORRIDOR + WOODLOTS; LANDS NOT OWNED

PIPE SIZE LEGEND (m)
Circular
300 825 1650 2250 3000

DSEL
120 Iber Road, Unit 103
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TEWIN
CITY OF OTTAWA

MASTER SERVICING STUDY - STORM

SCALE:	NTS	PROJECT No.:	21-1268
DATE:	MAY 2025	DRAWING:	STM 01

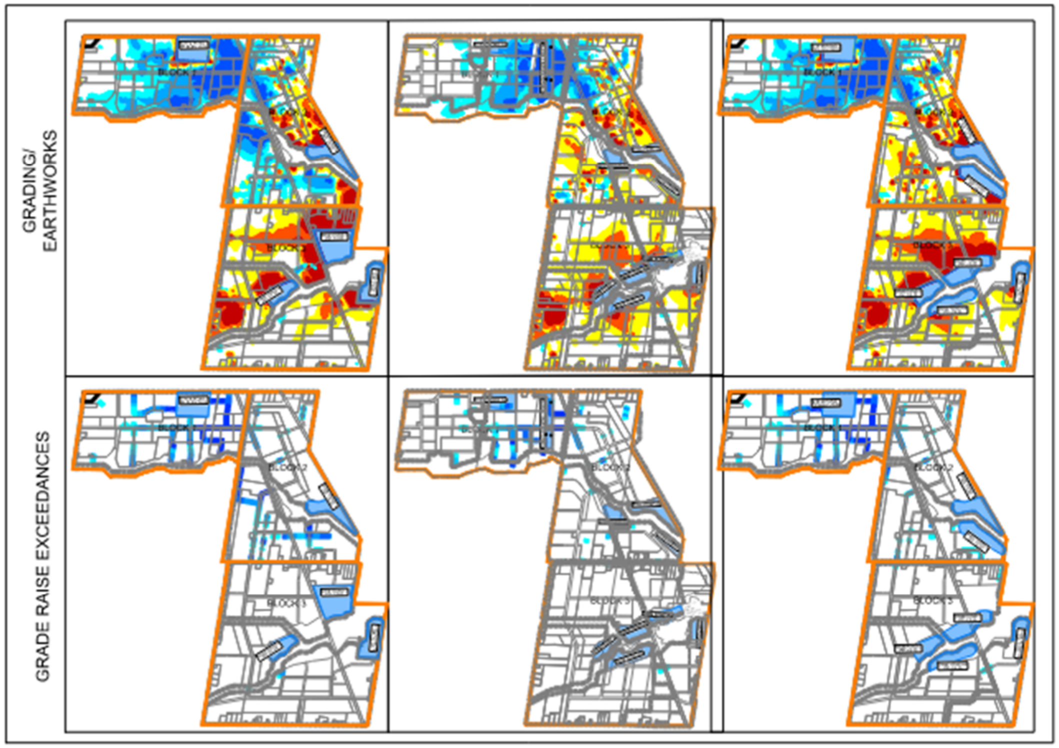
Figure 5.9: Pipe Oversizing for Stormwater Management Options

CUT FILL RESULTS

Option	Total Cut (m^3)
1A	135,488
2A	768,851
3A	574,534

GRADING EXCEEDING GRADE RAISE ALONG ROAD

Length of Road Exceeding Grade Raise (m)			
Grade Raise Exceedence Depth (m)	Option 1A	Option 2A	Option 3A
>1.50	3011.1	936.8	1,707.0
1.20-1.50	1536.7	645.6	830.9
0.90-1.20	1659.9	1,054.5	1,455.4
0.60-0.90	987.0	1,185.4	1,397.6
0.30-0.60	2243.2	1,395.6	2,172.2
Total	9437.8	5,217.9	7,563.1



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CITY OF OTTAWA

MASTER SERVICING STUDY - GRADING PLAN

SCALE: NTS		PROJECT No.: 21-1268	
DATE: MAY 2025		DRAWING: GRAD - 01	

Figure 5.10: Grading Results for Stormwater Management Options

Table 5-7: Grading and Trunk Analysis

Area	Option	Configuration	Approximate Grade Raise Impact	Trunk Routing
Block 1	Option 2	Two SWM facilities	~3,800 m of road exceeding grade raise	Provides opportunities for multiple inlets, reduces reliance on large diameter trunks, and improves overall system efficiency
	Option 1/3	Fewer facilities	~5,300 m of road exceeding grade raise	—
Block 2 (North of Smith-Gooding MD)	All	Single pond	Single facility evaluated	—
Block 2 (South of Smith-Gooding, North of Piperville)	Option 2	Pond 2A / Pond 3	~400 m exceeding grade raise	Efficient trunk network that minimizes the length of large diameter storm sewers
	Option 1	Pond 3	~2,800 m exceeding grade raise	—
	Option 3	Pond 3	~1,000 m exceeding grade raise	—
Block 3 (South of Piperville, North of Realigned Watercourse)	Option 2	Ponds 4A / 4B	Negligible exceedances	—
	Option 1	Pond 3	Negligible locally; significant exceedances north of Piperville	—
	Option 3	Pond 4	Negligible exceedances	—

	Note	—	—	Options 2 and 3 have comparable storm network configurations
Block 3 (South of Realigned Watercourse)	Option 2 / 3	Ponds 6B / 6A	Negligible exceedances	Two-pond configuration reduces the extent of oversized storm sewers and provides additional flexibility for storm routing
	Option 1	Pond 4	Negligible exceedances	—

The comparative assessment demonstrates that configurations incorporating multiple stormwater management facilities generally result in improved grading conditions and more efficient storm servicing layouts. In Block 1, Option 2 significantly reduces the extent of roadways exceeding permissible grade raise limits relative to consolidated pond configurations, while also allowing for a more distributed trunk system that minimizes large diameter sewers.

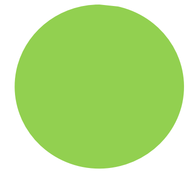
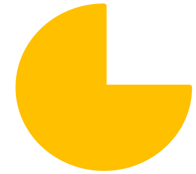
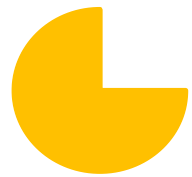
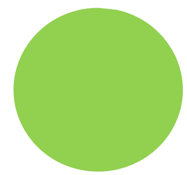
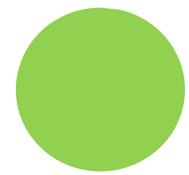
In Block 2 (south of Smith-Gooding Municipal Drain), the two-pond configuration (Option 2) substantially reduced grade raise exceedances and allows for an efficient trunk network.

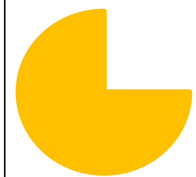
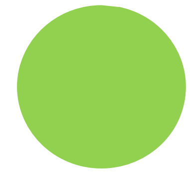
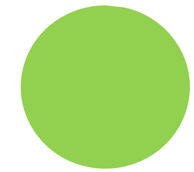
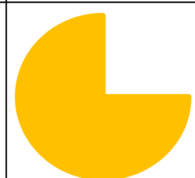
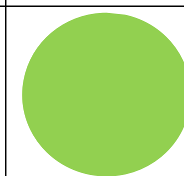
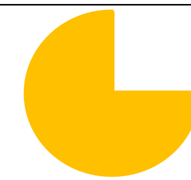
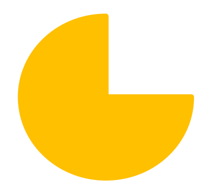
Across Block 3, grade raise exceedances are generally negligible under all options; however, Option 1 introduces localized grading impacts north of Piperville Road that are not present when ponds are added.

South of the realigned watercourse, all options perform similarly from a grading perspective, though the two-pond configuration offers added flexibility and reduces the extent of oversized trunk infrastructure.

Overall, the results indicate that distributed pond configurations provide both grading and servicing advantages. It is noted that this assessment does not include local roads or private lots which would increase the extent of grade raise exceedances, and mitigation measures such as lightweight fill will likely be required at the detailed design stage.

Table 5-8: Evaluation of Municipal Servicing Alternatives - Stormwater Management

Category	Summary	Option 1	Option 2	Option 3
A. DEVELOPMENT & LAND USE	All options support mixed-use centres and can be integrated with the existing homes and businesses. Option 2 follows natural drainage patterns and maintains outlets to tributaries, enhancing biodiversity and residents' connection to nature but reducing developable land. Option 1 focuses on fewer, centralized ponds, optimizing land use but potentially reducing biodiversity and residents' connection to nature. Option 3 reduces the number of ponds while preserving flow in tributaries, which impacts direct access to surface water features and community interaction with natural systems.			
B. TRANSPORTATION & MOBILITY	All three options are compatible with the Tewin transportation plan, allowing integration with transportation networks regardless of the approach. Option 2, with dispersed ponds, enhances active mobility by integrating access roads with cycling and pedestrian routes, creating a holistic network. Option 1, with centralized facilities, may miss opportunities for interconnected pedestrian and cycling paths aligned with natural water features. Option 3, similar to Option 2, improves connectivity for active mobility.			

C. NATURAL SYSTEM, PARKS, RECREATION & OPEN SPACES	Option 2 enhances connectivity with natural systems, fostering ecological awareness and resident interaction with nature through dispersed ponds. Option 1, with centralized facilities, reduces pedestrian interaction with natural features and connectivity. Option 3, similar to Option 2, increases connectivity with natural systems, supporting ecological awareness. Most ponds in all options are connected to parks and open spaces, improving access to recreational trails and community facilities, though some ponds may be disconnected in Options 1 and 3.			
D. SERVICING	Option 2 balances water flow across various points, supporting natural channels and minimizing oversized pipes and grade raise exceedances. Option 1 requires larger stormwater pipes and infrastructure, leading to complex construction and maintenance challenges.			
E. PHASING & IMPLEMENTATION	Option 2 has comparable capital costs, with benefits in better-serviced areas and long-term savings in sewer maintenance. Option 1 has the lowest capital costs on facilities but would have higher maintenance costs for larger, (and likely) submerged sewers. Larger pipe sizes are also more expensive to replace. Option 3 presents moderate capital costs for facilities, but has some ponds with larger sewers. Pond operating costs are highest for Option 2 due to more infrastructure components needing regular maintenance however the ponds are reasonably sized and have tributary areas in line with other ponds within the City. Smaller, less (and likely) submerged sewers present a cost savings. All options can be phased, allowing infrastructure and amenities to be introduced in stages, ensuring efficient delivery as the community grows.			

5.6.3.2 Stormwater Management Facility Configuration Results

In terms of trunk sewer sizing, Option 2 – Mimic Existing Drainage Features performs best by minimizing pipe oversizing and maintaining a smaller, more efficient network. Option 1 – Minimize Facilities results in the largest number of oversized pipes.

Environmentally, Mimic Existing Drainage Features scores well, as it closely follows natural drainage patterns, retains multiple outlets, and aligns with existing watercourses. In contrast, Minimize Facilities amalgamates multiple pre-development drainage areas and reduces the number of outlets, potentially disrupting natural flow paths. The Maintain Outlets to Tributaries option amalgamates fewer drainage areas and preserves connections to original tributaries.

Grading impacts also vary. Fewer outlets tend to result in more grade raise exceedances, which often require mitigation measures such as submerged sewers or sump pumps. All options were initially evaluated with non-submerged sewers; however, due to the extent of exceedances, the preferred option will be refined further to optimize grading. Option 1 results in the highest number of grade raise exceedances, indicating a likely increase in long-term maintenance due to more frequent use of submerged sewers. While all options are expected to result in some exceedances, these can generally be mitigated through partial sewer submergence—though Option 1 will require the most extensive mitigation.

5.6.3.3 Preferred solution

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

5.7 Summary and Conclusion

Based on the analyses presented in this section, the preferred servicing strategy for the Tewin site was determined to be:

Option 2 for the backbone watermain routing, avoiding new backbone watermains within existing right-of ways;

Option 1 Central Sanitary Trunk for the gravity sanitary routing with an outlet at Anderson Road; and,

Option 2 Mimic Existing Drainage Features for the location of stormwater management facilities.

6.0 WATER

The purpose of this section of the MSS is to outline the strategy for water servicing to the Tewin community. This MSS evaluates the preferred solution, the implementation process, and the overall design approach for delivering potable water. The MSS generally focuses on watermain trunks sized 300mm in diameter or larger. Design details related to local services - including hydrants, local watermains, and opportunities for connections for existing residents to local watermains - will be developed at a more detailed stage of design.

6.1 Off-Site Water Supply IMP solution

The City of Ottawa's Infrastructure Master Plan (IMP) outlines a plan to supply clean water to the Tewin area via a centralized distribution system that will integrate with the existing City network. This plan includes constructing a large-diameter water main from the current City system to the northern boundary of Tewin (Leitrim Road), accompanied by a storage facility and pumping station to ensure adequate water pressure for Tewin residents. The report recommends the watermain be designed to accommodate the entire Tewin community's needs, provide sufficient capacity for future development demands (post period capacity), and support growth in the neighboring SUC pressure zone.

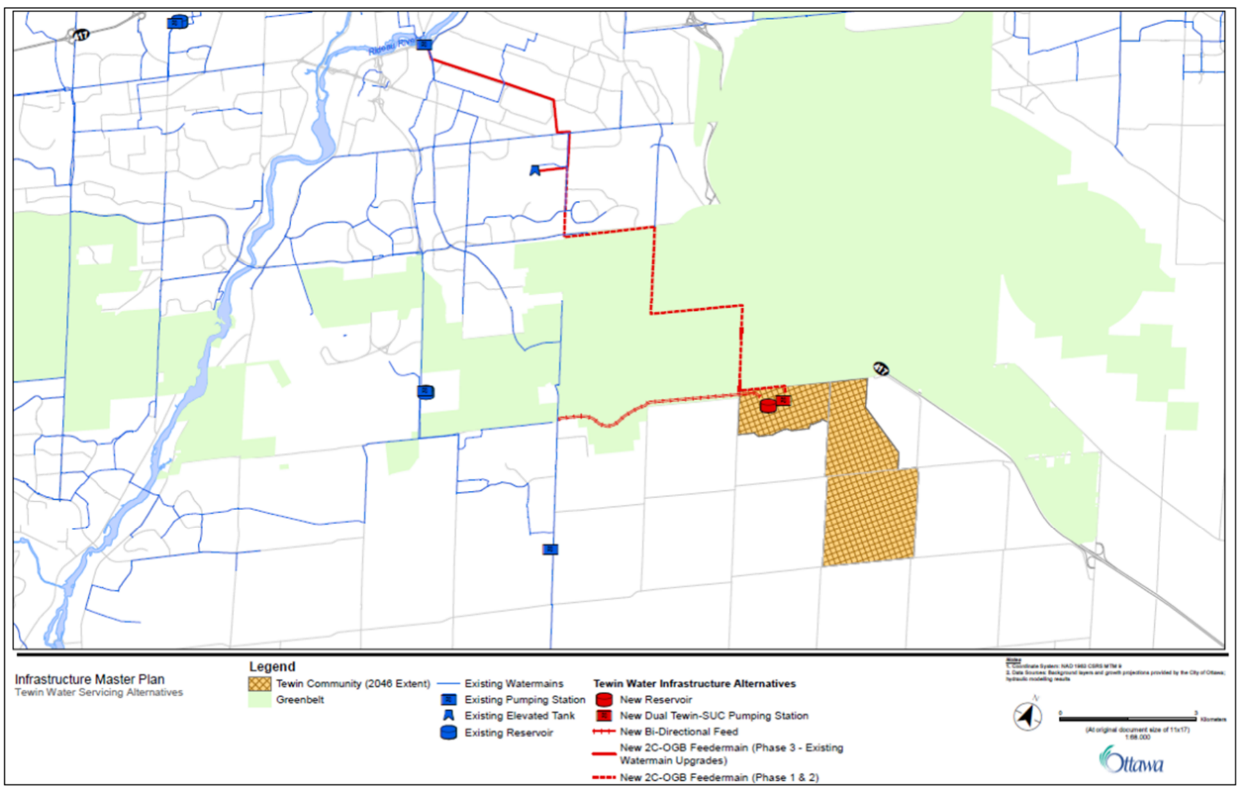


Figure 6.1: Infrastructure Master Plan Water Solution

The IMP outlines several key projects to support the external water services for Tewin and the South Urban Community.

The project would include a large 1220mm diameter transmission main from the City existing system to the Tewin development boundary. The document also proposes constructing a 1220mm diameter watermain along Bank Street/Kilborn Avenue from Billings Bridge Pump Station to Conroy Road. This would expand the central water distribution system, improve pressures in existing development areas, and support future growth and would be required once growth in the SUC pressure zone reaches a certain limit. A summary of the proposed water infrastructure from the City of Ottawa to service Tewin, SUC and future capacity is presented in Table 6-1.

Table 6-1: City IMP Sizing

Project Name	Description		Timing
2C-OGB Water Feed Phase 1 & 2	7,360 m of 1,220mm diameter watermain along Hawthorne Rd/ Whyte Side Rd/ Ramsayville Rd/ Leitrim Rd		Phase 1 Initial Tewin servicing (2029-2034)
	3,580 m of 1,220mm diameter watermain along Conroy Rd/Hunt Club Rd		Phase 2 (2029-2034)
Bi-Directional Water Feed	4,760 m of 914mm diameter watermain along Leitrim Rd		Initial Tewin servicing (2029-2034)
2C-OGB Water Feed Phase 3	5,020 m of 1,220mm diameter watermain along Bank St/Kilborn Ave		Phase 3 (2034-2039)
Tewin Pump Station & Reservoir Phase 1	Tewin Suppl y	7.5 ML of storage 32.3 MLD firm pumping capacity for Tewin	Phase 1 Initial Tewin servicing (2029-2034)
Tewin Pump Station & Reservoir Phase 2	SUC Supply	3.2 ML of storage 30 MLD firm pumping capacity for SUC	Phase 2 (2034-2039)
Conroy Tank Feed	740 m of 1,220mm diameter watermain		Phase 3 (2034-2039)

To provide a back-up water supply under emergency conditions, a 914mm diameter watermain was proposed to be constructed along Leitrim Rd from Bank St to Tewin.

Lastly, a 1220mm diameter watermain will be installed along Hunt Club/Hawthorne/Whyte Side/Ramsayville/Leitrim from Conroy Tank to Tewin. While this watermain will initially provide redundancy for Tewin in the early stages of development, it is also intended to provide additional capacity for the South Urban Community (SUC) in the future by extending the central water transmission system. The City's IMP sizing is conservative and oversized to accommodate speculated 2101 demands.

6.2 Off-Site Water Supply Servicing Tewin Day-1

In collaboration with Cima+, DSEL have developed a number of servicing strategies that aim to accommodate early stages for the Tewin development, minimizing upfront capital costs, and ensuring the lifecycle of large infrastructure is responsibly used, all while ensuring delivery on the ultimate needs of the region – as provided in the City's ultimate IMP solution – are not precluded. A separate MCEA is being advanced for the off-site water infrastructure and is to establish the 2046 horizon expansion land limit needs. As part of Council's direction, once these needs are established, oversizing infrastructure or alternative strategies to post-period capacity may be considered.

A Day-1 strategy is presented in Figure 6.2 which could service the needs of Tewin and SUC, at lower cost and does not preclude future growth. A 750mm diameter watermain from the 2C pressure zone to Tewin could be installed, with a 750mm diameter bi-directional feed from Tewin to SUC. A second 1050mm diameter feed could be installed, for future growth, when needed. Options will be evaluated in the separate MCEA study to ensure, among other factors, that the chosen solution remains affordable.

