Algonquins of Ontario | TAGGART GROUP OF COMPANIES | CAIVAN COMMUNITIES

TEWIN

Community Energy Plan Report

March 23, 2026

Submitted for City and Agency review

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March 23, 2026

Taggart Investments
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Attention: Laura Maxwell

Re: Tewin Community Energy Plan Report

Dear Laura,

On behalf of Urban Equation, I am pleased to submit the updated Community Energy Plan (CEP) Report for the Tewin Project.

This CEP provides a description of the anticipated energy use and related emissions for the project, while presenting design and construction considerations for advanced energy conservation and low-carbon generation that will be considered as the project continues to advance towards more detailed design.

If you have any questions, don't hesitate to contact me at 613.808.0011.

Kind regards,

Steve Dulmage
Director, Sustainability
Urban Equation

1 Introduction

On April 24, 2019, Ottawa City Council declared a climate emergency to underscore scientific warnings that Canada is warming roughly twice as fast as the global average, raising local risks of flooding, heatwaves and costly infrastructure damage. This action was meant to "name, frame and deepen" the City's commitment to safeguarding its economy, ecosystems and community from climate change, particularly after record Ottawa River floods and other extreme-weather events in the region.

The City's Climate Change Master Plan (CCMP) provides an overarching framework for reducing greenhouse gas emissions and responding to climate change imperatives. Energy Evolution is one of eight priorities of the CCMP, which sets out a vision to transform Ottawa into a thriving city powered by clean, renewable energy. Together with the companion Energy Evolution Strategy, these documents establish a decarbonization agenda for Ottawa's building sector.

In addition to the climate crisis, Ottawa is also facing a housing crisis. The Canada Housing and Mortgage Corporation (CMHC) estimates that Canada needs approximately 3.5 million additional units by 2030 to restore affordability[1], with the Province of Ontario committing to building 1.5 million new units by 2031[2].

Building this much housing is, according to The Task Force for Housing and Climate, both a generational challenge and opportunity. Their *Blueprint for More and Better Housing* sums up the issue as follows:

"While there's no question this is a generational challenge, it's also a historic opportunity to build more and better housing for a fast-growing population of homeowners, renters, seniors, young families, students and precariously housed. Seizing this opportunity will require coordinated leadership by each and every one of you. What does it mean to build more and better housing? For us, as for up to 85 percent of Canadians, it means making it affordable, making it low-carbon, and making it resilient to the worsening impacts of climate change.[3]"

- *Task Force for Housing and Climate, Blueprint for More and Better Housing, 2024*

With the right partners around the table, including the City of Ottawa, Hydro Ottawa, and others as needed, Tewin is optimistic that it can embody the leadership required to address both these challenges. Bold and ambitious targets have been established in the hope to build a pragmatic, viable roadmap that can begin to directly address these challenges.

[1] https://www.cmhc-schl.gc.ca/professionals/housing-markets-data-and-research/housing-research/research-reports/accelerate-supply/housing-shortages-canada-updating-how-much-we-need-by-2030
[2] https://www.ontario.ca/page/tracking-housing-supply-progress
[3] https://housingandclimate.ca/blueprint/

2 Description of Development

2.1 Development Overview

Tewin is planned to be a community of over 50,000 people, with upwards of 8,000 new jobs. It will be more compact and denser than existing suburbs in Ottawa, with new urban areas integrated alongside valuable natural areas. Tewin will be an inclusive and welcoming community, anchored in Algonquin wisdom and placekeeping principles. The community will have a meaningful mix of land uses and support active mobility to achieve a complete 15-minute community. The development of new housing at Tewin responds to municipal and provincial housing requirements and will help meet the growing demands for housing.

The major landowners at Tewin (Algonquins of Ontario, Taggart, and Caivan) have committed to exploring ambitious energy and carbon objectives to create a new model of suburban development. In addition to aspiring to be a zero-carbon community, the key objectives for Tewin are to create a community that is:

- Anchored in Algonquin wisdom, principles, and placekeeping.
- Driven by a nature-first approach which protects, enhances and integrates valuable natural areas and agricultural lands.
- Mobility-oriented and supportive of a broad range of active forms of movement.
- Defined by a meaningful mix of housing, amenities, jobs and services to achieve a complete, future-ready community.
- Affordable, inclusive, healthy, welcoming, and accessible to all.

This Community Energy Plan (CEP) follows the performance pathway. It has been prepared alongside a suite of technical studies that support the Tewin Community Design Plan (CDP) and the Secondary Plan. The Secondary Plan will establish a community-wide land-use framework for the Tewin Lands that reflects the principles, objectives, and policies for community development as directed by the Official Plan (2022). The 838-hectare Study Area for the Tewin CDP is identified in Schedule C17 of the City of Ottawa's Official Plan as a Future Neighbourhood Overlay.

The purpose of the Tewin CDP and Secondary Plan is to plan for the long-term evolution of the Study Area and guide development in a coordinated manner. Together, these two documents set out the overall vision, open space system, mobility network, and land uses for the Study Area, and provide guidance and policy direction regarding the implementation of these elements for future development. These two documents provide a level of direction between Official Plan policy and future development applications (e.g. Draft Plan of Subdivision applications under the Planning Act) to enable Tewin-specific development to occur incrementally over time and in an optimal, coordinated manner.

Similarly, this CEP has been prepared to provide a community-specific level of direction and, more specifically, seeks to:

- Identify appropriate on-site and off-site technologies to be carried forward for future screening, development, analysis, and implementation at Tewin; and
- Align the future energy systems with the project’s goal to reduce greenhouse gases (GHGs) and respond to current and future effects of climate change.

This CEP outlines potential strategies for consideration by developers, utility providers, and other partners, which will be considered as additional details on building types, uses, locations, sizes, and phasing become available. It will serve as a guide to the preparation and review of future CEP Reports/Briefs, where required, as part of future development application processes (i.e. Draft Plan of Subdivision application and/or conditions of approval).

2.2 Sustainability Drivers

Through ongoing consultation and the planning process, various priorities have been identified for Tewin, including sustainable and integrated development following Algonquin wisdom to treat the earth, and all that dwell upon it, with respect.

Development at Tewin will be based on the teachings of the Seven Grandfathers - including Honesty, Humility, Respect, Courage, Wisdom, Love, and Truth - and the principles of the One Planet Living sustainability framework. Stemming from both is the goal to create a new community that respects the environment and, among other things, ambitiously reduces greenhouse gas emissions.

Figure 1: One Planet Living Framework

The One Planet Living (OPL) framework is used as a holistic tool to guide and measure environmental resiliency, sustainable development, and reduced carbon emissions, while demonstrating leadership in the local context. The flexibility of the OPL framework will allow the project to layer Algonquin teachings and priorities into its sustainability commitments and develop a holistic plan to address greenhouse gas emissions.

Separate to this CEP, a One Planet Action Plan - a holistic sustainability action plan - is being prepared, establishing broad sustainability outcomes and measurable targets for development at Tewin through various stages of the project, from planning (current stage) to future site design, construction, and community life stages.

2.3 Development Characteristics

This Community Energy Plan is based on the community design plan as of March 2026 (see Figure 2).

The community design plan is defined by the 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 Spine.** The Community 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 Spine, sustainable and active modes of transportation will be prioritized.