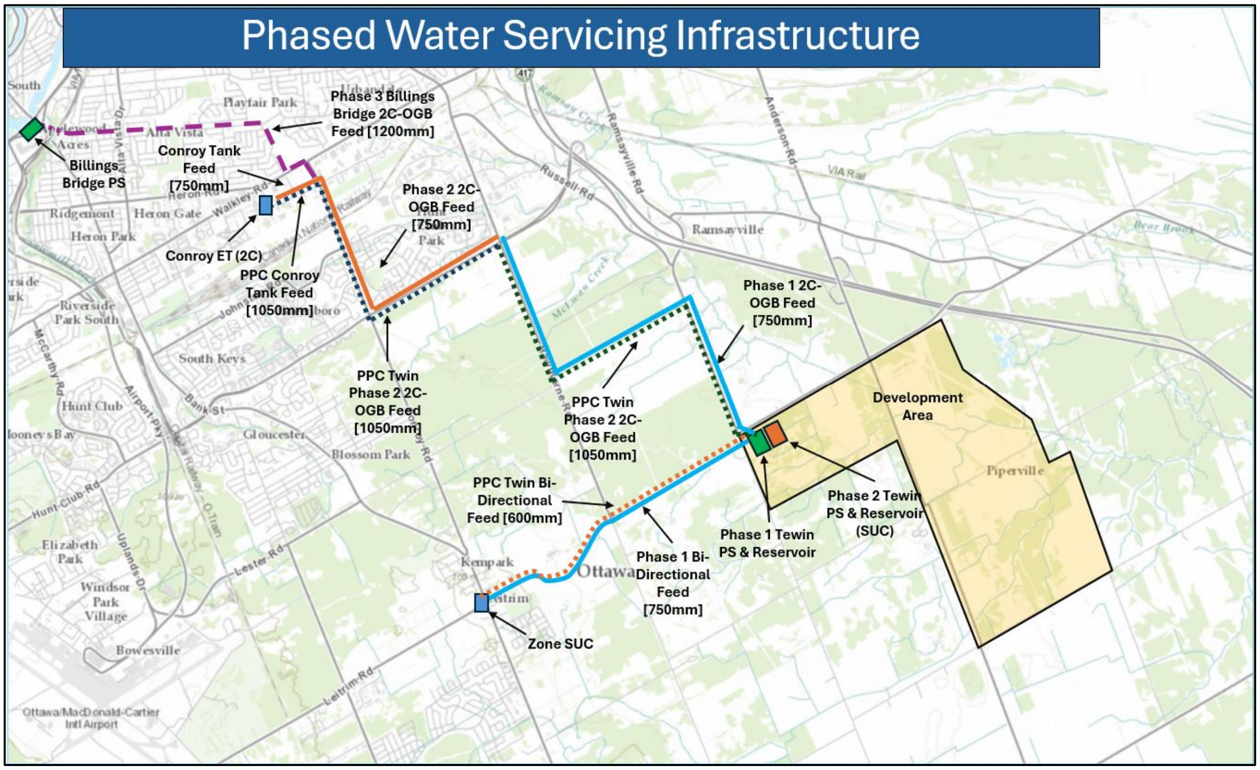


Figure 6.2 Phased Water Servicing Strategy

The proposed feedermains offer redundancy, ensuring reliable water supply during various phases of the community's development. Both of the watermains would be permanent installations, with the opportunity to implement additional feeds from the City distribution system, to Tewin as the community and demands grow. The proposed feedermains would be an effective and affordable solution for the Tewin development, with per capita costs comparable to the costs of extending City services to other communities in Ottawa.

As noted earlier, a separate Municipal Class Environmental Assessment will be conducted and is expected to provide a more detailed evaluation of the phased/day one solution.

A detailed presentation of funding mechanisms for this off-site water infrastructure is provided in the Financial Implementation Plan being prepared in support of the Secondary Plan/Community Design Plan, as outlined in Annex 12 of the Official Plan.

6.3 On-Site Water Supply

6.3.1 Introduction

CIMA+ was engaged by DSEL to develop a water servicing strategy to service the Tewin development. The proposed servicing plan includes extending the City of Ottawa's water distribution system with new feedermains, on-site water storage, and pumping facilities. The project focused on estimating water demands, assessing servicing options, and identifying pumping and storage requirements. Detailed result and the full report prepared by CIMA+ is presented in Appendix B. City staff provided feedback on the watermain layouts and have recommended proceeding with Option 3 described in Identification and Evaluation of Alternative Servicing Solutions therefore the analysis and conceptual design of feedermains was carried out using Option 3.

A hydraulic model of the Tewin Water Supply System was created using Autodesk's InfoWater Pro to allocate water demands to model nodes and incorporate the proposed pumping station and reservoir.

6.3.2 Level of Service Criteria

The level of service criteria was confirmed with the City of Ottawa staff and use values that are consistent with those presented in the 2024 Water Master Plan (WMP). Table 6-2 presented below summarises the criteria used for the evaluation.

Table 6-2 : LOS Criteria

Category	2024 WMP Values
Normal Operating Pressures	
Minimum Pressures (serviced areas)	
Peak Hour	40 psi
Maximum Day + Fire	20 psi
Maximum Pressures	
Unoccupied	Design pipe accordingly, ideally < 100 psi
Occupied area	80 psi
Fire Demands	
City-Wide Design Objective	13,000 L/min (217 L/s)
Methodology for development projects	FUS
Velocities in Major Watermains	
Maximum velocity	1.5 m/s for new mains (planning purposes only) and existing mains under basic demands 4.0 m/s under peak flow conditions (infrequent, short duration)
Water Age	

Maximum water age	5 days or less desired. 8 days not to be exceeded. To be reviewed on case by case basis.

6.3.3 Water Demands

Water demands were derived from the preferred land use plan and used for the hydraulic analysis. Average Day Demand (ADD), Max Day Demand (MDD) and Peak Hour Demand (PHD) were individually calculated based on the specific land-uses presented in Table 5-1. Table 6-3 presented below, summarises the calculated demands for average day (ADD), max day (MDD) and peak hour (PHD). A detailed analysis from CIMA+ is included in Appendix B.

Table 6-3: Total Buildout Demands

Tewin Total Demand	ADD	MDD	PHD
Buildout Total Demand (m^3/d)	17,488	30,684	59,725
Buildout Total Demand (L/s)	203	355	691

6.3.4 Water Supply

Water will be supplied from the existing City system (pressure zone 2C) to the Tewin boundary and will not require a new pressure zone. Zone 2C has an operating HGL of approximately 129m and is serviced from the Billings Bridge Pumping Station and the Conroy Elevated Tank. Pressure zone SUC to the east of the development has a higher operating HGL of 147m.

6.3.5 Pumping and Storage Requirements

The pumping and storage requirements were calculated using the MECP method for fire flow, balancing and emergency storage. Table 6-4 presented below presents a summary of the storage and pumping requirements. Additional detailed calculations are presented in the CIMA + report included in Appendix B.

Table 6-4: Summary of Reservoir sizing and Pumping Requirements

Infrastructure Type	Sizing	Capacity
Reservoir	Fire Flow (250 L/s for 3.5 Hours)	3,150 m^3
	Balancing (MSS*0.25)	6,974m^3
	Emergency ([FF+Balacing]*0.25)	2,531m^3
	Total Reservoir Capacity	13,000m^3

Pumping Station	Total Pumping Requirement (Greater of PHD or MDD+FF)	691 L/s

6.4 Model Setup and Components

The InfoWater Pro software was used to setup a hydraulic model complete with a network of pipes, junctions, pumps, valves, tanks and reservoirs. The general street network of the preferred land-use plan was used to provide the location of the proposed backbone watermains.

Watermains greater and equal to 300mm dimeter were modelled for the analysis.

- Zone 2C was input as a fixed reservoir with boundary conditions obtained from the City of Ottawa
    - 121.3m under 5-year MXDY 2046
- Based on the typical HGL for Zone SUC (147 m) according to the City's WMP, for modelling purposes, Zone SUC supply was input as a fixed head reservoir at the location of the Ottawa South PS to account for transmission head loss. The fixed head reservoir used for this analysis has a more conservative HGL of 145 m to account for other head loss from service connections in Zone SUC.
- Pump station and storage facility was located at the northwestern corner of the site.
- In-ground reservoir was modelled at a 5m depth and the capacities presented in Table 6-4.
- A pump with a VFD was used with settings to maintain a pressure of 67.1 psi at the discharge point in order to match the 2C target gradeline of 129m (WMP value) for Tewin
- A flow control valve (FCV) was added at the inlet of the reservoir to limit the flow from the 2C feedermain. Controls for the flow control valve were set to allow a flow of up to a maximum of 250 L/s into the reservoir.
- A FCV was input on the feedermain from SUC, which is closed under typical conditions and opened for modeling redundancy scenarios

Figure 6.3 presented below, displays the pipe sizing and reservoir locations modelled for the development based on the City's IMP off-site servicing alignment strategy.

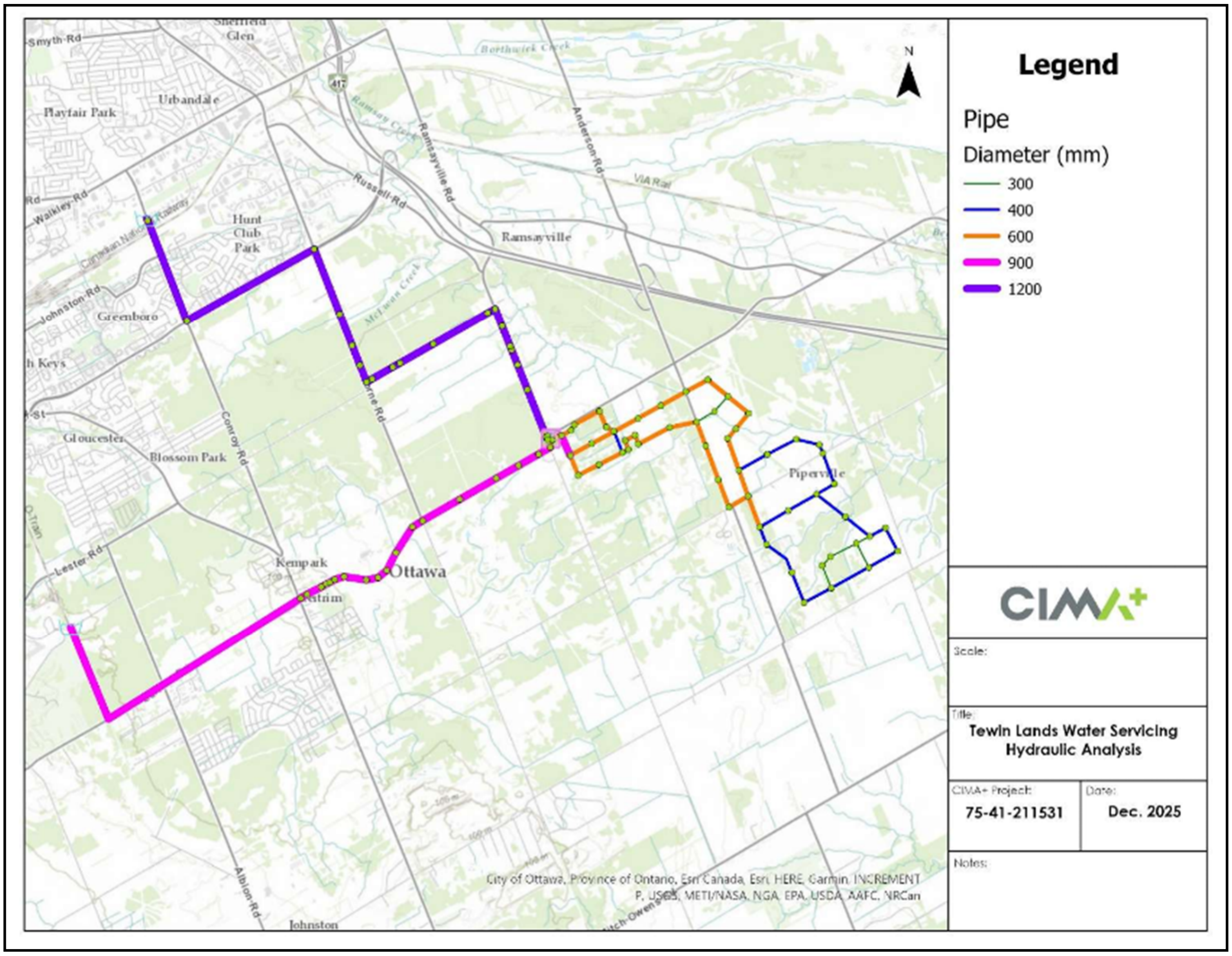


Figure 6.3: Hydraulic Model Schematic

6.4.1 Model Demands

Water demands were aggregated and applied evenly across the model nodes within each respective block. Diurnal patterns were developed and applied for ADD and MDD and applied to the notes to capture the demand variation over time. Details on the patterns are presented in the CIMA+ report included in Appendix B.

6.5 Model Results

6.5.1 System Pressures

The hydraulic model was used to ensure the following requirements were respected:

- Minimum 40 psi under PHD and MDD
- ADD pressures to be between 50 and 70 psi with not over 80 psi

Table 6-5: System Pressures

Scenario	ADD min	ADD max	MDD min	MDD max
Build-out	66.2	74.9	55.4	74.8

The results presented in Table 6-5 confirm the pressures are within the City's established criteria.

6.5.2 Available Fire Flow

Available fire flow was modelled to ensure the system can deliver the City's fire flow requirement of 217 L/s while keeping system pressures above 20 psi.

Table 6-6: Available Fire Flow during MDD Scenarios

Scenario	Min (L/s)	Max (L/s)
Build-out	308	1361

Table 6-6 presented above shows that the available fire flow is within the acceptable range.

6.5.3 Water Age

The City criteria for maximum water age is 5 days. The Model was run to equilibrium to extract water age over consecutive average day demands. The results are presented in Table 6-7 and confirm the City criteria are met with the proposed layout. The introduction of a new reservoir and pumping station at Tewin may allow for re-chlorination if required. As development applications progress, water age is also expected to be assessed for each phase.

Table 6-7: Water Age

Scenario	Max Water Age (hours)
Build-out	67

6.6 Existing Trickle Feed System

The existing trickle feed system operates in a different pressure zone than the proposed Tewin distribution system. The new Tewin system can be connected to the existing trickle feed at strategic locations to provide redundancy. As the trickle feed system operates at higher pressures than Tewin, check valves can be implemented at the connection locations. Should the pressure drop in the trickle feed system, Tewin could backfeed the trickle feed at the Tewin pressure. Detailed connection locations can be explored during functional level designs.

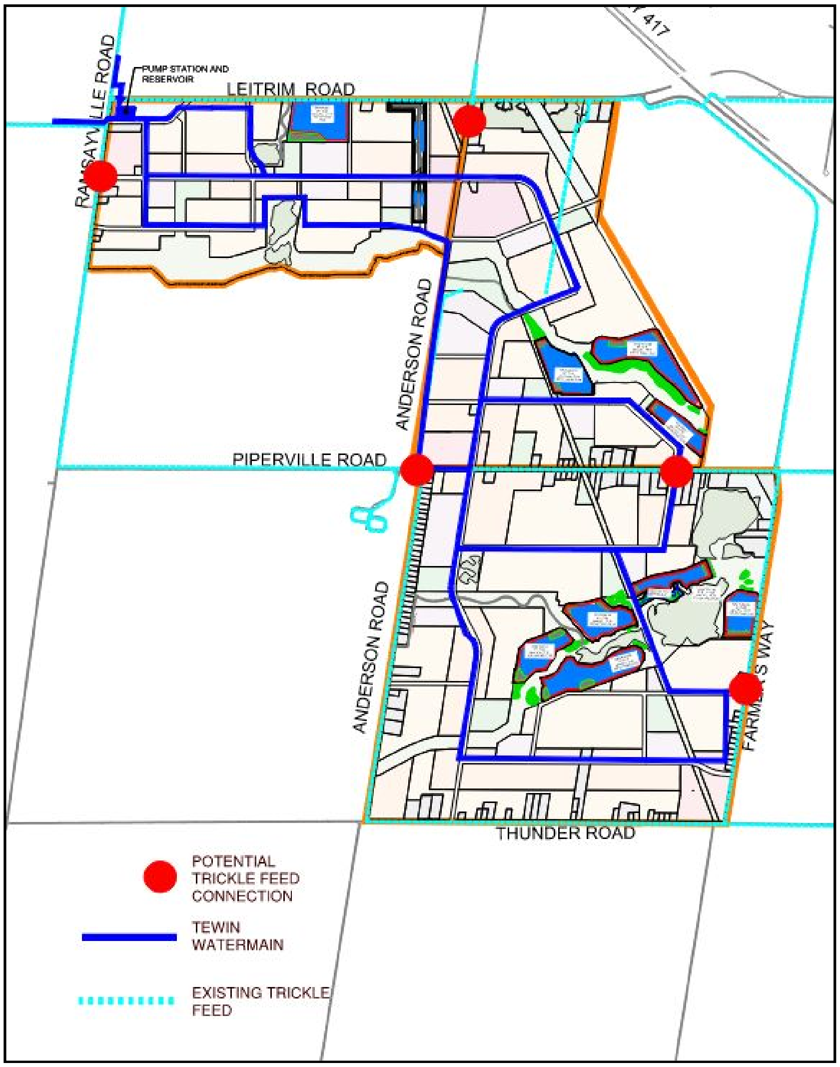


Figure 6.4: Potential Connections to Trickle Feed

6.7 Summary and Conclusion

The proposed water servicing strategy for the Tewin development is a robust, phased approach that balances the need for cost-effective, early-stage infrastructure with long-term capacity and resiliency. Hydraulic modeling confirms that the proposed system meets the City's criteria for pressure, fire flow, and water age. The strategy ensures sufficient capacity to meet both near-term and ultimate buildout demands for Tewin while providing redundancy and future integration with the South Urban Community. A full Hydraulic Analysis is included in Appendix B.

A separate Municipal Class Environmental Assessment will guide implementation of phased off-site infrastructure, ensuring the proposed solution aligns with growth, system performance, and City objectives through to the 2046 planning horizon and beyond.

It is important to note that the preferred trunk watermains represent only the primary components of the overall watermain network. These trunk systems will ultimately be supported by a network of local watermains and individual service connections, which will be developed and refined as part of subsequent planning and engineering stages. As the design progresses and future Planning Act processes—such as draft plan of subdivision and site plan control applications—are initiated, further technical detail will be made available to support the continued evolution of the servicing strategy.

The City of Ottawa will be responsible for administering any local servicing programs for existing residents and implementing connection strategies in accordance with municipal standards and infrastructure delivery models.

Continued coordination with City-led studies, including the ongoing Municipal Class Environmental Assessment, will ensure that the servicing strategy remains adaptable and aligned with long-term infrastructure planning objectives.

7.0 WASTEWATER

7.1 Sanitary Services Background

Currently, there is no existing municipal sanitary servicing infrastructure in the immediate vicinity of the Tewin site with sufficient capacity or at the appropriate elevation to accommodate a community of several thousand residential units. Nearby rural areas rely on private septic systems. Therefore, the wastewater generated by the Tewin community must be routed to an existing City of Ottawa collector system. The closest neighbourhood to the west, Findlay Creek, is currently serviced by a pumping station that lacks sufficient capacity for expansion.