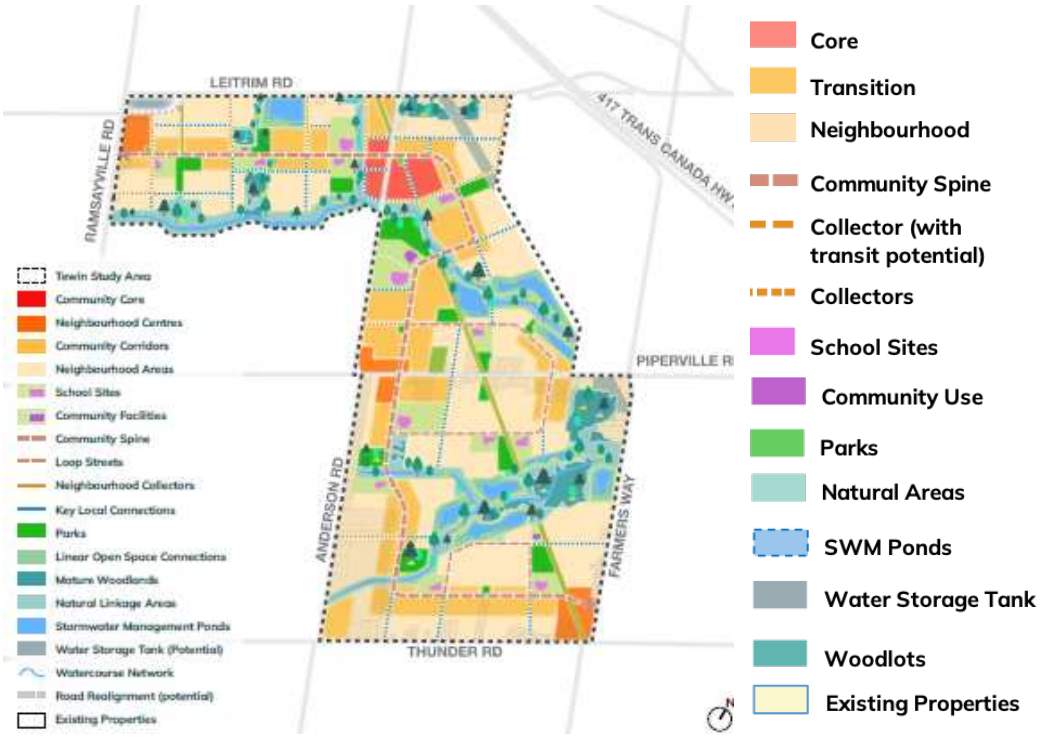

Figure 2: Preliminary Tewin Community Design

3. **Neighbourhood Collectors.** A series of neighbourhood collector streets will complement the Community 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. A Collector Loop will be designed with transit potential to seamlessly connect with the Community 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 service uses. The Core Area will be the hub for civic and recreational uses, including densities in the tallest built form, focused on a human scale that supports vibrancy and animation. The Core Area will be complemented 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. **Community Corridors.** Primarily focused along the Community Spine and Collector Loop, Community Corridors 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, and may also include stacked-townhome and low-rise apartments in key locations. It is important to note that, while these neighbourhood areas are the lowest density areas in Tewin, they are required to deliver 40 units per net hectare, which is above the City of Ottawa's current minimum average density requirement of 36 units per net hectare for greenfield areas.

Tewin is designed as a community with a level of density high enough to sustain transit, infrastructure, 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 and utility services over time.

2.3.1 Preliminary Development Statistics and Phasing

At full build-out (the entire Study Area), Tewin is expected to be home to over 53,500 residents in 20,000+ homes, while creating upwards of 8,000 new jobs. The Secondary Plan will support a smaller land area (445 hectares) for initial development, which will support over 35,000 residents in 14,000+ homes over the short- to medium-term. The highest densities will generally be concentrated within the Core Area and Neighbourhood Centres, and located along the Mobility Spine which connects the full community. These areas will be developed with each phase through the planning and design process. The tallest built form is expected within the Core Area, creating a centralized cultural and commercial hub that considers and can adapt to future intensification. This report and its findings have been informed by the degree and distribution of density at full build-out across the entire Study Area.

Preliminary projections (see Table 1: Tewin Development Statistics) have been prepared based on the current land use plan specifically for the purpose of this CEP. Best available information has been used to inform this CEP, including technical engineering reports. Future CEP Reports/Briefs will be prepared as detailed design, phasing plans and building arrangements, sizes, and densities are known.

The approximate "floor area per unit" has been estimated by Urban Equation based on past experience, current industry trends, and knowledge of the preliminary planned housing typologies at Tewin.

The assessment has been carried out using anticipated minimum density projections for the various typologies and density zones aligning with the CDP. As a conservative measure, the lower end of the expected density range for each density zone has been applied, as they are less suited for community-based energy infrastructure. As detailed building forms and densities are developed through future development applications, these projections will be updated.

Table 1: Tewin Preliminary Development Statistics

Density Zone	Building Archetype	Net Land Area (% of total)	Total Units (approx.)	Floor Area Per Unit (m^2) (estimated)	Total Floor Area (m^2) (estimated)
Core	Mid to high-rise apartments	5%	2,009 to 2,423	92	184,828 to 222,878
	Low to mid-rise apartments				
	Stacked and back-to-back towns				
Neighbourhood Centres	Low to mid-rise apartment	5%	2,170 to 2,528	100	217,000 to 252,805
	Stacked and back-to-back towns				
Community Corridors	Low to mid-rise apartment	35%	9,253 to 10,986	100	925,300 to 1,098,586
	Stacked and back-to-back towns				
	Townhomes				
Neighbourhood	Townhomes	55%	6,765 to 7,830	110	744,150 to 861,272
	Semis/Singles/Detached				
Total		**100%**	**20,197 to 23,766**		**2,071,278 to 2,435,541**

To better analyze the energy and carbon data within the context of Ottawa's draft High Performance Development Standard (HPDS), Tewin's development characteristics were mapped onto the HPDS building archetypes (see Table 2: Tewin Development Statistics – HPDS Archetypes). It was assumed that both back-to-back and stacked townhouses qualified as townhomes, given their typology is similar to traditional townhouse archetypes.