7.2 Infrastructure Master Plan Sanitary Solution

The City Infrastructure Master Plan (IMP) proposes a 1500mm diameter gravity sewer system extending from the South Ottawa Tunnel (SOT) to the Tewin development as the ultimate sanitary servicing solution for the City of Ottawa's 2101 planning horizon. The population projections for the post-period capacity (associated with land beyond the Official Plan’s 2046 planning horizon and outside of Tewin's CDP area) far exceed the population projection that the City included for the Tewin development and what the Tewin landowners project. The post-period capacity of the 1500mm gravity sewer is considered to be an allocation for lands outside of the proposed Tewin urban boundary expansion, which would be subject to future urban boundary expansions, potentially beyond the 2046 planning horizon. Figure 7.1 conceptually depicts the potential area serviceable by the IMP sanitary solution.

Figure 7.1: Conceptual PPC Service Area

A separate Municipal Class Environmental Assessment (MCEA) will be carried out, with Tewin being the primary stakeholder, to identify and evaluate alternatives for off-site water and wastewater. The MCEA is expected to assess relevant opportunities and constraints, with consideration given to all major social, natural, and economic environmental factors, including consideration of nearby federal lands. Preliminary alignments considered by the City include Hawthorne Road, Ramsayville Road and Russell Road, and a corridor east of Highway 417 on Ramsayville Road – these are depicted in Figure 7.2. All alignments converge toward the South Ottawa Tunnel downstream of the Walkley Chamber. The sewer's upstream portion is expected to start at the Tewin boundary on Leitrim Road, intersecting with either Anderson Road or Ramsayville Road.

While the Infrastructure Master Plan (IMP) has fulfilled Approach #1 of a Master Plan exercise, it does not meet the full requirements of a Schedule B project. The MCEA study will undertake Phases 1&2 of the MCEA process to arrive at a preferred wastewater solution. As approved by Council, staging and phasing options will also be examined as part of this study.

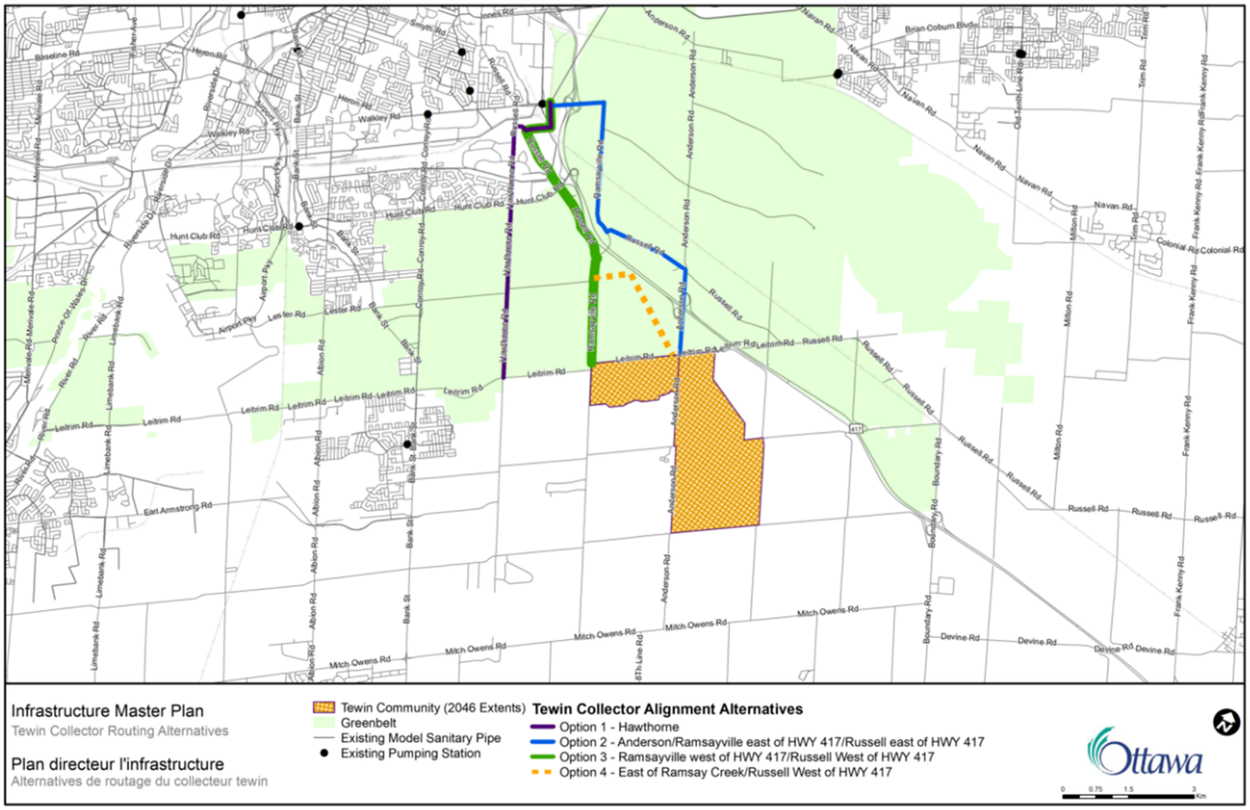


Figure 7.2: City of Ottawa IMP Preliminary Sanitary Trunk Routing

7.2.1 South Ottawa Tunnel (SOT)

The IMP sanitary solution presupposes the ability to connect the City's IMP tunnel (referred to as the Tewin Collector in the IMP) to the South Ottawa Tunnel (SOT), a 3m diameter concrete tunnel commissioned in the 1990s.

The original SOT tunnel configuration led to sediment accumulation due to low flow velocities. To mitigate this, the City implemented several operational modifications, including pumps in the downstream shaft, an SOT overflow chamber downstream of the Walkley Chamber, and adding downstream grit and screening facilities.

System Operation:

- Dry Weather Flows: South Ottawa Collector (SOC) and Greens Creek Collector (GCC) flows pass through the Walkley Chamber and are controlled using a modulation gate located at the SOT, directing flows to the GCC (north).

- Wet Weather Flows: As flows and levels rise, the modulation gate holds back the SOC/GCC flow. Once the overflow chamber reaches a certain level, flow spills over a bending weir and is screened before entering the SOT drop structure.

- In addition to not being able to accept solids, the SOT was designed as a tunnel rather than a gravity sewer. It functions more like a long underground tank than a pipe, meant to hold water during a storm and slowly drain out later. Because it is built so deep, it uses large, widely spaced shafts for maintenance instead of the common maintenance holes.

- Precast Concrete Cylinder (PCC) Shaft Pumps: Three pumps are installed to manage wet weather flow at the downstream end of the SOT. In excess conditions, the SOT can surcharge and operate in siphon mode.

- Bypass and Overflow: A 2134mm bypass tunnel connects the PCC shaft to a chamber outside the Raw Sewage Pumping Station (RSPS). This tunnel can drain the SOT under certain conditions but risks overflow to the Ottawa River if the gate is left open while surcharging the SOT.

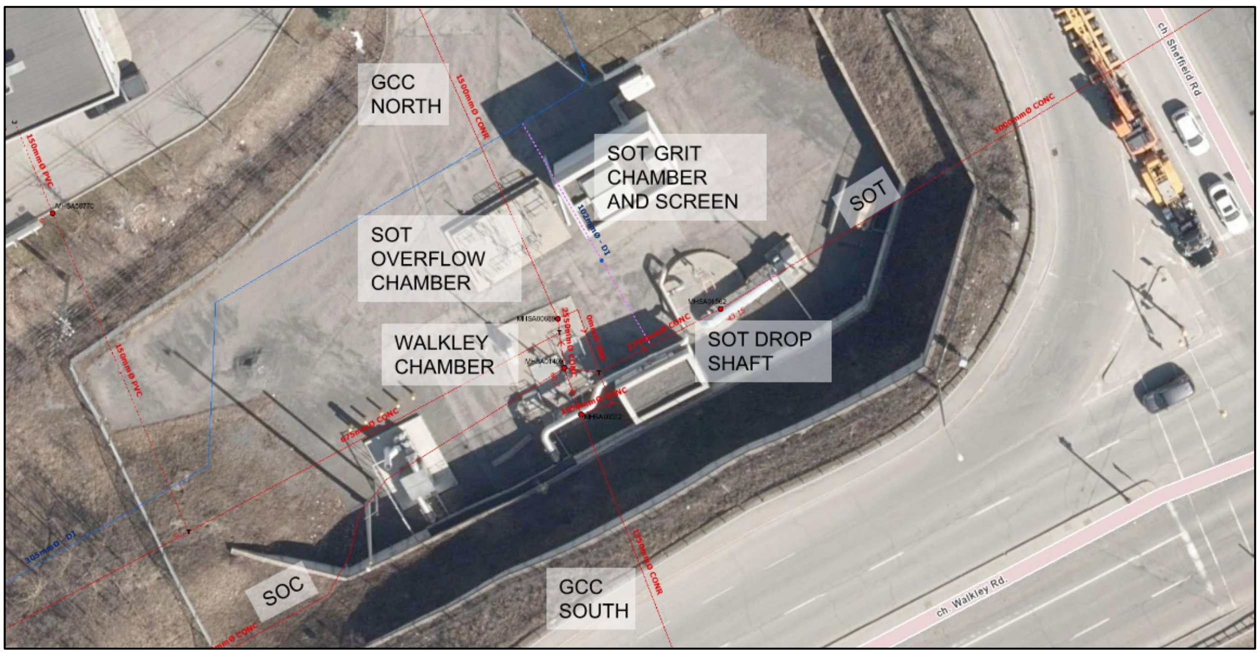


Figure 7.3: South Ottawa Tunnel and Walkley Chamber Schematic

These systems collectively regulate flow, minimize sediment accumulation, and protect the downstream wastewater treatment processes.

It is our understanding that the SOT, as it currently operates, does not have the capacity to accept solids. Remedial works or upgrades to the SOT will be necessary to accommodate the deep trunk sanitary connection proposed in the City's IMP and WWMP.

Through discussions with the City, it is our understanding that upgrades to certain components of the SOT will be required to enable the sewer to accept solids. Preliminary options include upgrading the pumps at the PCC shaft to handle larger flows containing solids. The functional design for these upgrades has not yet commenced. The City has indicated that a design tender for the upgrades is currently anticipated for release sometime in 2026. It is important to note that the pumps will need to be sized to accommodate growth city-wide to maximize the use of the SOT, not solely to support the City's IMP collector sewer, or the full build-out of the Tewin community. The pump station will need to be designed, funded, constructed, and commissioned prior to the South Ottawa Tunnel being capable of accepting solids.

7.2.2 Preliminary Off-Site Day 1 Wastewater Solution

Given the magnitude of investment required to construct a large collector sewer, and the current inability of the South Ottawa Tunnel to accept solids, options continue to be reviewed to implement a phased solution that can be accommodated within the existing City system. A phased approach may allow the available downstream capacity to be used in the interim, supporting the delivery of housing while broader City-wide upgrades and servicing solutions are reviewed and implemented.

7.2.3 Evaluation of Sanitary Outlets

As the SOT is not expected to be available as a feasible outlet for development in the near term due to the timing of the required City-led studies and the lower expected flows generated from the early stages of development, an alternate outlet is needed to service the Tewin Development. The collector sewers nearest to the Tewin development are:

- Conroy Road Collector – 600/750mm dia.
- Greens Creek South Collector (GCC) – 1350mm dia.
- South Ottawa Collector (SOC) – 2700mm dia.

The Conroy Road Collector connects to the GCC. Both the GCC and the SOC connect to the Walkley Chamber.

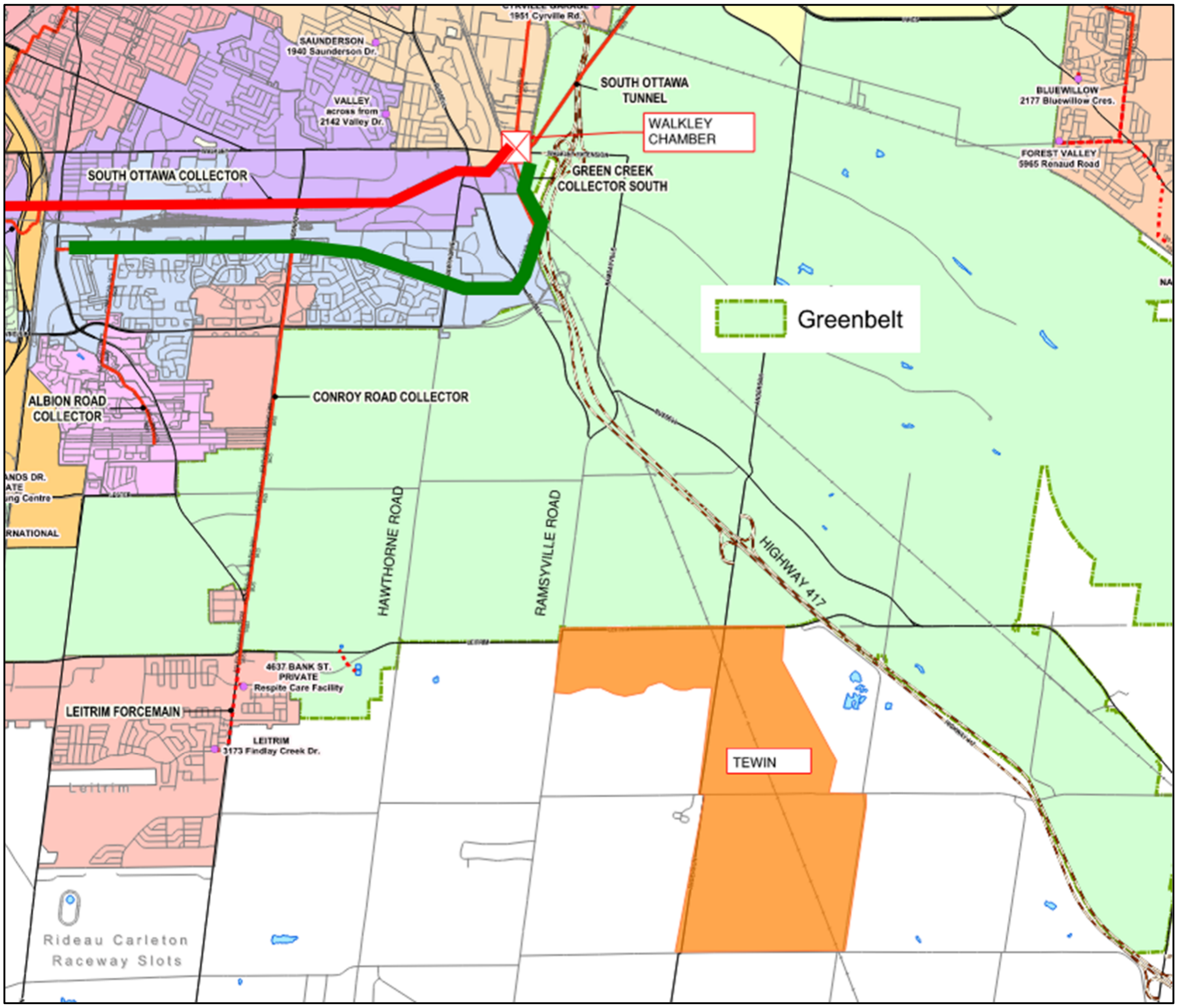


Figure 7.4: City of Ottawa Sanitary Trunk Sewers

7.2.4 Summary of Walkley Chamber and Associated Infrastructure

The Walkley Chamber is a critical node in the City's wastewater collection system. The wastewater flows from a large portion of the growth areas identified in the Official Plan (including Barrhaven, Riverside South and Leitrim) will be routed through this chamber. The chamber is used to regulate flows from the incoming Greens Creek Collector (GCC) and South Ottawa Collector (SOC). The chamber includes an overflow mechanism to divert the solids northward toward the GCC North and allow for overflows to the SOT.

The GCC North flows northward from the chamber with a 1350mm diameter pipe that increases to 1500mm before discharging to the R.O. Pickard Environmental Center (ROPEC) near the screen and grit removal facility. Downstream of the Walkley Chamber, additional trunk sewers—Innes Sewer, Cyrville Collector, Maxime Trunk and Relief, and the Innes Road Collector—merge into the GCC.

7.2.5 Preliminary Preferred Connection Point

The GCC is identified as the preliminary preferred outlet for the Day 1 Tewin sanitary system. Its advantages include a shorter connection distance from Tewin and a shallower depth compared to the South Ottawa Collector, resulting in a more practical and constructible Day 1 routing. Further coordination with the City will be undertaken as part of servicing refinement.

As noted earlier, a separate Municipal Class Environmental Assessment will be conducted and is expected to provide a more detailed evaluation of the phased/day one solution.

7.2.6 Proposed Corridors

Two alignments for the Day 1 solution were evaluated as potential options to route the sanitary flows from the Tewin Development to the GCC: an alignment along Ramsay Road and a second alignment along Hawthorne Road. These alignments were chosen as they are located within municipal road right-of-ways across the Greenbelt. This would facilitate maintenance access within existing City-owned corridors and avoid encroachment into NCC land.

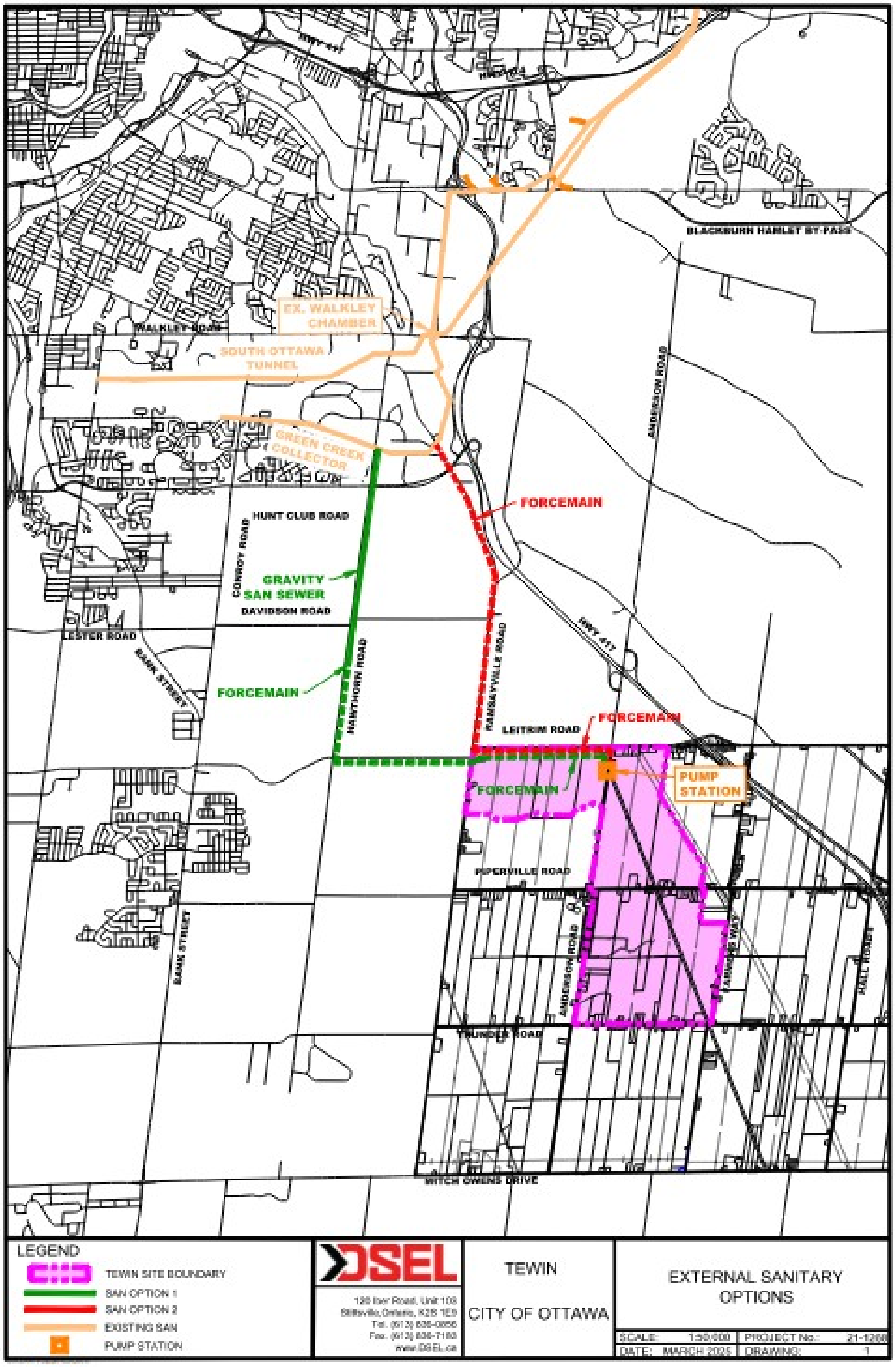


Figure 7.5: Day-1 Off-Site Routing Options

7.2.6.1 Ramsayville Alignment

Ramsayville Road was evaluated as a potential servicing corridor for a sanitary sewer or forcemain to convey flows from the Tewin Development to the GCC. Preliminary design profiles were prepared using available City of Ottawa mapping. Based on this profile, a gravity sewer could be installed along Ramsayville Road with a lift station located at a strategic point within the Tewin lands to direct flows into the gravity segment. A gravity sewer option was carried forward for evaluation because it is generally more cost-effective than a forcemain.

This alignment results in sewer depths exceeding 10 m in areas expected to exhibit poor soil conditions, which would increase the complexity and cost of open-cut construction. The Ramsayville corridor also includes 7 creek crossings. Open-cut excavation is not expected to be permitted at these locations, meaning tunnelling would be required. Although technically feasible, the combination of deep excavation and multiple crossings would significantly escalate construction challenges and overall costs.

7.2.6.2 Hawthorne Alignment

Hawthorne Road was also reviewed as a potential sanitary infrastructure corridor to connect the Tewin development to the GCC. A design profile was prepared using City of Ottawa mapping. Due to variations in ground elevation, which rises north toward Davidson Road before descending toward Hunt Club Road, a gravity-only solution is not practical along the full alignment.

To address these grade changes, a pressurized forcemain is proposed along the portion of Hawthorne Road where the surface elevation increases. As the elevation decreases toward the GCC, the system would transition to a gravity sewer. North of Hunt Club Road, Hawthorne Road contains an existing 250 mm diameter sanitary sewer that outlets to the GCC. This segment could be replaced with a larger-diameter gravity sewer sized to accommodate flows from the Tewin Development.

This alignment reduces the number of creek crossings compared to Ramsayville Road and avoids the deep excavations required along that corridor, offering a more practical and constructible servicing option.

7.2.7 Preferred Pump Station Location

The pump station should be located at the outlet at the intersection of the Harvest Walk Block and Anderson Road. This location minimizes the depths required for the on-site sewer system and maintains flexibility for connecting to the ultimate IMP trunk sewer.

7.2.8 Sizing

As the pumping station is proposed at the outlet of the Tewin lands, its depth will be governed by the elevations required for the on-site sanitary sewer system to service the full development area. The long-term intent is for the pumping station to be decommissioned once the large-diameter gravity tunnel is constructed, at which point flows would be redirected to the tunnel.

Self-cleansing velocities of the off-site collector and the capacity of the downstream sanitary network are key considerations in sizing the Day 1 solution, particularly as it represents the first phase of a larger sanitary strategy for Tewin and surrounding future growth areas. Additional factors include the timing of South Ottawa Tunnel upgrades and the financial implications of sizing Day 1 infrastructure to support development within the current planning horizon. The upcoming Environmental Assessment is expected to evaluate these considerations in detail, with input from the Tewin project team.

The pumping station and associated off-site infrastructure must be sized to justify the capital investment and support the expected operational life of the facility. While the pumping station may be implemented in phases, the forcemains will likely need to be fully sized and installed at the outset to avoid future reconstruction. Preliminary cost estimates indicate that a facility designed to accommodate 10 to 15 years of growth would provide an efficient and financially reasonable solution for the Tewin development, with per-capita costs comparable to other growth-related sanitary servicing projects in Ottawa. The Day 1 servicing approach would also support long-term system performance by contributing to the minimum flow requirements of the future IMP tunnel.

Final functional sizing and design will be completed by a qualified professional with specialized expertise in pumping station design. As noted earlier, the initial sanitary servicing solution is planned to be rigorously assessed and confirmed in the separate MCEA for off-site water and wastewater services, which will confirm the appropriate sizing and associated costs.

7.2.9 Summary of Off-Site Wastewater Day-1 Solution

A sanitary pump station is identified as the preferred solution to service the initial stages of Tewin development. The pump station will allow initial stages of development to proceed, while complexities involved with the IMP’s ultimate deep trunk sewer connection to the SOT are resolved and there is an adequate population base accumulated to ensure sedimentation is not an issue in the IMP tunnel.

Based on the evaluation of the two potential offsite alignments to convey development wastewater to the GCC, the Hawthorne Road alignment is recommended as the preferred servicing solution. This decision is driven by the following key factors:

1. **Cost Efficiency**: It is expected that the Hawthorne Road alignment offers a more cost-effective solution, when compared to the Ramsayville Road alignment. The use of dual forcemains for the higher elevations along the route, combined with gravity sewers in the lower-lying areas, minimizes excavation depth and associated costs. The Ramsayville Road option includes multiple creek crossings and deep sewers. Extensive tunneling would be required at these crossings, leading to higher construction costs.

2. **Feasibility of Construction**: The Hawthorne Road alignment is expected to present fewer technical challenges, as it avoids the need for tunneling under multiple creeks, which is a complicating factor along the Ramsayville route. By taking advantage of the natural topography along Hawthorne Road, the design integrates both forcemain and gravity systems where appropriate, reducing the need for over-depth excavation and limiting environmental disruption.

3. **Environmental Impacts:** The Hawthorne alignment has fewer creek crossings than the Ramsayville option.

7.3 Summary of Design Criteria for Wastewater Servicing

The Tewin development will be serviced by a network of new gravity sewers designed in accordance with City of Ottawa design criteria.

Table 7-1: City of Ottawa Sanitary Design Guidelines Design Parameters

Design Parameter	Value
Low Density Residential	3.4 p/unit
Medium Density Residential	2.7 p/unit
High Density	2.3 p/unit
Peak Wastewater Generation per Person	280 L/p/d
Peaking Factor Applied	Harmon's Equation $P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000} \right)^{1/2}} \right) \times K$ K = 0.8
Institutional Flows	28,000 L/ha/day
Institutional Peaking Factor	1.0 (Contribution Area <= 20%), 1.5 (>20%)
Infiltration and Inflow Allowance	0.28 L/s/ha (wet) 0.05L/s/ha (dry) 0.33L/s/ha (total I/I)

Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	135 mm dia PVC SDR 28 with a minimum slope of 1.0%
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Additional Considerations	Sewers servicing less than 10 residential connections to have a minimum gradient of 0.65%
	Where expected depth of flow is less than 1/3 pipe diameter, calculate actual flowing velocity and increase slope as required to achieve 0.6 m/s.
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, December 2025.	

7.3.1 Wastewater Demands

Unit type and land use components were extracted from the preferred land-use plan.

Using the City of Ottawa design guidelines presented in Table 7-1 projected wastewater demands have been calculated for the proposed development. Table 7-2 summarizes the demands.

Table 7-2: Projected Wastewater Peak Flows

Zone	Gross Area (ha) ***	Net/ Gross Area *	Total Net Area (ha)	San. Flow Rate	Avg. Unit Per Net Ha *	Avg. Pers. Per Unit **	Tot. Units	Pop.	Pop / Gross Ha	Peak Factor	Peak Flow (L/s)	Infl. (L/s)	Tot. San. Flow (L/s)
Core (High – Mid Density)	16.38	75%	12.29	280 L/p/d	148	2.4	1818	4364	266	2.84	40.16	5.41	**45.56**
Neighbourhood Centres	20.11	90%	18.10	280 L/p/d	126	2.5	2280	5701	284	2.75	50.87	6.64	**57.51**
	5.20	100%	5.20	28000 L/ha/d	-	-	-	-	-	1.00	1.69	1.72	**3.40**
Community Corridor (Transition)	122.99	85%	104.55	280 L/p/d	97	2.6	10141	26366	214	2.23	190.21	40.59	**230.80**
	6.74	100%	6.74	28000 L/ha/d	-	-	-	-	-	1.00	2.18	2.22	**4.41**
Neighbourhood	225.43	80%	180.35	280 L/p/d	41	3.3	7394	24401	108	2.25	178.15	74.39	**252.54**
Lands Not Owned (Low Density)	101.37	80%	81.09	280 L/p/d	36	3.1	2919	9050	89	2.60	76.20	33.45	**109.65**
Commercial	0.45	100%	0.45	28000 L/ha/d	-	-	-	-	-	1.00	0.15	0.14	**0.29**
Parks	33.95	-	**-**	9300 L/ha/d	-	-	**-**	**-**	-	-	3.65	11.20	**14.86**
Community Centre	6.32	-	**-**	28000 L/ha/d	-	-	**-**	**-**	-	-	2.05	2.08	**4.13**
School	47.44	-	**-**	28000 L/ha/d	-	-	**-**	**-**	-	-	15.37	15.66	**31.03**
Total	**586.38**	**-**	**408.31**	**-**	**-**	**-**	**24553**	**69882**	**170**	**-**	**-**	**-**	**671.53**

Notes:
Highlighted cells represent commercial spaces within mixed use blocks
* Average based on projects with similar land use

** Based on similar land use, this column averages 1.8 people/unit for mid-high density, 2.7 people/unit for stacked towns, b2b towns and townhomes, and 3.4 people/ ha for single units

*** Areas based on March 10, 2025 Land Use Plan

According to the City of Ottawa Sewer Design Guidelines, sanitary sewer design should be based on the ultimate sewage flows permitted under the applicable land use zoning, wherever feasible. The preferred concept plan and corresponding unit projections, as outlined in Table 7-2 above, represent current high-end projection planning data and have therefore been used to size the proposed sanitary sewer network.

- **Core (High – Mid Density):** Built forms within the core areas are proposed to include mid to high rise apartments, mid-rise apartments and back-to-back and stacked townhomes. In mixed use buildings, retail plazas and ground floor retail are also expected. Based on the City of Ottawa *Sewer Design Guidelines,* population densities of 2.7p/unit for townhomes and 2.4p/unit for apartments were applied.

- **Neighbourhood Centres:** Built forms within neighbourhood centres are proposed to include low- to mid-rise apartments and back-to-back and stacked townhomes. Based on the City of Ottawa *Sewer Design Guidelines,* population densities of 2.7p/unit for townhomes and 1.8p/unit for apartments were applied.

- **Community Corridor (Transition)**: Built forms within community corridor areas are proposed to include low to mid rise apartments, back-to-back and stacked townhomes and traditional townhomes. Based on the City of Ottawa *Sewer Design Guidelines,* population densities of 2.7p/unit for townhomes and 2.4p/unit for apartments were applied.

- **Neighbourhood (Low Density)**: Built forms within the neighbourhood areas are proposed to consist of townhomes, semi-detached and detached homes. Based on the City of Ottawa *Sewer Design Guidelines,* population densities of 2.7p/unit for townhomes and semi-detached homes, and 3.4p/unit for detached homes were applied.

- **Lands Not Owned**: As required by the City of Ottawa, lands within the study area that are not currently owned but have potential for future development must be considered. These lands are assumed to include a mix of townhomes and detached homes. Based on the City of Ottawa *Sewer Design Guidelines,* population densities of 2.7p/unit for townhomes and 3.4p/unit for detached homes were applied.

The values used in this section are intentionally conservative to ensure the sanitary sewer network has the capacity to accommodate potential future increases in population, including future intensification through additional dwelling units (ADUs) as development progresses, as well as to reflect site-specific considerations. Demands will be confirmed through future infrastructure planning work.

7.3.2 Trunk Sewer Sizing and Routing

Trunk sewers were routed using the most direct route to the outlet to minimize overall pipe depths. Using the Harvest Walk Block provides a direct route bisecting the development and allows the trunk sewers to be as high as possible. Sizes were determined based on tributary areas and peak demands calculated in Table 7-2.

Crossings with storm pipes were verified and generally govern the sanitary depths for Block 3. The maximum pipe size is located at the outlet at Anderson Road and is 975mm in diameter. Based on the trunk level routing, the invert at the outlet of the site is expected to be 67m in elevation and generally in the range of 15m in depth. It is expected that some of deeper sections of sewers may need to be installed using trenchless installation methods which is a common technique for deep excavations. The trunk sewer will eventually be gravity-fed to the ultimate sanitary sewer once the pump station is decommissioned.

7.3.3 Deep Sewer Trunk Considerations

Where the sanitary trunk sewer reaches significant depths, particularly in the Harvest Walk Block, the project team consulted a local contractor who confirmed the feasibility of installing a deep sanitary trunk based on the soil conditions identified by Paterson Group. Construction methods are expected to be consistent with practices used elsewhere in the City and southeastern Ontario. Where the sanitary alignment crosses environmentally sensitive areas, the pipe can be installed within a casing and grouted to allow for future maintenance without impacting sensitive surface conditions, if required. Standard groundwater management techniques would be employed during installation. Although final means and methods will be determined during detailed design prior to construction, a portion of the sanitary sewer is anticipated to be installed using trenchless technologies.

If open-cut excavation is required for future maintenance, Paterson Group have developed a conceptual shoring detail to facilitate safe access to the pipe. The Harvest Walk cross-section has been designed to provide adequate space for these future repairs based on the conceptual shoring requirements. All other right-of-ways are currently sufficient in width to allow for future maintenance of deep installations.

7.3.4 HGL Analysis

The sanitary hydraulic grade line (HGL) was modeled in accordance with the requirements outlined in City of Ottawa Design Guidelines, which specifies the need to evaluate two scenarios:

Scenario 1: A rare event under normal operating conditions
Scenario 2: A pump station failure during an annual design event

In the absence of detailed lotting or specified product types, a fixed vertical relationship between the road centerline and underside of footing (USF) was applied, based on typical single-family units with basements. This approach is consistent with Master Servicing Study (MSS)-level design.

The minimum freeboard from the centerline of road to the HGL is required to exceed 2.1 m for Scenario 1 and 1.8 m for Scenario 2.

Scenario 1 satisfies the freeboard requirement of 0.3 m below the USF across the site. For Scenario 2, the freeboard criteria are generally met, with the exception of sanitary manholes MH 25A and MH 93A, which have freeboards of 1.18 m and 1.55 m, respectively. These manholes are not proposed to have any units directly connected to the sanitary trunk and, therefore, do not pose a risk of USF exceedance or basement flooding under this condition. The full HGL analysis can be found in Appendix C.

7.3.5 Watercourse Crossings

Watercourse crossings were minimized and are generally located within future right-of-ways. A crossing is being proposed through the Harvest Walk Block south of the Smith Gooding drain as it offers a central route for the system minimizing sanitary pipe depths throughout the system, specifically in Block 3. It is expected that the trenchless methods will be utilized to construct the crossings and minimize disruption to the environment and watercourse.

7.3.6 Existing Residents

The integration of existing residents into the new sanitary servicing strategy has been considered as part of the overall development plan. Where feasible, existing residents within or directly adjacent to the Tewin boundary are expected to be provided the opportunity to connect to the new sanitary system. However, for properties fronting existing rights-of-way, these opportunities may be limited, as the new sanitary network is primarily located within the internal road network of the development and not along the existing frontage roads. While the trunk sewers shown in the conceptual design package show the trunk network, they do not represent the full extent of the sanitary collection network. Local sanitary sewers will be designed in future phases to supplement the trunk system and extend servicing coverage where appropriate.

Further details regarding connection opportunities will be developed through future Planning Act processes and detailed design. Any program to facilitate local service connections for existing residents would be led by the City of Ottawa, subject to municipal policies, servicing feasibility, and infrastructure capacity. These considerations will be addressed as part of ongoing coordination between the City and development proponents during future implementation stages.

7.3.7 Preferred Sanitary Servicing Strategy Conclusion

The sanitary servicing strategy for the Tewin development has been developed in response to the absence of existing municipal infrastructure in the immediate area and the limitations of nearby systems. The Infrastructure Master Plan identifies a long-term solution via a deep gravity trunk sewer connection to the South Ottawa Tunnel (SOT); however, the SOT currently lacks the capacity to accept solids and will require significant upgrades before it can be utilized. In the interim, a phased solution is proposed to enable early stages of development to proceed.

Based on an evaluation of outlet options and available capacity, the Greens Creek Collector (GCC) is identified as the preliminary preferred outlet, given its relative proximity, residual capacity, and elevation advantages over other collectors. A new sanitary pump station located near Anderson Road and along the Harvest Walk Block is recommended to service the initial stages of development, with dual forcemains and gravity sewers directing flow northward. Among the two off-site alignment options reviewed, the Hawthorne Road corridor is identified as the preferred alignment due to cost efficiency, construction feasibility, and reduced environmental impacts relative to the Ramsayville Road option.

This sanitary servicing approach establishes a flexible framework that accommodates early development, responds to infrastructure constraints, and delivers an efficient sewer network to service the development.

8.0 STORMWATER MANAGEMENT

8.1 Introduction

The Tewin community is a planned urban expansion that includes a mix of residential, recreational, commercial, and institutional land uses, in accordance with the City of Ottawa's updated urban boundary. The development of these lands will increase stormwater runoff, which must be effectively managed to maintain the integrity of the existing drainage systems and protect downstream watercourses. The MSS is a roadmap for identifying trunk sewer routing and does not go into details beyond a typical MSS-level. Detailed designs will be completed and reviewed at later stages of development through development approvals under the Planning Act. The MSS outlines the proposed stormwater management strategy for the community, including runoff control and treatment measures that align with applicable environmental policies and municipal planning documents. As identified in Section 5.0, the preferred approach incorporates a series of stormwater management facilities distributed throughout the site to provide quantity control.

8.2 EMP Report Recommendations

The Environmental Management Plan (EMP) for the Tewin development provides a comprehensive framework for identifying, evaluating, and mitigating potential environmental impacts associated with the development of this new community. The EMP outlines development constraints, drainage patterns and establishes mitigation measures necessary to protect the natural environment and its ecological functions. As part of the City's planning process, the EMP is complementary to other documents, such as the Official Plan and Secondary Plans, providing direction for subsequent site development stages.