Table 2: Tewin Development Statistics - HPDS Archetypes

Ottawa HPDS Archetypes	Tewin Building Archetype	Floor Area (m^2)
Singles, Townhomes	Semi and Single Detached Family Homes, Back-to-Back and Stacked Townhouses,	1,897,110
Apartment (<6 storeys)	Low to Mid-Rise Apartments	100,200
MURB (>4 storeys)	Mid to high-rise apartments	73,968
Total		**2,071,278**

For this community-wide CEP, it is assumed that Tewin will have a steady build-out, distributed evenly across the years and building archetypes. It is assumed that approximately 1,000 units/homes are built each year, starting as early as 2029. For context, the City of Ottawa Development Charges Amendment Background Study (October 2024) indicates upwards of

4,000 households per year to be built in the urban area outside the Greenbelt, including Tewin, in the same time period.

This steady build-out assumption is appropriate for this CEP as it approximates the long-term development and energy needs for the community. This assumption will be further refined in the submission of future CEP Reports/Briefs as part of future development applications, once additional development details and market trends are better known.

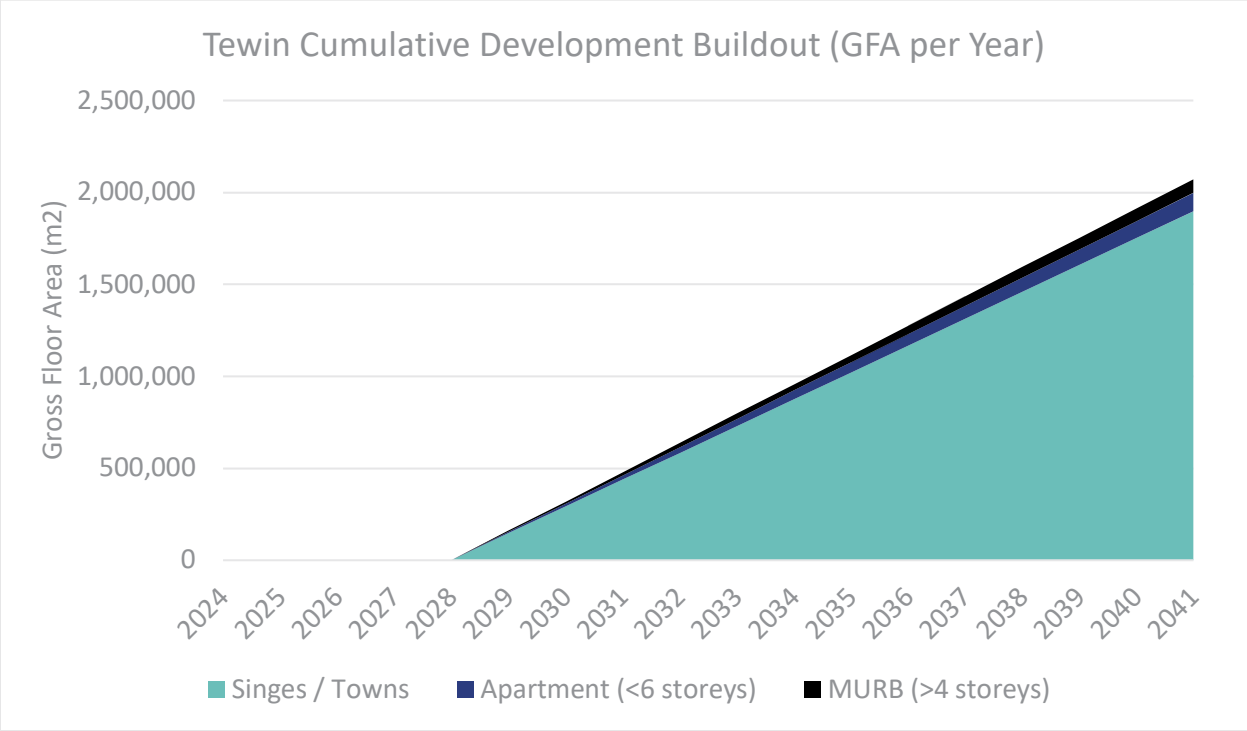

Figure 3: Cumulative Development Buildout (GFA per Year)

3 Existing Context

Tewin is in southeast Ottawa, adjacent to the Greenbelt and west of Highway 417. In 2022, the Tewin lands were added to the urban boundary in the City of Ottawa's Official Plan.

Much of the lands within the Study Area are undeveloped today, although there are clusters of residential properties, businesses and services located primarily along the existing main road corridors. Many of these existing residential and commercial uses are associated with the Piperville community. The remainder of the lands are predominantly characterized by forests, agricultural fields, natural lands, a golf course, and other open spaces.

Two additional right-of-way corridors exist within the Study Area, both running in a diagonal direction, as shown in Figure 4 on the following page. A decommissioned rail corridor, which is now a utility corridor, traverses through the middle of the site, while a hydro corridor is located along the eastern edge of the Study Area.

Through consultation meetings with Hydro Ottawa, it is understood that construction of a new hydro substation, called the Piperville Municipal Transformer Station, is currently underway at the intersection of Piperville Road and Farmer's Way. Hydro Ottawa intends to develop the Piperville Municipal Transformer Station as a low-carbon substation. Hydro Ottawa is undertaking a full project review of the station's construction, including an innovative design, procurement and construction techniques that include using lower Global Warming Potential (GWP) materials, and equipment that will address embodied carbon associated with the construction and operation of the substation.[4] Hydro Ottawa's focus on making the available electricity system near Tewin as clean, sustainable, and resilient as possible aligns well with Tewin's energy goals, and helps leverage Ontario's clean electricity sector, where nearly 94 percent of electricity is produced completely free of GHG emissions[5].

At present, there are no known existing thermal energy resources that could be leveraged by Tewin at a community-scale , meaning that thermal energy will need to be met by new sources. It is known that the subsurface conditions, including the depth to bedrock, the silty clay deposit, and the hydrogeological conditions documented in the relevant Existing Conditions Reports, indicate limited community-scale geothermal heating and cooling resources that could be leveraged by Tewin in the future. However, individual and localized site-specific opportunities are further discussed in Section 8.3.

Through the Tewin planning and design process, opportunities to connect to these surrounding neighbourhoods, employment areas and major destinations will continue to be considered, including the potential for transit connections, where appropriate.

4 https://hydroottawa.com/en/community/planned-work-projects/current-major-projects/piperville-municipal-transformer-station

5 https://hydroottawa.com/en/community/planned-work-projects/current-major-projects/piperville-municipal-transformer-station