Key components of the EMP include a detailed assessment of existing conditions, such as landforms, soils, geology, vegetation cover, and wildlife. It also addresses surface and groundwater features, identifying any natural heritage features and systems, potential natural hazards, and regulatory constraints. It also recommends the preservation and restoration of natural features, such as wetlands and riparian buffers, to maintain ecological functions and support biodiversity.

The EMP for the Tewin development provides a thorough and specific plan for mitigating environmental impacts and managing stormwater in a sustainable manner.

8.3 Stormwater Management Performance Criteria

8.3.1 Flood Control Targets

Quantity control requirements were set by JFSA in the EMP using the approved Cumulative Hydrologic Impact Assessment (CHIA) for the Bear Brook tributaries, and the Ramsay Creek Preliminary SWM Design reports for Ramsy Creek.

Ramsay Creek

A stormwater management (SWM) analysis was completed by JFSA to support the development of the portion of the Tewin lands south of Leitrim Road, draining to Ramsay Creek. The assessment was undertaken using SWMHYMO v5.5 to quantify pre- and post-development peak flows, establish allowable release rates, and determine required storage volumes to mitigate downstream flood and erosion impacts. A standalone report is included in Appendix D.

Pre-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. Delineation was based on 1 m LiDAR data, reviewed and adjusted against existing studies and watershed boundaries.

Key inputs for the pre-development model included:

- Curve Numbers (CN*) based on Land Information Ontario (LIO) land use and soils data
- Time-to-peak calculations using the Federal Aviation Administration (FAA) method and topographic flow paths
- Channel routing using surveyed cross-sections and Digital Terrain Model (DTM)
- Continuous simulation for erosion analysis using 47 years of hourly rainfall data (1967–2016) from Ottawa International Airport

Post-Development Drainage Conditions

Under post-development conditions, 150.23 ha, will be directed to on-site SWM facilities. These facilities will outlet to the easternmost culvert under Leitrim Road. Additionally, an 8.4 ha natural channel corridor will remain unaltered and discharge to the existing western culvert.

Post-development peak flows were controlled to remain at or below pre-development levels through iterative pond sizing. The total drainage area to the Ramsay Creek confluence (JRC-4) remains essentially unchanged (313.44 ha pre vs. 313.79 ha post).

Unitary Release Rates and Storage Requirements

The required SWM facility storage volume and allowable release rates were established to ensure compliance with pre and post development conditions, and to satisfy erosion thresholds. Table 8-1 summarizes the maximum unitary release rate and storage volume needed to manage runoff from the development lands.

Table 8-1: 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

Bear Brook

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

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.

The 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 South Nation Conservation's (SNC) 2022 flood hazard mapping study. SWMHYMO was then used to assess storage requirements and validate post-development controls.

Unitary Release Rates and Storage Requirements

The unitary release rates for the Tewin Lands were derived to guide stormwater management design in a way that mitigates downstream hydrologic impacts. These rates were established by extracting peak flows from the original HEC-HMS spring model at a key downstream node (J32), which represents cumulative flow from the Tewin Lands and adjacent areas. Peak flows for multiple return periods (2-, 5-, 10-, 50-, and 100-year) were normalized by the total contributing drainage area (4,898 ha) to determine target release rates in litres per second per hectare (L/s/ha).

To determine storage volumes, a SWMHYMO model simulated post-development runoff using:

- 70% total imperviousness which is considered representative of the land uses proposed in the Tewin CDP, 60% of which was directly connected (typical of similar developments within the City of Ottawa),

- Horton's infiltration parameters (per City of Ottawa standards),
- 3-hour Chicago and 24-hour SCS Type II storms, with the latter proving most critical.

The resulting storage requirements ranged from 265 m³/ha (2-year) to 618 m³/ha (100-year).

Table 8-2: 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

Since 2022, SNC has revised its model to reflect updated watershed information and include further downstream areas. JFSA has thus produced a cumulative impact assessment of future development within the Bear Brook watershed (included in Appendix D) to evaluate how annual flood flows could be affected if the stormwater management objectives that are applied to the Tewin lands were applied to all potential future development. The future development lands in the report are conceptual, based on overlays of lands that were deemed "undevelopable" based on constraints. To undertake this assessment, the 2025 SNC HEC-HMS model was used to compare existing conditions and proposed conditions peak flows at 20 selected model nodes, most of which are located along the main branch of the Bear Brook. The analysis concluded that applying the Tewin SWM design (target release rates and storage) across all potentially developable lands in the Bear Brook watershed results in future-controlled 2- to 100-year peak flows (spring) that are lower than existing conditions at all 20 model nodes evaluated. Future-controlled spring or summer peak flows did not exceed the larger of existing spring or summer peaks at any location.

To support the erosion analysis work, a continuous hydrological model was necessary. The SNC HEC-HMS model is not continuous. JFSA developed a separate hydrologic model to undertake continuous simulations. Details on the continuous model are provided in the Bear Brook Continuous Model to Support Downstream Erosion Analysis (JFSA, April 2026) presented in Appendix D.

Both the JFSA continuous model and the updated 2025 SNC model produce pre-development unitary flow rates which are higher than those presented in the above table. A comparison is provided in the Tewin Pond Sizing Memo included in Appendix D. Unitary flow rates directly influence the required storage volume of quantity control ponds, smaller release rates necessitate larger storage volumes to maintain post-development flows at or below pre-development conditions. Given that both the updated 2025 SNC and JFSA models produce higher unitary flow rates, it can be concluded that the Tewin stormwater management ponds—designed using more conservative (lower) unitary release rates for the 100-year spring event—provide a conservative level of storage and that the pond footprints are oversized. As such the values presented in Table 8-2 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.

8.3.2 Quality Control Targets

Per Appendix A of the CLI-ECA, water quality requirements involve characterizing stormwater contaminants and controlling them as needed to protect the receiving environment per assessment studies. Requirements are to be based on the 90th percentile rainfall event.

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 per the JFSA Tewin EMP.

Provisions related to phosphorus load reduction in the Lake Erie and Lake Simcoe watersheds do not apply, as this drainage area does not discharge to either system.

8.3.3 Erosion Control Targets

Per Appendix A of the CLI-ECA, erosion control criteria for development scenarios may be established through an assessment identified in Table A1. The erosion threshold represents the magnitude of flow required to mobilize bed or bank material in the receiving watercourse and is used to evaluate the effectiveness of stormwater mitigation by comparing pre- and post-development flows.

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. Both these reports form part of the Environmental Management Plan.

The formal targets, based on industry standards, are the following:

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

Toronto and Region Conservation Authority. (2012, August). *Stormwater management criteria* (Version 1.0)

Credit Valley Conservation. (2015, January). *Fluvial geomorphic guidelines*.

8.3.4 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.

As only retention is a volume control mechanism, retention is to be targeted to maximum extent possible.

Per the CLI-ECA, maximum extent possible means maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices. Only retention measures are evaluated as filtration does not provide volume control.

8.4 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.

8.4.1 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.

8.4.2 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.

<u>Infiltration</u>

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.

<u>Reuse</u>

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

<u>Evapotranspiration</u>

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.

8.4.3 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.

8.4.4 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.

8.5 Summary of Stormwater Management Criteria

The Tewin development will be serviced by a storm sewer system designed in accordance with the amendment to the storm sewer and stormwater management elements of the Ottawa Design Guidelines. Table 8-3 presents the design guidelines employed in the design of the proposed stormwater sewer system.

Table 8-3: Stormwater Management Criteria

Design Parameter	Value
Minor System Design Return Period	2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Mobility Spine) – PIEDTB-2016-01
Major System Design Return Period	100-Year
Intensity Duration Frequency Curve (IDF) 5-year storm event. A = 998.071 B = 6.053 C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Initial Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	100 mm dia PVC SDR 28 with a minimum slope of 1.0%
Minimum Depth of Cover	1.8 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s (above 3.0 m/s may require protection against displacement by sudden jarring)
Clearance from 100-Year HGL	Not above ground surface in areas with sump pumps 0.30 m for USF in areas without sump pumps
Max Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extracted from Sections 5 and 6 of the City of Ottawa Sewer Design Guidelines, December 2025	

The following key City standards will be required for stormwater management within the subject lands and conveyance to the proposed stormwater management ponds, among other requirements:

- For less frequent storms (i.e. larger than the minimum level of service), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges;
- When catchbasins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope; and,
- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads.

Detailed stormwater management designs will be prepared in support of future development applications under the *Planning Act.*

Runoff Coefficients

The following run off coefficients (RC) were applied to the development to size the conceptual trunk network and the ponds.

- Neighbourhood Zones
  - 0.65 RC singles / 0.68 RC townhomes
  - Total 0.67 RC

- Transition Zones
  - 0.68 RC townhomes / 0.79 RC Rear Lane Townhomes, Back to Back, equiv.
  - Total 0.74 RC

- Core Zones
  - Higher Density Private Blocks
  - Total 0.80 RC

- Park
  - 5 year level-of-service
  - 100 year storage requirement
  - 0.40 RC

- Schools/ Community Centre
  - 5 year level-of-service
  - 100 year storage requirement
  - 0.60 RC
- Pond
  - 0.50 RC

- Water distribution Block (pump station and reservoir)
  - 0.60 RC

Runoff coefficients have been proposed based on typical impervious levels for maximum zoning using recent detailed design examples on Ottawa for the various land uses, noted above. Pervious surfaces such as landscaped areas are assigned a runoff coefficient of 0.2 while impervious surfaces such as paved surfaces and roofs were assigned a runoff coefficient of 0.9.

8.6 Stormwater Management Facilities

Stormwater management facilities are proposed at locations throughout the development that mimic the existing tributary catchment areas to the receiving watercourses as described in Section 5.6.3.2. These strategic pond locations treat both the quality and quantity of urban runoff, while maintaining the surrounding natural environmental features.

Permanent Pool

The required volumes for the permanent pool are set by the SWMP design manual in table 3.2. For enhanced level of protection (80% TSS removal), with 70% imperviousness, the following calculation applies.

(225m3/ha – 40m3/ha) x Tributary area (ha.) = Volume of permanent pool required (m3)

The 70% imperviousness target has been carried forward in this MSS as a conservative representation of the planned land uses in the Tewin CDP Secondary Plan. Calculations should be refined at the detailed design level to account for actual runoff coefficient and ensure sufficient volumes of permanent pools are provided.

Inlet Forebays

Inlet forebays were conceptually designed to respect the criteria set out by the MOE SWMP manual including the minimum length to width ratios and settling velocities. By-passes are incorporated to route the minor events towards the forebays and have larger storm events conveyed directly to the main cell. Sediment management areas were sized to be roughly the equivalent area of the permanent pool at each forebay and located adjacent to the inlet forebays for easy access during maintenance.

8.6.1 Land Tributary to Ramsay Creek

Headwater Feature Conceptual Design

The realignment of a headwater feature tributary to Ramsay Creek is being proposed for Block 1. This headwater feature is meant to provide ecological functions as described in the EMP report and will act as an outlet for a portion of Block 1. The naturalized headwater feature will be used as 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 with a mix of private and public roadways.

Treatment Train Approach

A combination of isolator rows and OGS units to achieve 80% TSS removal is proposed within the right-of-way and environmental feature. The headwater feature will incorporate naturalized flow attenuation mechanisms that ensure a controlled release rate to the downstream receiver.

Pond 1 Conceptual Design

The conceptual design for Pond 1 incorporates a permanent pool set as low as possible while maintaining positive drainage. The outlet discharges to a pipe that is routed towards the eastern lowered tributary of Ramsay Creek. The pond receives flows from three separate inlets, which have been designed to minimize pipe sizes and ensure the system remains as low as feasible. These inlets are generally positioned at the upstream end of the pond to optimize flow distribution. Sediment forebays, sized in accordance with MECP guidelines, are strategically located near the inlets making them accessible for operations. Additionally, a service road is provided around the entire facility to ensure accessibility for maintenance and provide a walking paths for pedestrians.

Table 8-4: Features Tributary to Ramsay Creek

ID	Trib Area (Ha)	RC	Quantity Required (m3)	Quantity Provided (m3)
Pond 1	123.6	0.68	67,289	75,787
Headwater Feature	29.9	0.64	16,304	69,629*

*Available storage

Lowering of Ramsay Creek Tributary

Block 1 is currently drained by two distinct watercourses, each with culverts crossing at Leitrim Road. The western feature consists of a series of agricultural surface ditches, effectively serving as a farmer's drainage system through agricultural fields. North of Leitrim Road, both watercourses transition into straightened and unconfined channels that flow through agricultural areas, eventually converging approximately 600 meters downstream.

The western channel measures 4-6 meters in width, with an approximate depth of 1.5 meters, a slope of ~0.2%, and a riparian zone spanning 9-13 meters. The eastern channel is slightly narrower at ~5 meters wide but deeper at 2.0 meters, with a steeper slope of

~0.3% and a wider riparian zone of 17-19 meters. 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, ranging from approximately 79.8 meters to localized depressions as low as 78.8 meters. Grade raise exceedances across the site pose a design challenge, therefore, adjusting the outlet is desirable. It is recommended to lower the eastern tributary of Ramsay Creek to partially alleviate these exceedances while also improving the ecological function of the existing corridor. The scale of the impact on grade raise exceedances is expected to be significant:

- **Existing channel invert:** 77.1 m
- **Minimum permanent pool elevation:** 77.1 + 0.15 = **77.25 m**
- **Minimum obvert of 2250 dia. storm pipe 50% submerged:** 77.25 + (2.25/2) = **78.37 m**
- **Minimum road starting grade at pond:** 78.37 + 2.0m cover = **80.37 m**

A large portion of block 1 has existing grades around 80 m. This calculation highlights that the majority of Block 1 would exceed the permissible grade raise recommendation of 0.5 meters above the existing ground if the tributary is not regraded.

To address this, both tributaries were evaluated for potential lowering. 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 heavily altered outlet and allows for a significant reduction in final grades across Block 1.

The NCC was approached about the lowering of Ramsay Creek and has indicated willingness to review design details further. Preliminary versions of a lowered channel with added ecological functions has been presented to NCC staff for preliminary input. Feedback was received, and the conceptual design has been refined to ensure existing agriculture operations are thoughtfully considered. A conceptual channel design, completed by Geomorphix is included in Appendix E.

If approval to lower the Ramsay Creek channel is not granted by the NCC, the overall servicing strategy for sanitary, water, and stormwater systems will remain unchanged. Without the lowered outlet, the storm sewer network would need to be set at higher elevations. This would result in higher finished grades throughout Block 1, leading to an increased number of grade raise exceedances. Therefore, more units would require sump pumps, and multi-year surcharge programs would be required to meet permissible grade raise limits. Despite these additional grading and mitigation requirements, the design can be successfully implemented to meet all functional servicing requirements.

Ramsay Creek Erosion Analysis

To assess potential erosion impacts, GEO Morphix completed an erosion threshold analysis for Ramsay Creek (presented under separate cover) by modelling both pre- and post-development runoff conditions for the contributing drainage area. The hydrologic model provided by JFSA was used to estimate runoff volumes based on appropriate runoff coefficients and catchment parameters. This analysis considered flow duration and frequency characteristics to evaluate the potential for increased erosive forces in the receiving watercourse. GEO Morphix supported the study by identifying channel sensitivity and providing geomorphic thresholds to guide the design of erosion control measures.

The conclusion from the Ramsayville Exceedance Report (GEO Morphix, March 2026) confirm that the erosion criteria for the site have been met.

Grading Implications

The stormwater management network governs the grades on site. To set the centerline of road grades, consistent with City guidelines the following criteria were considered:

1. Providing 0.3m freeboard from the 100 year HGL to the underside of footing.
2. Minimum cover of 2.0m over the obvert of storm pipes.
3. Verification that the sanitary HGL during the City of Ottawa mandated catastrophic event does not reach the underside of footing.
4. Minimum 0.1% slopes from high point to high point on the road network.
5. Major overland flow directed towards ponds.

The starting centerline of road is determined by the worse case scenario (highest centerline of road) grade near the pond. Minimum pipe sewer slopes and grades are used to grade the site upstream of the pond. Following this procedure, a conceptual grading plan is developed and compared against the recommended permissible grade raise to verify against exceedances in the road right-of-ways.

Due to the relatively flat site, and low values for permissible grade raise (approximately 0.5m) the grading plan assuming free-draining units results in many exceedances of the permissible grade raise.

There are several developments within Ottawa where this condition is encountered.

Recognizing this, the City of Ottawa allows the use of sump pumps (ISTB-2018-04 and ISTB -2019-02) where certain screening criteria are met: These criteria are:

1. *The area under consideration is on full services.*
2. *The area under consideration is underlain by clay soils subject to grade raise restrictions.*

3. *The finished grades that would be required to allow gravity drainage would exceed permissible grade raises, potentially leading to long-term settlements that exceed the OBC and City of Ottawa Standards. In making this determination, the proponent must allow for the placement of lightweight fill under the garage and porch. The use of sump pump systems would thus alleviate excessive areas of lightweight fill (beyond the garage and porch), long duration (multi-year) pre-loading, or other such extreme means to prevent long-term settlements. Grade raise restrictions are to be determined by a geotechnical engineer with specific experience in this matter. The analysis and results must be to the satisfaction of the City of Ottawa.*
4. *Hydraulic grade lines (HGL) cannot reasonably be lowered any further due to outlet restrictions. Outlet restrictions need to be clearly defined and reasonable options considered. In addition, increasing the storm sewer pipe size to reduce the HGL should have a higher priority than the implementation of sump pump systems.*

Condition 3 is intended to ensure that sump pumps are not proposed where grade-raise constraints can be fully mitigated using lightweight fill alone. This is not the case for Tewin in Block 1. Grade-raise exceedances persist even with the inclusion of sump pumps, which reduce the required finished grade relative to a gravity drainage system.

Sump pumps are proposed only in areas where lightweight fill will still be required on private lots. Dwellings that exceed permissible grade raises will require lightweight fill beneath garages and porches. The use of sump pumps allows the final road grade to be reduced by up to 1.6 m compared to a road serving gravity-drained units. Without sump pumps in the proposed locations, grade-raise exceedances would occur within the rights-of-way, resulting in excessive lightweight fill on private lots and the need for a multi-year pre-loading program within the road allowances.

Based on the above, the intent of the condition is satisfied.

Hydraulic constraints were also reviewed to confirm that the need for sump pumps is not driven by storm sewer capacity. Outlet limitations associated with Ramsay Creek, including the proposed channel lowering, have already been accounted for, and the hydraulic grade line is not the controlling factor. Further lowering the HGL or increasing storm sewer sizes would not resolve the grade-raise constraints that preclude gravity drainage. Accordingly, sump pumps are required in select areas of Block 1.

Grading constraints for areas where units are equipped with sump pumps, consistent with City guidelines:

1. Catch basin top of grates located above the 1:100 year HGL.
2. Minimum of 1.8m cover from centerline of road to pipe obvert.
3. Verification that the sanitary HGL during the City of Ottawa mandated catastrophic event does not reach the underside of footing.
4. Minimum 0.1% slopes from high point to high point on your road network.

5. Major overland flow directed towards your ponds.

Free-draining units are proposed in areas where grade raise exceedances can be avoided. In cases where the permissible grade raise recommendations are violated, sump pumps are recommended.

Pipe network

The design for Pond 1 incorporates three separate inlets, which have been optimized to minimize pipe sizes and maintain the system at the lowest possible grades. An existing drainage feature near the western boundary of the pond was considered, and pipe elevations were confirmed to accommodate the creek crossing. The inlet pipes are submerged below the permanent pool to minimize grade raises and avoid exceedances. This approach is consistent with approved techniques utilized in the City of Ottawa for soils with grade raise restrictions, similar to those at Tewin.