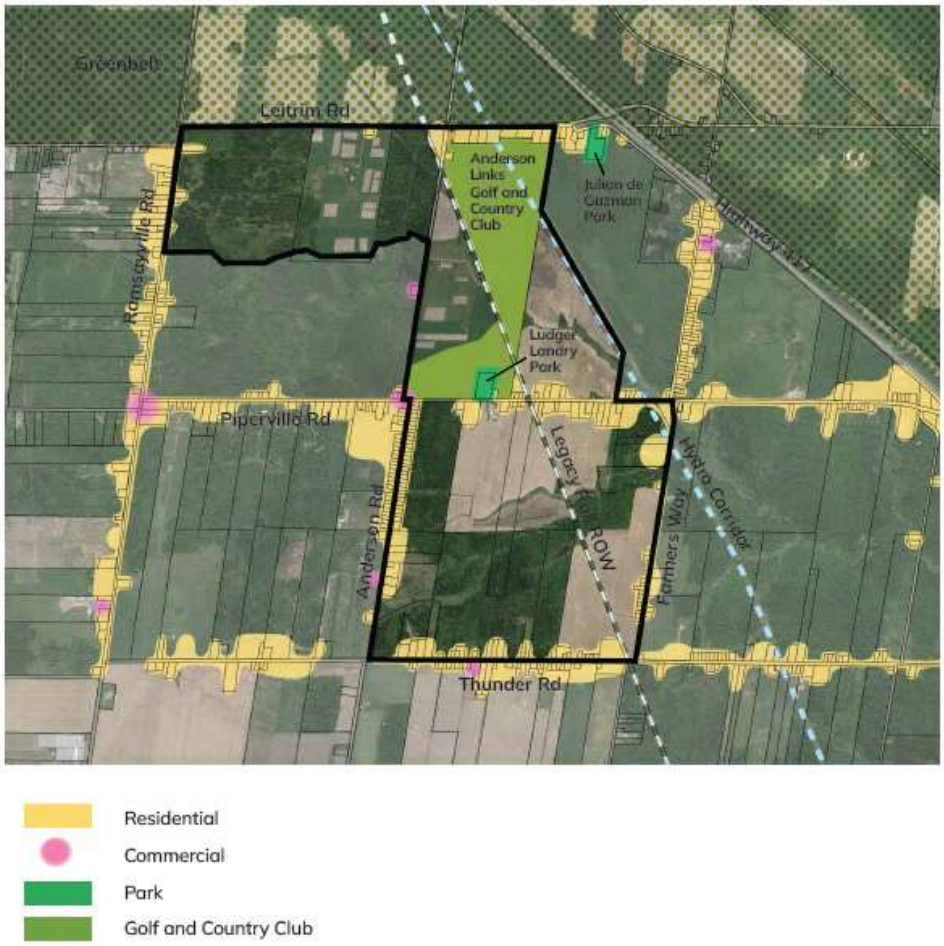

Figure 4: Map of Tewin Existing Site Context

4 Objectives of the Community Energy Plan

This Community Energy Plan sets objectives for energy and greenhouse gas emissions to provide pathways, considerations and solutions that can be leveraged with current and future interest-holders. This CEP also serves as a guide to the preparation and review of future CEP Reports/Briefs. This ensures that the community is thoughtfully planned and future-proofed to evolve over time with the infrastructure and systems necessary to support achieving the City's goal of net zero emissions by 2050, as per the City's Energy Evolution Strategy[6].

Following CDP and Secondary Plan approval, future development applications will be complemented by a CEP Report/Brief that will speak to detailed design and building-specific details of the development application. Therefore, the mitigation and resilience strategies identified in this CEP are intended to serve as a guide for ongoing future feasibility and implementation plans.

5 Tewin Partners

This CEP is prepared for the Tewin Study Area as defined in Schedule C17 of the City of Ottawa's Official Plan (2022). This CEP has been prepared at the direction of the major Tewin landowners: the Algonquins of Ontario Realty Corp. (AOO), the Taggart Group of Companies (Taggart), and Caivan.

6 Data Sources and Methodologies

The main data sources used to generate this CEP are as follows:

- The City of Ottawa's Community Energy Plan Terms of Reference.
- The City of Ottawa's Energy Evolution Strategy.
- Bioregional's One Planet Living Framework.
- Tewin Community Design Plan and Secondary Plan.
- Tewin Mobility Strategy.

It has been assumed that the greenhouse gas targets outlined in this report are attributed to the ongoing operations of the buildings only, unless otherwise specified. Greenhouse gas emissions associated with the transportation network are addressed in the Tewin Mobility Strategy, under separate cover. The Tewin Mobility Strategy demonstrates how active transportation and transit mode shares have been maximized through the careful design of the community, and their role in reducing emissions, including through low-carbon transit options.

7 Consultations and Joint Working Group

Developing a zero-carbon community is complex and requires support and alignment across many interest-holders, including the development community, local utilities and the City of Ottawa.

[6]https://documents.ottawa.ca/sites/default/files/energy_evolution_strategy_en.pdf

Since the earliest stages of the community planning, the Tewin Project Team has collaborated with Hydro Ottawa to discuss opportunities related to reducing energy and greenhouse gas emissions for the community. Hydro Ottawa, recognized as a Sustainable Electricity Leader for its commitment to environmental, economic, and community excellence, has acknowledged the opportunity for Tewin to leverage the smart use of technologies to power homes, buildings and transportation in the new community. The Tewin Project team is supported by Urban Equation and Rathco, both leaders in building and community scale low-carbon energy systems.

The discussions have explored opportunities for Hydro Ottawa to assist and support Tewin as it advances toward detailed development applications by identifying and evaluating potential innovative energy-related technologies to reduce greenhouse gas emissions, within the context of various business models and funding/incentive opportunities available.

Discussions to date have included:

- March 2023 – Introductory briefing
- November 2023 – Coordination meeting
- June 2024 – Exploratory meeting regarding potential district energy and non-utility model technologies
- November 2024 – Working Group kick-off meeting
- June 2025 to March 2026 - Technical Group coordination regarding load profiles and potential future energy systems

These discussions and the cadence of engagement will continue and increase as Tewin advances to appropriately address future development needs. At each step of the process, an opportunity exists to evaluate and adopt zero-carbon technologies or programs, with continued coordination with key partners such as Hydro Ottawa. At the CDP and Secondary Plan level, early planning is being advanced through working group meetings in order to realize Tewin's goal to reduce carbon emissions and develop an implementation plan.

Given the long build-out and phasing expected for the Tewin community, technologies, methodologies, and governing standards are expected to evolve. As such, on an application-by-application basis over the lifespan of the development of the new community, this CEP will be re-evaluated in the appropriate context to continue moving towards a low-carbon future. Coordination with Hydro Ottawa and all other relevant partners, including the City of Ottawa, is expected to continue and advance through future developments.

8 Energy Use and Carbon Emissions

8.1 Reference Scenarios

The Community Energy Plan requires that the project consider how the proposed solution (referred to as ‘Scenario 5’) will compare to four (4) reference scenarios. Per the City’s CEP Terms of Reference, these include:

- Scenario 1: Business As Planned (BAP). The BAP Scenario estimates 1,175kg equivalent annual CO^2 emissions added for every new home. Household energy for Ottawa’s baseline year 2016 is estimated at 105.56GJ / household declining down to 65.93 GJ / household by 2050.

- Scenario 2: 50% Emissions Reduction. The Energy Evolution Strategy Model to 2050 reduces emissions 50% from the BAP scenario to 587kg equivalent annual CO^2 emissions per new home.
- Scenario 3: Near Zero Emissions. The Energy Evolution Strategy target scenario calls for near zero emissions for every new home built after 2030. Household energy use in this scenario is expected to reduce to 23.43 GJ / household in the target scenario, this consumption is offset by local renewable energy generation to achieve near zero emissions.
- Scenario 4: Business As Usual (BAU). The BAU scenario, represents the Ontario Building Code, this is representative of the minimum performance allowed for new construction in Ontario. Comparing the BAU with the Scenario 5 benchmark, serves as a clear indicator of how the proposed design improves annual CO^2 emissions, thermal performance and energy use relative to code minimum construction.

8.2 Proposed Scenario

This section outlines the proposed targeted thermal energy demand intensity (TEDI), energy use intensity (EUI) and greenhouse gas intensity (GHGI) targets for Tewin's buildings (see Table 3). These targets align with the project's goal to become a zero-carbon community. Specific plans to achieve this goal will continue to be evaluated and shared through future CEP Reports/Briefs, where required, as part of future development application processes (i.e. Draft Plan of Subdivision application and/or conditions of approval).

Table 3: Proposed Scenario – Long-Term Energy and Carbon Targets

Building Archetype	EUI (kWh/m^2)	TEDI (kWh/m^2) [7]	GHGI (kg$CO2_e$/m^2)
Single Detached	100	34	0
Townhouse	100	34	0
Apartment (<6 Storeys)	100	34	0
MURB (>4 Storeys)	100	34	0

While the proposed scenario is an ambitious target, there are many pathways to realize this outcome, including energy use and supply strategies (as described further in Section 8.3) and offsetting.

8.3 Mitigation Strategies

This section provides more detail on the potential energy consumption and carbon emissions mitigation strategies that can be leveraged to assist Tewin in meeting the proposed zero-carbon approach. The strategies have been broken down into the following categories:

- Community Infrastructure
- Building Design
- Occupant Behavior

[7] Current TEDI targets based on CAGBC ZCB-design. Further evaluation and adjustments will be made based on typologies and associated energy systems.

- Embodied Carbon

As the project advances towards detailed development applications, the following strategies will continue to be explored in further detail as the community and building designs evolve. Notably:

- The strategies included in this section have informed and guided preliminary investigations.
- These strategies will continue to be evaluated during the preparation and review of future CEP Reports/Briefs, where required, as part of the Draft Plan of Subdivision processes.