The maximum pipe size at the inlets is 2250 mm in diameter, with obvert-to-obvert connections applied using minimum slopes and drops as per the *Ottawa Sewer Design Guidelines* (OSDG). Sanitary crossings were verified and generally do not pose a constraint since the sanitary sewer network runs deeper than the storm system. For future local road sewers, the design will ensure grades are minimized and minimum cover requirements are met.

8.6.2 Lands Tributary to Bear Brook

Pond 2, 3 and 4, 5 ,6A and 6B Conceptual Designs

Each conceptual pond was designed with the same basic features. These features include:

- Permanent pool set as low as possible while maintaining positive drainage to the receiving watercourses.
- The permanent pools are designed to be 1.5 m deep.
- 1.5m conceptual active storage (to be refined at functional design)
- Pond outlets are designed as open channels, with emergency spillways provided at the outlets to direct overflow towards the receiving watercourses.
- Top of pond banks are set to be 0.3 m above the 1:100-year water levels consistent with City guidelines.

- Inlets are located at the upstream ends of the ponds, and designed to minimize pipe sizes and keep the grading low to respect grade raise restrictions where possible.

- A continuous service road surrounds each facility to provide maintenance access.

- Grading tie-ins and pond limits are situated outside the governing:

  - Paterson Slope Hazard Extent
  - Geomorphix Meander Belt Extent
  - South Nation Conservation 100 year floodplain
  - Ecological corridor recommendations

The conceptual pond designs incorporate consistent features aimed at achieving efficient stormwater management while ensuring compliance with design standards and site constraints. Conceptual level designs for each pond are provided in the drawing package. As development applications proceed, details will be refined and every opportunity to reduce footprints will be explored at functional design. Localized lowering of the Bearbrook tributaries may be beneficial to improve grading conditions for Tewin or potential future lands outside of Tewin.

Bear Brook Tributary SWM Ponds

A total of 8 ponds are being proposed to service Blocks 2 and 3. The drainage areas tributary to each pond range between 114 ha to 30 ha which are within typical range of quantity control ponds in Ottawa. The ponds were all conceptually designed to respect the quality and quantity requirement criteria outlined in earlier section. Table 8-5 presented below provides a summary of the proposed facilities. The modeled RC of 0.7 was used as a conservative approach for this MSS. This value is slightly greater than the RCs assumed based on the land use plan. This approach is prudent for MSS level designs and allows for flexibility should impervious assumptions change.

Table 8-5: Ponds Tributary to Bearbrook

ID	Trib Area (Ha)	Modeled RC	Min. Quantity Required (m3)	MSS RC (based on landuse plan)	Quantity Provided [100-year] (m3)
Pond 2A	77.03	0.70	47,604	0.62	58,730
Pond 2B	114.34	0.70	70,662	0.61	76,997
Pond 3	30.25	0.70	18,694	0.65	30,016
Pond 4A	75.37	0.70	46,566	0.65	52,585

Pond 4B	34.23	0.70	21,148	0.67	23,396
Pond 5	58.60	0.70	36,205	0.68	44,703
Pond 6A	94.23	0.70	58,218	0.67	68,717
Pond 6B	61.34	0.70	37,898	0.67	38,030

Based on the criteria set by the Cumulative Impact Study, the conceptual ponds have adequate volumes to manage runoff to the downstream receiver.

Pond 4B Integrated Design

Pond 4B is located next to proposed wetland features, as detailed in the EMP. These features are expected to offer environmental benefits and have been carefully designed to coordinate with the stowmater management approach for the site. Pond 4B is proposed as traditional stormwater management facilities that are sized to provide quality treatment and to retain volumes generated for a minimum of 10 year storm event through the use of a traditional outlet structure. These ponds would be subject to traditional maintenance requirements for stormwater management facilities.

For larger storms, the pond IS conceptually designed to overtop and spill towards the wetland features that act as additional storage. Earthen weirs will be incorporated within the wetland features to further control post-development flows for larger storm events. Both controls (outlet structure and earthen weirs) will be designed to respect the allowable release rate for these areas. Although the wetland feature is proposed within the hazard limits the feature would be designed to ensure there is no increased erosion risk, flood risk, public safety risk or slope instability. This integrated approach is consistent with the Tewin intent for alternative design solutions that promote systems-based environmental planning and efficient land use of infrastructure.

Pond 2B

Pond 2B is being proposed adjacent to a Hydro corridor. At the draft plan stages, opportunities to locate a portion of the pond within the Hydro corridor will be explored. Hydro has the following general guidelines for these cases:

1. *Stormwater management (SWM) ponds placed under 115 and 230 kV transmission lines cannot exceed two-thirds of the corridor width.*
2. *Hydro One requires fifteen (15) meters of clearance on all sides around its transmission structures, as measured from the nearest structure member (base of pole, tower leg footing or structure anchor), in order to carry out maintenance operations.*

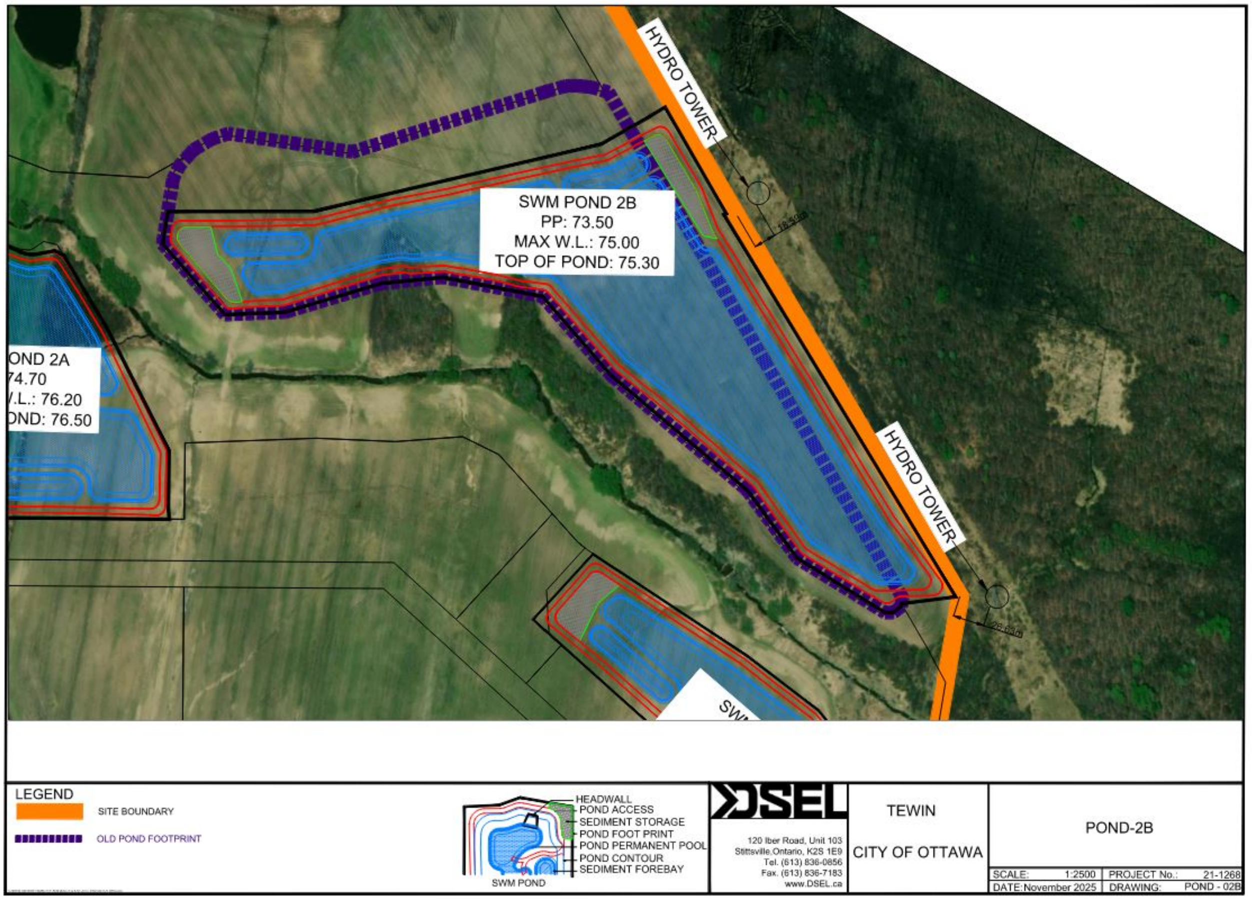


Figure 8.1: Pond 2B Alternate Location

A standard construction agreement will need to be executed and all conditions pertaining to the agreement shall be met should this option be chosen.

Bear Brook Erosion Thresholds Analysis

To assess potential erosion impacts, GEO Morphix completed an erosion threshold analysis for Ramsay Creek (presented under separate cover) by modelling both pre- and post-development runoff conditions for the contributing drainage area. The hydrologic model provided by JFSA was used to estimate runoff volumes based on appropriate runoff coefficients and catchment parameters. This analysis considered flow duration and frequency characteristics to evaluate the potential for increased erosive forces in the receiving watercourse. GEO Morphix supported the study by identifying channel sensitivity and providing geomorphic thresholds to guide the design of erosion control measures. Erosion thresholds represent the critical flow conditions (e.g., discharge or shear stress) required to initiate sediment movement from the bed or banks of a watercourse. These thresholds are used to guide erosion mitigation strategies within channels influenced by stormwater management.

The conclusion from the Bear Brook Exceedance Report (GEO Morphix, March 2026) confirm that the erosion criteria for the site have been met.

Pipe Network

Storm pipes were conceptually designed with obvert-to-obvert connections applied using minimum slopes and drops as per the *Ottawa Sewer Design Guidelines* (OSDG). Sanitary crossings were verified and generally do not pose a constraint since the sanitary sewer network runs deeper than the storm system. For future local road sewers, the design will ensure grades are minimized and minimum cover requirements are met.

Table 8-6: Partially Submerged Inlets

Pond ID	INLET	Stm Size (mm)	Approximate Submergence
POND 1	HW 1	2250	71%
	HW 2	1950	60%
	HW 3	2100	86%
Channel	HW 802	900	0%
	HW 808	900	0%
	HW 814	900	0%
	HW 820	900	0%
	HW 826	900	0%
POND 2A	HW 10	1950	48%
	HW 11	2400	37%
POND 2B	HW 8	2100	43%
	HW 9	2250	42%
POND 3	HW 12	1950	10%
POND 4A	HW 14	1650	0%
	HW 15	2100	44%
POND 4B	HW 4	1200	0%
POND 4B	HW 13	2100	5%
POND 5	HW 16	1500	47%
	HW 17	2250	30%

POND 6A	HW 18	2400	10%
	HW 19	1950	11%
POND 6B	HW 20	1800	11%
	HW 21	1950	27%

Due to the grade raise restrictions across the site, several storm sewer inlets were designed to operate in a partially submerged condition to keep grade raise exceedances within the right-of-way to a minimum. In areas within the City of Ottawa where clay soils impose Limits on PGR, such as Tewin, partial submergence is an accepted practice to maintain adequate sewer cover without requiring extensive surcharge programs or excessive earthworks. Submerging inlets allows upstream pipe elevations to be lowered, thereby helping maintain compliance with geotechnical constraints.

Table 8-6 provides an approximation of the expected submergence at key inlets based on concept-level grading. As detailed grading advances and permissible grade raises are refined, efforts will be made to reduce submergence where feasible while maintaining a functional storm sewer network.

In addition, several operational and structural measures can be incorporated to isolate the stormwater management ponds when required. These features support maintenance, inspection, sediment removal, and emergency response procedures without affecting upstream or downstream conveyance. Common measures include:

- Standardized stop-log panels and gains, which allow flows to be temporarily blocked or throttled, enabling controlled drawdown or isolation of specific cells within the pond.
- Slide gates or sluice gates, which provide adjustable flow control at the outlet, allowing operators to shut off or modulate discharge during maintenance activities.
- Bypass pipes or channels, which redirect flows around the pond during cleaning or repairs, maintaining upstream drainage continuity.
- Temporary cofferdams or inflatable plugs, used during exceptional maintenance events to isolate structures or inlet/outlet chambers.

These measures provide flexibility for long-term operation, enhance maintenance efficiency, and ensure that the stormwater system continues to function effectively while individual components are taken offline when necessary.

Grading Implications

The stormwater management network governs the grades on site. In order to set the centerline of road grades for the site, the following criteria were considered:

Free Draining units:

1. Providing 0.3m freeboard from the 100 year HGL to the underside of footing
2. Minimum cover of 2.0m over the obvert of the storm pipes
3. Verification that the sanitary HGL during the City mandated catastrophic event does not reach the underside of footing
4. Minimum 0.1% slopes from high point to high point on your road network
5. Major overland flow directed towards the ponds.

The starting (lowest) centerline of road is determined by the worse case scenario (highest centerline of road) grade near the pond. Minimum pipe sewer slopes and grades are used to grade the site upstream of the pond. Following this procedure, a conceptual grading plan is developed and compared against the recommended permissible grade raise to verify against exceedances in the road right-of-ways.

8.7 HGL Analysis

The storm sewer hydraulic grade line (HGL) was modeled in accordance with the City of Ottawa Sewer Design Guidelines.

The stormwater management system was simulated using PCSWMM, a hydrologic and hydrodynamic modeling software. Design sheet flow rates were used as input, with a 35% increase applied to account for additional head pressure on inlet control devices (ICDs) during the 1:100 year storm event. These adjusted flow rates were input at their corresponding model nodes. HGLs were generated for the 1:100 year event to assess freeboard adequacy for units with basements.

In the absence of detailed lotting or specified product types, a fixed vertical relationship between the road centerline and underside of footing (USF) was applied, based on typical single-family units with basements. This approach is consistent with Master Servicing Study (MSS)-level design. A minimum vertical separation of 1.8 m between the road centerline and USF, combined with a minimum 0.3 m of freeboard between the USF and the HGL, results in a required total freeboard of 2.1 m from the road centerline to the HGL.

Most areas within the site meet this freeboard requirement. However, several manholes in Block 1 fall short of the full 2.1 m freeboard due to grading constraints. To address this, sump pumps will be provided for units fronting storm sewers with insufficient separation, ensuring continued compliance with the City’s freeboard criteria. The complete HGL analysis is provided in Appendix D.

8.8 Water Budget

8.8.1 Pre Development Water Budget

JFSA completed a pre-development water budget analysis for the Tewin Lands, which was approved and is available under separate cover. The purpose of this analysis was to quantify key hydrologic processes under existing conditions, providing a baseline for evaluating future development impacts and guiding servicing and stormwater management strategies.

A water budget model was developed to simulate key components of the hydrologic cycle under pre-development conditions at the Tewin Lands. The model operates on a daily timestep, providing a higher-resolution and seasonally responsive representation of hydrologic processes compared to conventional monthly or annual methods.

Key inputs to the model include:

- **Daily meteorological data** (temperature, rainfall, snowfall, snowpack) from Environment Canada's Ottawa CDA station;
- **Land use and soil type classifications** to establish curve numbers (CN) and initial abstraction values;
- **Topographic drainage areas**, derived from City of Ottawa LiDAR data;
- **Site-specific monitoring data** (2022 flow and rainfall records) to support calibration;
- **Hydrogeological recharge estimates** from the Dillon Consulting report (April 2024).

The water budget analysis used a daily timestep model to assess the full annual water balance across the Tewin Lands. This model considered site-specific land cover, soil conditions, and meteorological data to simulate the following hydrologic processes:

- **Precipitation and Snowmelt** (including degree-day snowmelt modelling)
- **Evaporation and Evapotranspiration** (based on Thornthwaite method)
- **Interception losses** (variable by land cover and season)
- **Surface runoff** (using the SCS Curve Number method with seasonal adjustments)
- **Infiltration** to shallow soil storage and partitioning into:
    - Interflow
    - Baseflow
    - Deep groundwater recharge

Input data included 2022 site monitoring data (flow and rainfall), long-term daily flow records from the Water Survey of Canada's Bear Brook Gauge near Bourget, and climate normals from Environment Canada. The Bear Brook gauge was used to verify model results and extend the analysis across all seasons. Detailed results are presented in the approved report, under a separate cover. A summary of the results is presented in Table 8-7.

Table 8-7: Pre-development Water Budget Results

Watershed	Total Evaporation	Total Transpiration	Total Direct Surface Runoff	Total Infiltration (Interflow+Baseflow+Deep Aquifer)
Ramsay Creek	25%	23%	18%	34%
Bear Brook	32%	19%	17%	32%

8.8.2 Post Development Water budget

Post-development scenarios were modeled by JFSA (under separate cover) for both the Ramsay Creek and Bear Brook tributaries to evaluate the effects of urbanization on the hydrologic balance. The model was updated to reflect proposed land uses, including an increase in impervious surfaces and reconfiguration of drainage patterns associated with urban development. Results from the evaluation are presented in Table 8-8.

Table 8-8: Post-Development Water Budget Results

Watershed	Evaporation	Total Transpiration	Total Direct Surface Runoff	Total Infiltration (Interflow+Baseflow+Deep Aquifer)
Ramsay Creek	22%	6%	63%	10%
Bear Brook	23%	8%	57%	12%

Table 8-9: Differences in Annual Water Budget Between Proposed and Pre Development Conditions

Watershed	Total Evaporation	Total Transpiration	Total Direct Surface Runoff	Total Infiltration (Interflow+Baseflow+Deep Aquifer)
Ramsay Creek	-4%	-16%	+44%	-24%
Bear Brook	-9%	-11%	+40%	-20%

As expected, development leads to an increase in runoff and a corresponding reduction in evapotranspiration, with minimal impact to deep groundwater recharge. These changes are typical of urbanized environments.

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.

As only retention is a volume control mechanism, retention is to be targeted to maximum extent possible.

Per the CLI-ECA, maximum extent possible means maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices. Only retention measures are evaluated as filtration does not provide volume control.

As documented in Section 8.4.1 and consistent with Appendix 10 of the City of Ottawa design guidelines which prohibits the use of infiltration type LIDs in clay soils there are no opportunities for municipally owned and operated infiltration-based LIDs. As a result, there is limited potential for infiltration. To address the post-development infiltration deficit identified in the EMP, a suite of Best Management Practices (BMPs) is to be considered at a lot level during functional design. The applicable BMPs for the development include:

- Downspout/foundation drain disconnection;
- Roof leaders to grassed areas;
- Reduced lot grading;
- Grassed swales;
- Soil amendments;

8.8.3 Feature-Specific Water Budget

A feature-based water budget and hydrologic assessment was completed by JFSA Inc. for the Tewin Lands to build upon the October 2024 Existing Conditions Water Budget Analysis. The report is presented in the EMP under a separate cover. The study evaluated key components of the hydrologic cycle—precipitation, interception, evapotranspiration, surface runoff, and groundwater recharge—under existing conditions using historical climate data and field monitoring from the site.

The analysis focused on nine significant woodlands within the Tewin Lands, totaling approximately 35 hectares. These woodlands were identified based on ecological significance, following criteria established by Kilgour & Associates Ltd. (2024), City of Ottawa's Significant Woodlands Guidelines, and supported by the Provincial Natural

Heritage Reference manual, including a minimum size of 0.8 ha and forest age of 60 years or older. The identified features included mixed forests, conifer plantations, swamps, and thickets.

The objective was to assess hydrologic function at a feature-specific scale to inform development planning. The analysis provided insight into how volume, seasonal timing, and spatial distribution of water inputs could be maintained to avoid negative impacts on the ecological form and function of these significant woodlands.

Hydrologic partitioning was assessed for each of the nine significant woodlands, with consistent results observed across features. On average, 36% of total precipitation was lost to evaporation, 21% to transpiration, 30% contributed to direct surface runoff, and 13% infiltrated into the subsurface through interflow, baseflow, and deep aquifer recharge.

Infiltration, evapotranspiration and transpiration is not expected to be altered under post-development conditions as no development will occur within the woodlands. Grading under post-development conditions will need to ensure that clean direct surface runoff is maintained towards the woodlots. To achieve this, measures such as directing runoff from rear yards, parks, and/or overland flow routes will be employed to ensure the woodlots remain properly hydrated. In areas where less surface water is being directed to the woodlots in post-development conditions, a monitoring plan is being proposed. Should the condition of the woodlot begin to deteriorate, modification to the outlets such as raising the outlet to allow the woodlot to retain more water could be implemented.

8.9 Legal and Sufficient Outlet

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. 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.

For portions of the watercourses that are on NCC property, access easements will be coordinated through the FLUDTA process, rather than establishing a municipal drain.

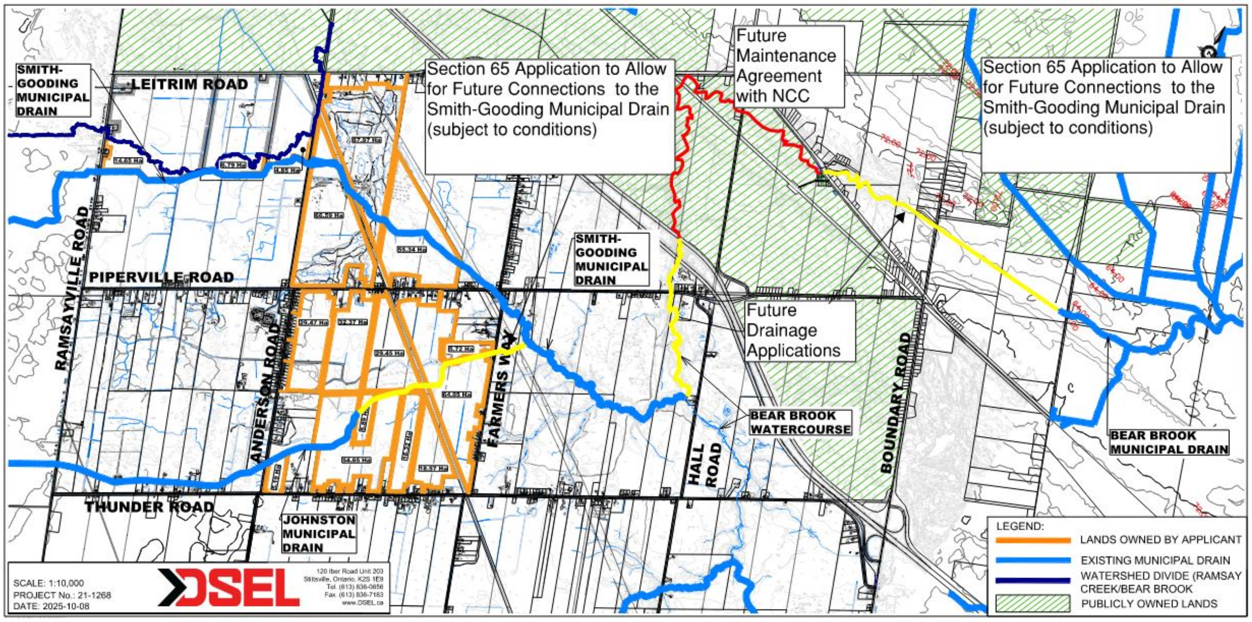


Figure 8.2: Legal and Sufficient Outlets

9.0 GRADING

The grading design incorporates standard City of Ottawa practices to ensure effective drainage and proper integration with surrounding properties. All stormwater management facility outlets are positioned at the lowest feasible elevations. Overland flow is directed towards stormwater management (SWMM) facilities for collection and treatment. Grading tie-ins at development limits are designed to align with existing property grades, preventing stormwater from being directed toward existing residences. A minimum slope of 0.1% is maintained between high points to ensure effective drainage.

The following additional grading criteria and guidelines will be applied to the detailed grading designs in future development applications as per City of Ottawa Guidelines:

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15 m deep with 3:1 side slopes unless otherwise indicated; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope (preferred to promote infiltration) and will be used to interconnect rear yard catchbasins where possible.

9.1 Grading Summary

Paterson group have reviewed the grading and servicing plans to confirm that the proposed master site servicing and grading strategies are considered feasible for the subject site from a geotechnical perspective. A summary of their findings is presented in Geotechnical Review of Master Site Servicing Strategies Proposed Mixed-Use Community Development Tewin Communities – Report PG5827-MEMO.19. A copy of the memorandum is included in Appendix E.

There are localized areas where grade raise exceedances are shown on the grading drawings. These areas represent areas of potential grade raise exceedances for further review. A blanket grade raise restriction of 0.5m was applied to inform the drawings. It is expected that detailed permissible grade raise will continue to be refined to determine actual permissible grade raise restrictions. Grading will also be optimized to reduce or eliminate the need for road surcharge in Blocks 2 and 3 and minimize the need for any surcharge program in Block 1.

10.0 UTILITY COORDINATION

Utility companies have been contacted to understand the existing utilities within the study area. Existing utilities, as confirmed by the respective providers, are listed below.

Hydro Ottawa

- High voltage corridor with transmission towers that bisect a portion of the site on Block 2
- Overhead hydro lines are located on all existing right-of-ways: **Leitrim Road, Piperville Road, Thunder Road, Anderson Road, Ramsayville Road, Farmers way.**

Bell

- **Bell corridor** bisecting the site – buried copper cables
- **Leitrim Road** from Ramsayville to Anderson - existing buried trunk cable
- **Anderson** Road from Leitrim to easement – existing buried trunk cable

Rogers

- **Ramsayville Road** (from Leitrim Road to Piperville Road) aerial

- **Anderson Road** (from Leitrim Road to Thunder Road) From Leitrim Road to 4296 Anderson Road - buried, Piperville Road to Thunder road - aerial.

- **Farmer’s Way** (from Leitrim Road to Thunder Road) from Leitrim Road to Piperville - aerial and buried, Piperville Road to Thunder Road – buried, aerial from 4675 to 4725 aerial, 4875 to thunder road aerial.

- **Leitrim Road** (from Ramsayville Road tp Highway 417) – Buried (Ramsayville road to 4968 Leitrim Rd) (4968 to hwy 417 – aerial)

- **Piperville Road** (from Ramsayville Road to Farmer's Way) – Aerial

Enbridge

- Enbridge have confirmed there are no existing facilities within the development limits.

In support of the Tewin Secondary Plan, a Community Energy Plan has been prepared, under separate cover. This plan outlines considerations for delivering energy to the new community, with a focus on the project's goal to reduce greenhouse gas emissions and respond to current and future effects of climate change.

All utility extensions and phasing are to be addressed as development applications advance within the CDP area. Partnerships with utility companies will continue to be explored to achieve the project's goals of being a highly connected community that seamlessly supports working from home and is well-suited to embrace emerging technological trends.

11.0 CLIMATE CHANGE RESILIENCY

The proposed servicing strategy integrates climate change considerations in accordance with City of Ottawa guidelines and industry best practices, to ensure long-term system performance and risk mitigation under future climate conditions.

Key measures include:

- **Storm Sewer Design**: At detailed design, storm sewer systems will be assessed using the 1:100-year return period event increased by 20% to reflect projected climate intensification. This analysis will confirm that hydraulic grade lines remain below underside of footing elevations, providing adequate protection for residential basements.

- **Overland Flow Management**: Macro-level grading has been planned to direct major system overflows toward stormwater management facilities and away from dwellings, in line with the City's dual-drainage requirements.

- **Stormwater Facility Resiliency**: All stormwater management facilities will be equipped with emergency overflows directed toward receiving watercourses, ensuring controlled discharge paths and minimizing risks to private property in extreme storm events.

- **Sanitary Overflow Protection**: To mitigate the risk of basement flooding during pump station failure or extreme inflow events, sanitary overflow provisions have been included as part of the conceptual design.

- **Water System Redundancy**: Watermains are looped to ensure system reliability and operational flexibility under emergency conditions, consistent with City design standards for redundancy and pressure management.

These strategies demonstrate a proactive and technically grounded approach to addressing climate change impacts within the Tewin servicing framework and are intended to meet the City's expectations for resilient infrastructure planning.

12.0 IMPACT ASSESSMENT AND MITIGATION MEASURES

12.1 Methodology

A project's environmental effect can be described as an impact or change, positive and/or negative, of an activity on the environment. The determination of project environmental effects involved applying the following steps:

Step 1. Identify and analyze instances where the project may interact with existing environmental conditions.
Step 2. Acknowledge predetermined project activities that act as built-in mitigation measures.
Step 3. Identify residual environmental effects, if any;
Step 4. Determine significance of the residual environmental effects, after mitigation.

12.2 Project Interactions

Table 12-1 identifies areas where the project may interact with the biophysical and social environmental components in the study area. Only those components with the potential for interactions with the project were analyzed.

12.3 Mitigation Measures

In this assessment, mitigation measures are actions intended to eliminate, reduce, control or offset the adverse effects of a project on the existing environment. They can include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or other means that are technically and economically feasible. They include actions and design features that can be incorporated in the preconstruction, construction, and operation phases that have the specific objective of lessening the significance or severity of environmental effects which may be caused by the project.

The Tewin development project has been designed and will be implemented with the benefit of contemporary planning, engineering, and environmental management practices for construction. Regard shall be had for the legislation, policies, regulations, guidelines, and best practices of the day. Mitigation measures identified in the environmental assessment process will be identified in the construction contracts and specifications.

General Practices, based on current standards, laws and guidelines that should be employed to mitigate general effects on the overall project are described below.

12.4 Public Communications Plan

The purpose of a communications plan is to keep the public informed about the work in progress and the end result of the construction activity. Residents and other stakeholders must be aware of scheduled lane closings and other disruptions to normal service ahead of time in order that their activities can be planned with minimum disruption. The public communications plan should detail how to communicate the information to the public, what information should be disseminated, and at what project stages the communications plan should take place. Prior to construction, the proponent will implement the Public Communication Plan. Residents will be notified in advance of upcoming construction activities through appropriate means such as mailed notices, on-site signage, or municipal websites.

12.5 Erosion, Sedimentation and Drainage Control Plan

The purpose of this plan is to determine the degree of erosion and sedimentation that would occur under normally anticipated weather conditions during the life of the project. It also assists in the development and implementation of mitigative strategies to control any foreseen areas determined to be pre-dispositioned to the problem. This could include: the identification of planning and slope rounding specifications within the contract tender; identifying and specifying seeding locations; identifying areas requiring slope benching or retaining structures; site specific measures to prevent erosion and sediment production; drainage control; and any post construction monitoring and mitigative practices. The contractor will be responsible for the development and implementation of the Erosion, Sedimentation and Drainage Control Plan, subject to review and approval by the City.

12.6 Excess Soil Management Plan

In accordance with Ontario Regulation 406/19: On-Site and Excess Soil Management, excess soil generated during construction of the subdivisions will be managed to ensure compliance with provincial regulatory requirements. The regulation mandates that excess soil must be characterized, tracked, and managed in a manner that protects human health and the environment, while promoting beneficial reuse where appropriate.

During detailed design, the following measures will be implemented to manage excess soils:

- **Soil Characterization**: A Qualified Person (QP) will conduct sampling and analysis of all potentially excess soils in accordance with the regulation's requirements, including characterization against applicable Site Conditions Standards.

- **Reuse Assessment**: Opportunities for on-site reuse of suitable soils will be prioritized to reduce off-site disposal and transportation. If reuse is not feasible, receiving sites will be identified that meet regulatory requirements for quality, quantity, and purpose of use.

- **Documentation and Tracking**: A Soil Management Plan (SMP) and Tracking System will be developed where applicable, to document soil movements, receiving sites, and compliance with regulatory thresholds.

- **Registration and Notices**: Where required, project notices and excess soil registry filings will be completed in accordance with the regulation’s timeframes and content requirements.

- **Contractor Compliance**: Construction tender documents will include specifications to ensure that all contractors comply with O. Reg. 406/19 and any project-specific soil management procedures.

These activities will be integrated construction planning phases to ensure regulatory compliance, minimize environmental impact, and optimize the reuse of clean fill materials.

12.7 Traffic Control Plan and Signage Plan

Construction activities within the subdivision, including the planned commercial area, will cause temporary traffic and access disruptions. To ensure public safety and minimize inconvenience, the Contractor will be required to prepare a detailed traffic control plan, including temporary detours, signage, and access provisions for residents, businesses, and service vehicles, as required, as part of construction planning and staging.

12.8 Tree Protection and Landscaping Plan

A landscaping strategy has been developed for the project in the CDP, and will be implemented through future development applications. As part of the subdivision process, a Tree Conservation Report will be prepared to identify existing woodlots consistent with the Environmental Management Plan (EMP) that are to be preserved, along with the required mitigation measures during construction to avoid harm or damage. Trees designated to be kept, will be protected according with the City’s Field Practices and Regulatory Codes for Construction Activities around Trees. Existing landscaping (lawns) will be re-instated according to the landscape plan, following construction. The health of any new landscaping materials will be monitored following planting.

12.9 Residual Effects and Significance

In this assessment, “residual” environmental effects are defined as changes to the environment caused by the project, and vice versa, when compared to existing conditions and taking into account all *built-in* mitigation measures. Potential residual environmental effects were assessed as to their significance, including spatial and temporal considerations, and were categorized according to the following definitions:

- *"Negligible"* means an effect that may exhibit one or more of the following characteristics:
    - nearly-zero or hardly discernible effect; or
    - affecting a population or a specific group of individuals at a localized area and/or over a short period in such a way that the effect is similar to random small changes but would have no measurable effect on the population as a whole.
    - *"Insignificant"* means an effect that may exhibit one or more of the following characteristics:
        - not widespread;
        - temporary or short-term duration (*i.e.,* only during construction phase);
        - recurring effect lasting for short periods of time during or after project implementation;
        - affecting a specific group of individuals in a population or community at a localized area or over a short period, but not affecting the integrity of the population or community; or
        - not permanent, so that after the stimulus (*i.e.,* project activity) is removed, the integrity of the environmental component would be resumed.
    - *"Significant"* means an effect that may exhibit one or more of the following characteristics:
        - widespread;
        - permanent transcendence or contravention of legislation, standards, or environmental guidelines or objectives;
        - permanent reduction in species diversity or population of a species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural reproduction or immigration would not return that population, or any species dependant on it, to its former level within several generations;
        - permanent loss of critical/productive habitat; and/or
        - permanent alteration to community characteristics or services, established land use patterns, which is severe and undesirable to the community as a whole.

The definitions of significance were adopted for use in this assessment with consideration of both the Municipal Class Environmental Assessment document (2024) and the Impact Assessment Agency of Canada guidance document for describing environmental effects and characterization of significance. These documents provide guidance and are intended to promote a consistent basis across the project environmental components.

Monitoring is important to verify the accuracy of predicting effects. Monitoring measures may need to be recommended to determine what effects actually occurred with project implementation, and may result in the modification of mitigation measures to improve their effectiveness.

Table 12-1: Impact Assessment and Mitigations

Criteria	Project Interactions	Potential Environmental Effect	Mitigation Measure(s)	Monitoring	Residual Effects and Significance (N/I/S)
Biophysical Environmental Effects	**Air Quality**	Debris or dust caused during construction activities	- Managed by each contractor/developer with responsibility to follow City by-law requirements	Monitor through construction	I
	Wildlife Habitat	Clearing and grubbing activities may impact or displace existing wildlife on lands	-Removal of vegetation must be outside of bird and bat breeding or nesting season	Monitor through construction	I
			- Remove natural features only where development is proposed		
			- Work areas must be isolated with exclusion fencing (typically incorporated into ESC planning) as they are established		
	Fisheries and Watercourses	Passage/habitat disturbances caused by modifications made to Bear Brook and Ramsay Creek	- All in-water work is subject to mitigation measures prescribed by the required CA permits (and/or DFO permits in areas of fish habitat)	Monitor through construction, with post-construction monitoring of new features indicated within the specific CA and/or DFO permit authorizing the work.	I (Permits for waterbodies mandate provision of overall "net benefit" for impacted species)
		Passage/habitat disturbances caused by construction activities	- Monitor construction on-site with a qualified biologist		I
			- Fish and turtle relocations by a qualified biologist		I
	Woodlots and Tree Removal	Impact to the integrity of the existing woodlots	- Significant woodlands will be preserved. Other wooded areas or natural features will only be removed only where development is proposed, to minimize tree removal - Standard mitigation measures indicated under City of Ottawa tree removal - Identify and protect	Monitor through construction	I

			healthy SAR including, but not limited to, working outside of critical root zones, fencing parameters to avoid disruption and minimizing exposure to construction fumes		
	Species at Risk (SAR)	Potential disruption or removal of SAR from clearing or construction	- SAR-specific mitigation measures to protect individuals and habitats will be prescribed under the MECP net benefit permit required for each SAR on site.	Monitor through construction per SAR permit requirements with post-construction monitoring of any offsetting measures obliged by those permits	I (SAR permits mandate provision of overall "net benefit" for impacted species)
	Invasive Species	Potential spread of invasive species	Ash trees will be mulched on site. Phragmites will be collected, stored and tarped on site for at least one year.	Monitor through construction	N
	Drainage	Impact to the existing natural drainage routing	- Construct of interim ditches and ponds to control runoff during construction	Monitor through construction	I
Social Environment	**Physical Connectivity**	Construction may temporarily disrupt connectivity within and to adjacent communities	- Develop detour routes to maximize connectivity along all corridors, roads and pathways during construction	Monitor through construction	I
	Archaeology	Site alteration disruptions caused during construction activities	- Ensure careful planning and staging of construction activities	Monitor through construction	I
	Noise	Noise exposure during construction activities	- Managed by each contractor/developer with responsibility to follow City by-law requirements	Monitor through construction	I
	Existing Land Use	Existing dwelling adjacent to the site	- Managed by each contractor/developer with	Monitor through	I

		may be temporarily disrupted	responsibility to follow City by-law requirements	constructi on	
Physical Environm ent	**Soils**	Potential to encounter undesirable soil conditions or contaminated materials	- Implement appropriate handling procedures for contaminated materials, and ensuring proper disposal in compliance with environmental regulations.	Monitor through constructi on	I
	Grading	Grade changes within silty clay areas	- Must be approved with consideration for permissible grade raise limitations or surcharging requirements. Slope stabilization programs to be implemented, if applicable.	Monitor through constructi on	I
	Groundwate r	Potential to encounter groundwater table	- Ensure construction activities implement measures to prevent groundwater contamination and adhere to PTTW requirements, where applicable, for any water-taking or discharging activities.	Monitor through constructi on	I
Technical	**Transit Ridership**	Transit connectivity and services may be disrupted, damaged, or altered during construction	- Ensure detour routes and alternative transit options are available to support existing transit ridership	Program to be develope d pre-constructi on with City of Ottawa/O C Transpo, and monitored through constructi on	I

12.10 Permitting & Environmental Mitigation

As part of the development approval process, a number of environmental permits and studies must be completed to ensure that the proposed residential development aligns with applicable municipal, provincial, and federal regulations. These approvals are essential for protecting natural heritage features, managing environmental impacts, and meeting the City of Ottawa's planning and servicing standards. The table below outlines the primary environmental permits, studies, and approvals that may be required during the planning and implementation stages of development, including the associated responsibilities and timing considerations.

Relevant environmental permits and approvals for the development, along with associated responsibilities, can be found in Table 12-2.

Table 12-2: Permitting

Action	Responsibility	Timing/Process/Permits and Approvals
Woodlands and Forests – Review recommendation for retention of woodlots / trees	City of Ottawa / Developers	Through EIS, TCR and Plan of Subdivision
FLUDTA and IAA	Developers	Submit to NCC for approval. Coordinated with MCEA and Planning Act requirements
Tree Conservation Report (TCR) and Landscape Plan	Developers	Reviewed and approved by the City of Ottawa through conditions of Plan of Subdivision
Environmental Impact Statement (EIS)	Developers	As required by Official Plan policies Submitted with development applications
Stormwater Management Report	Developers	As part of Functional Servicing Report submitted with development applications. Implemented via Plan of Subdivision conditions. Permits maybe required from DFO, SARs, Reviewed by City and Conservation Authority
Environmental Compliance Approval (CLI-ECA)	Developers	Submit for City approval Required for storm, sanitary sewers, and stormwater ponds

Hydrogeological and Geotechnical Studies	Developers	Early in design phase Submitted with development applications as required
Conservation Authority Permit (e.g., O. Reg. 174/06)	Developers	Prior to construction within regulated area + Closure of features Apply to RVCA/SNC
Endangered Species Act Permit	Developers	Required if species at risk are present Coordinate with MECP during EIS or field studies
Archaeological Assessment (Stage 1 & Stage 2+)	Developer	Required before development in areas of archaeological potential Reviewed by Ministry of Citizenship and Multiculturalism
Fisheries Act Authorization	Developers	Required for in-water works affecting fish habitat Submit to DFO
Migratory Birds Convention Act Compliance	Developers / Biologist	Avoid clearing during nesting season Field review may be required prior to vegetation removal

12.10.1 Approval Authorities

A number of environmental permits and approvals are required as part of the development process to ensure compliance with applicable municipal, provincial, and federal regulations. These approvals are typically tied to the servicing and environmental conditions of the site and must be addressed through various studies and submissions during the planning and design stages.

The following summarizes the key approval authorities involved in the review and permitting of residential development, along with their respective roles and responsibilities:

City of Ottawa

The City of Ottawa is responsible for reviewing development applications to ensure compliance with Official Plan policies, Secondary Plan studies, Zoning By-law provisions, and applicable guidelines such as the Tree Protection By-law and Parkland Dedication By-law. The City also reviews supporting reports such as the Environmental Impact Statement (EIS), Tree Conservation Report (TCR), and Stormwater Management Reports as part of Plan of Subdivision and Site Plan Control applications. The City may also facilitate coordination with other approval authorities through the development review process.

Rideau Valley / South Nation Conservation Authority

Approvals from the Rideau Valley and South Nation Conservation Authority (RVCA and SNC) are required for any proposed works within regulated areas, including floodplains, wetlands, and adjacent lands. Permits are typically required under Ontario Regulation 174/06 for development, interference with wetlands, alterations to shorelines and watercourses, and the modification or closure of headwater drainage features. The Conservation Authority also reviews stormwater management reports and erosion and sediment control plans to ensure compliance with watershed protection objectives.

Department of Fisheries and Oceans (DFO)

If a proposed development involves in-water work that may impact fish habitat, an authorization under the Fisheries Act may be required. A Qualified Aquatic Biologist must assess whether the proposed works are likely to result in serious harm to fish, and mitigation measures may be proposed accordingly.

National Capital Commission (NCC)

Works located on or draining through National Capital Commission (NCC) lands will require coordination with the NCC. Portions of the downstream watercourses cross NCC property, and any proposed modifications or maintenance activities will need NCC review and approval. Maintenance access agreements may be required. Design elements associated with the Ramsay Creek tributary, including potential lowering and naturalization, must be reviewed with the NCC to ensure compatibility with land management objectives. Ongoing consultation will be necessary as design progresses.

Additional Authorities

Other approvals and clearances may be required from additional authorities depending on site-specific conditions. These may include compliance with the Migratory Birds Convention Act during vegetation removal periods, coordination with the Airport Authority for secondary bird hazard area implications, coordination with MTO for any impacts to Highway 417 corridor, and Hydro One approvals for development adjacent to or crossing hydro corridors. Approvals will also be required under the Municipal Drainage Act for works impacting existing municipal drains, and from the Ministry of the Environment, Conservation and Parks (MECP) for matters related to stormwater management, wastewater, and other regulated activities.

13.0 IMPLEMENTATION OF THE MASTER SERVICING PLAN

13.1 Phasing Strategy

The development of Tewin and its supporting infrastructure will occur incrementally to align with market demand and the staged delivery of municipal services. While the exact sequence may shift over time, development is expected to begin in the northern portion of the study area and extend southward as servicing progresses. This approach enables the extension of municipal water, wastewater, transportation, and stormwater infrastructure in a cost-effective and coordinated manner, supporting the orderly development of new neighbourhoods. As conditions evolve, the phasing plan will be refined to ensure efficient, adaptable, and well-coordinated growth across the community.

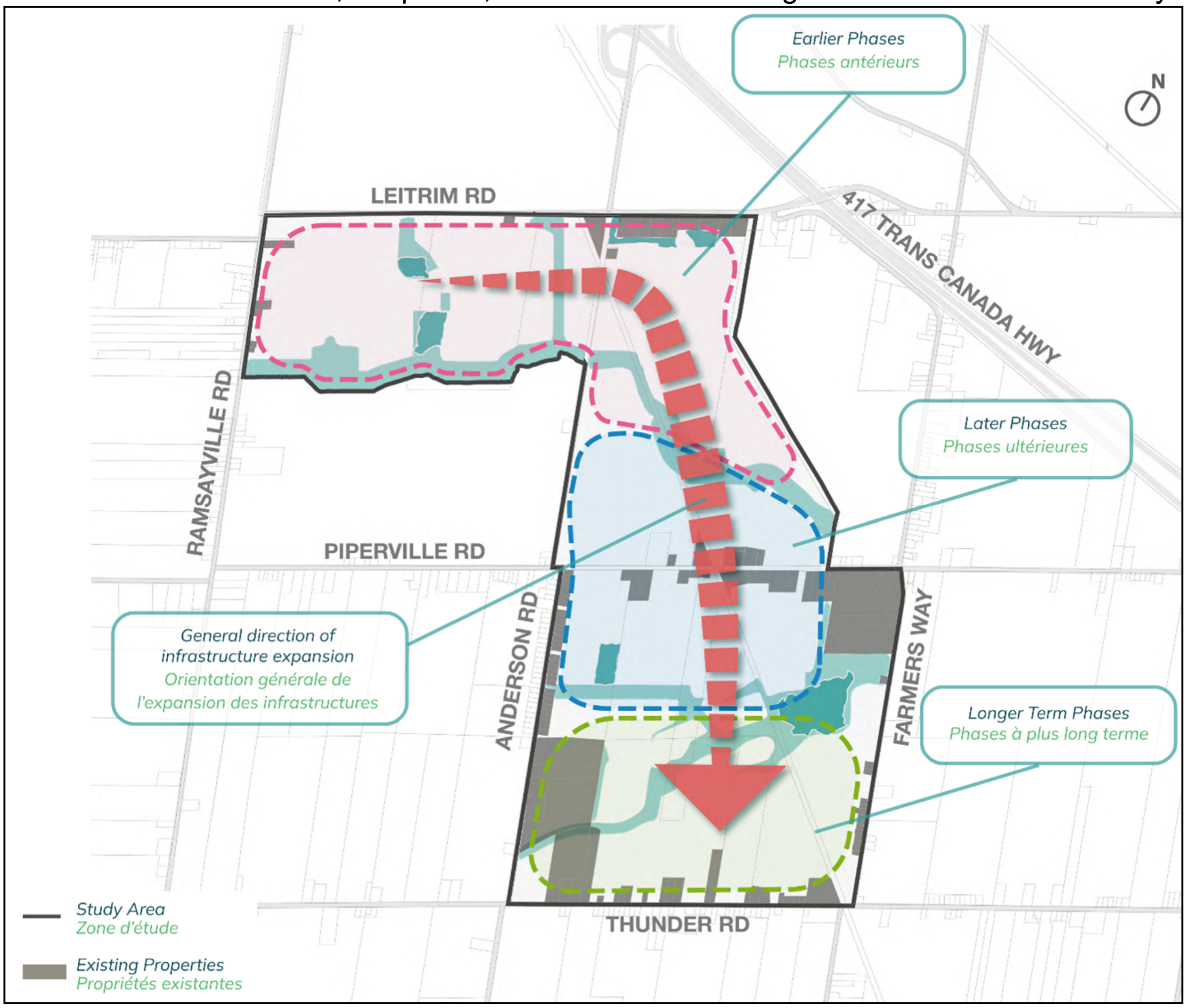


Figure 13.1: Phasing Strategy

13.2 Future Development Applications

The City of Ottawa will consider this MSS for approval under the Official Plan Amendment process. City approval is required prior to the development of any servicing infrastructure recommended in this report. The MSS will also be made available for public review in accordance with the requirements of the MCEA.

The Tewin Master Servicing Study (MSS) has been developed through the coordinated MCEA process, and represents a possible servicing scheme for the Tewin lands, based on the environmental constraints and opportunities identified through the environmental inventory and evaluated as part of the EMP.

Permitting and approval requirements may change over time. It is expected that all permitting and approval requirements will be confirmed at the time of detailed design and construction for any servicing infrastructure recommended in this report.

13.3 Project Amendment/Change Process

The Tewin MSS outlines a servicing strategy that supports the proposed land use while allowing flexibility for future refinements. As detailed design progresses, changes to the MSS may be required. This section defines a process to manage those changes, distinguishing between minor updates that do not affect overall impacts, and major changes that alter the intent or require new mitigation.

The MSS is intended to illustrate the feasibility of implementing the recommended environmental management strategy while providing a servicing strategy that supports the currently proposed land use plan. The intent of the MSS is to develop a municipal servicing design for storm drainage, wastewater collection, and water supply that would support the land use plan, having regard for municipal standards and appropriate ministry guidelines. The MSS has created a blueprint for development, while maintaining sufficient flexibility to allow for future refinements and changes to the land use plan. It is prudent to develop a process to recognize that refinements and changes will occur as the project advances through detailed revisions. It is expected that project details will be refined from those represented in the MSS.

The following sets out the process to deal with changes that occur after filing and obtaining approval of the MSS and prior to construction. The change process distinguishes between minor and major changes. A major design change would require completion of scoped amendment to this MSS, while a minor change would not. For either kind of change, it is the responsibility of the proponent to ensure that all possible concerns of the public and affected agencies are addressed.

Minor Changes may be defined as those that do not appreciably change the expected net impacts associated with the project. Examples of minor changes include, but are not limited to, design changes in landscaping, pathway connections, underground infrastructure sizes, right-of-way (ROW) widths and alignment, alignment of trunk infrastructure, or changes to pond footprints, as well as modest changes to alignment or other facility footprints.

All affected landowners and appropriate interest holders will be provided details of the modification through subsequent planning applications. The majority of such changes could likely be dealt with during the subdivision and detailed design phase and would remain the responsibility of the proponent to ensure that all relevant issues are taken into account.

Major changes may be defined as those that change the intent of the MSS or appreciably change the expected net impacts associated with the project. An example of a major change would result from a proposed shift to an alternate design alignment or configuration that would warrant changes in mitigation, as described in the EA. For example, the consolidation of ponds could be considered a major change. If the proposed modification is major, the recommendations and conclusions in this report would require updating. A scoped addendum to the MSS, scoped to the intended changes only, would be required to document the change, identify the associated impacts and mitigation measures, and allow related concerns to be addressed and reviewed by the appropriate stakeholders.

The MSS has developed a high-level servicing solution that demonstrates feasibility and guides future development. The report is not intended to provide a street-by-street detailed design; rather, this enhanced level of detail will be completed in conjunction with Plan of Subdivision and/or Site Plan applications. The more rigorous field investigation and design undertaken on a site-by-site basis will inevitably lead to adjustments from the design herein. These alterations are both normal and expected as any design evolves into a final constructed format. (A discussion of minor versus major design change is outlined above). The detailed design solution will depend upon several constraint factors – such as final geotechnical information, including grade raise for units and roadways, dwelling configuration, etc.

The pond sizes recommended in this MSS are preliminary in nature, meant to show the feasibility to service the community with an appropriate level of detail for a CDP, based on today's knowledge from the environmental inventory, and today's regulations and technologies. As detailed design advances over the course of the full buildout of the community, land use efficiency should be re-examined at each subsequent phase to establish whether smaller pond footprints could meet the same functional intent presented in this MSS. Ponds adjacent to Hydro Corridors may be reviewed during draft plan stages to review the potential for locating portions of the ponds within the corridors, subject to Hydro approvals.

Grading constraints can be dealt with and/or mitigated by a variety of design techniques, such as pre-loading, light-weight fill, slab-on-grade dwellings (no basement). The precise engineering technique(s) to resolve localized constraints are best refined during detailed design. The key point is that the MSS demonstrates a feasible design solution for the Tewin Community that will guide future designers in developing detailed designs through each phase of development.

13.4 Financial Implementation

Annex 12: Principles for the Tewin Financial Memorandum of Understanding (MOU) of the Official Plan establishes a framework for funding the infrastructure and services required to support the Tewin suburban community development. The Tewin landowners have committed to a funding strategy to see the necessary infrastructure financed by the appropriate benefiting parties in line with development funding mechanisms commonly implemented within the City of Ottawa. A Financial Implementation Plan is being prepared in support of the Secondary Plan/Community Design Plan, as per the direction of Annex

10 of the Official Plan, which will detail the funding mechanisms of Tewin-related infrastructure consistent with the MOU. The plan will illustrate financial implementation principles with cost estimates, estimated proportionate benefiting shares, and potential funding mechanisms such as Area-Specific Development Charges. This report will be subject to City review and approval and will accompany the Secondary Plan reports to Committee and Council. The projects will include, but are not limited to, Tewin's roads, water, stormwater, wastewater, and transit infrastructure.

For broader regional and city-wide infrastructure needs, City-wide Development Charges are expected to appropriately address projects with shared benefits for Tewin and the rest of Ottawa, such as arterial roads and system-wide transit upgrades.

The process is expected to involve multiple layers of approval by the City Council, including adopting the Community Design Plan, Secondary Plan/Official Plan Amendment, potential ASDC By-law and updates to the City-wide DC By-law.

On-Site Works

Local on-site services, including but not limited to local roads, sewers, ponds, and watermains will be 100% Developer-funded. Developers may choose to enter into private cost sharing agreements for shared infrastructure. This infrastructure is transferred to the City following completion at no cost. Like all other areas of the City, the City of Ottawa then operates and maintains the infrastructure with recoveries through municipal property taxes.

Off-Site Works

City staff have been directed by Council to support the identification of day one water and wastewater projects to service the Tewin lands identified within the current urban boundary, while ensuring that the IMP solutions that service beyond the 2046 planning horizon are not precluded in the future. The funding mechanisms and cost responsibilities for off-site works will be explored in the Financial Implementation Plan.

Water

Cost allocation methodology proposed by the City is outlined in the Water Master Plan. City cost allocations are distributed based on the proportion of capacity required by each benefiting area:

1. Tewin 2046 demand – funded by Tewin
2. Growth to 2046 in SUC – funded through development charges (Outside Greenbelt DC)
3. Benefit to Existing (BTE) – funded by the rate base

4. Post-Period Capacity (PPC) – considered the incremental costs of upgrading watermain sizes

The City notes that PPC costs for the proposed infrastructure are high and recommends that any oversizing beyond 2046 be re-evaluated during functional design and the MCEA process for off-site infrastructure, based on updated unit demands, affordability considerations, and revised growth projections. It's important to note that in this case, the post-period capacity allocated by the City is the largest portion of the demand. Having post-period capacity contributing the majority of the flow but only being responsible for upsizing costs downloads a portion of costs for future growth to Tewin and Outer Greenbelt DC ratepayers. Discussions are ongoing with the City to explore the opportunity to have infrastructure costs equitably attributed on a flow basis. One such approach is the implementation of phased projects to align construction costs more closely with the actual demand for available capacity.

Sanitary

It's expected that the Day-1 sanitary solution outlined earlier in this report will be funded by developments that benefit from this solution.

City cost allocations for the large diameter off-site trunk sewer, as described in the WMP and IMP are as follows:

1. Tewin 2046 demand – funded by Tewin
2. Post-Period Capacity (PPC) – considered the incremental costs of upgrading trunk sanitary sewer sizes

Again, based on the large flow allocations for PPC, it is recommended that opportunities to equitably share the costs on a flow basis be explored along with careful consideration of the timing and extent of PPC needs.

14.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This Master Servicing Study (MSS) has confirmed the feasibility of providing municipal water, wastewater, and stormwater services to support the proposed development area in accordance with the City of Ottawa's design guidelines and servicing policies. The following key conclusions have been identified:

Water Servicing:

The proposed backbone water distribution system can adequately service the development through a combination of existing and new infrastructure. Watermain sizing and looping strategies have been developed to ensure sufficient pressure, flow, and fire protection, while maintaining system redundancy.

Wastewater Servicing:

The preferred wastewater servicing strategy provides sufficient conveyance capacity to support full buildout. Interim measures such as pumping stations and forcemains have been identified to allow development to proceed in advance of ultimate gravity infrastructure.

Stormwater Management:

Stormwater servicing has been designed to control post-development peak flows and minimize erosion and flood risks downstream. Storage volumes have been calculated using recognized hydrologic modeling software, and overland flow routing has been incorporated to protect adjacent properties and infrastructure.

Environmental Compatibility:

Natural features and existing drainage patterns have been considered throughout the servicing strategy. Opportunities to maintain or enhance hydrologic function, avoid impacts to sensitive areas, and comply with conservation authority requirements have been incorporated.

Recommendations

The following recommendations are made to guide the next stages of development and implementation:

Detailed Design and Modeling:

Conduct detailed water, wastewater, and stormwater modeling at the subdivision or site plan stage to confirm infrastructure sizing and performance under refined land use and grading conditions. Optimize grading designs per detailed road and unit configurations, and continue coordination with Geotechnical Engineers to refine grade raise restrictions and mitigation strategies such as targeted localized surcharging programs.

Coordination with City Infrastructure Planning:

Continue coordination with City staff to ensure integration with existing and planned trunk infrastructure, including any ongoing Environmental Assessments or Infrastructure Master Plans.

Approvals and Permitting:

At detailed design, initiate discussions with the Ministry of the Environment, Conservation and Parks (MECP) and local conservation authorities to confirm approval requirements, including CLI-ECA.

Ongoing Review of Planning Assumptions:

Update servicing strategies as population forecasts, densities, or land use designations are refined through planning processes.

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