8.3.1 Community Infrastructure

As Tewin represents a real city-building opportunity, there exists a unique opportunity to design community infrastructure differently. Everything from Tewin's energy sources to design of its transportation and street network will be considered in order to minimize energy use and carbon emissions. This section outlines strategies and approaches that are currently being analyzed for Tewin.

Energy Infrastructure

The use of community-based energy systems can be an effective method to efficiently provide thermal and electrical energy to buildings. The following community energy sources will be investigated with the Major Landowners and energy providers as the Tewin community structure continues to take shape. Some examples based on current initiatives and systems include:

- **Solar Photovoltaics (PV):** Solar PV has the potential to produce onsite zero-carbon energy, offsetting and mitigating carbon emissions for the development. There is an opportunity for solar to be considered both on buildings themselves and open spaces within or adjacent to Tewin.

- **Battery Energy Storage Systems (BESS):** While not an energy source itself, BESS facilitates the full use of intermittent renewable electricity sources, such as solar PV, by allowing electricity to be stored for future use. The combined use of distributed and central battery storage systems will be assessed to mitigate carbon emissions.

- **District Energy Systems for Heating and Cooling:** District energy systems can optimize efficiency and reduce operating costs when implemented in communities with suitable density. These systems typically involve the construction of a central heating and cooling plant that distributes thermal energy through buried pipes in the public right of way. To connect buildings to the district energy system, buildings will often have energy transfer stations (ETS), which allows for thermal energy from the district energy system to be circulated through the building. Sources for low or zero carbon heating and cooling to be considered can include:
    - Closed and open loop geoexchange
    - Waste energy exchange from local sewer connections
    - Air source heat pumps
    - Biogas and/or biomass boilers
    - Solar thermal
    - Electric boilers
    - Heat recovery chillers

In many cases, the use of connected, community-based energy infrastructure can be more expensive and less efficient in more suburban settings, such as at Tewin. This is because lower-density applications (as compared to campus-like or urban core settings) typically require significantly more distribution piping and equipment, which both reduces the efficiency of the system and increases the cost of construction, operations, and maintenance. The subsurface conditions at Tewin, similar to other communities in Ottawa, may specifically constrain the feasibility of some community-based heating and cooling systems, especially for the neighbourhood and community corridor areas. However, geo-exchange for individual buildings will remain an important consideration, as outlined in Section 8.3.2.2.

With the technical and financial feasibility of community-based energy infrastructure being dependent on detailed development density and spatial layout, the inclusion of community energy infrastructure and geothermal will continue to be evaluated as those future development areas advance.

To date, the following zero-carbon energy sources have been investigated at a community level to better understand feasibility and constraints. These include:

- On-site rooftop solar.
- Off-site community solar.
- Heat pump systems, including air-source and geo-exchange applications.

These energy sources require further technical and financial feasibility analyses, including partnership and funding opportunities, operating models, and risk assessments. They also need to consider current innovations and programs that continue to change, such as through IESO. As planning and detailed design progresses, more information will become available and reported through future CEP Reports/Briefs. Other innovative technologies and processes may be identified as discussions with potential partners continue, such as battery storage systems.

Transportation Network

The Tewin Mobility Strategy, under separate cover, explains how the land use plan has been shaped as a walkable and connected 15-minute community that will encourage active transportation and transit use as a priority. The Tewin Mobility Strategy finds that "sustainable mode" shares at Tewin - the percentage of trips made by active transportation or transit - are expected to be greater than other suburbs in Ottawa and lays out requirements for implementation to achieve this high-performance transportation network.

Tewin's "Sustainable by Design" approach includes the following transportation strategies:

- **Connected and Active Transportation Networks:** Active transportation will be prioritized at Tewin, including a network of all-season dedicated pedestrian and cycling facilities. These efforts should make Tewin a pedestrian and bike-friendly community, thereby reducing the need to drive within the community to run local errands and travel to and from work and school.

- **Strong Transit Connection:** Tewin will work with the City of Ottawa to create a modern, 21st century transit network that makes connecting to, from and within Tewin much easier (and lower carbon) than in comparable communities.

- **Electric Vehicle Charging Availability:** As technology improves and the adoption of electric vehicles increases, the Tewin Landowners will continue to monitor the progression towards zero-emission vehicles and ensure that charging infrastructure is appropriately supported. The Major Landowners recognize that these vehicles offer our communities enormous benefits, such as:
    - Lower operating and maintenance costs for users.
    - No, or less, combustion-based fuel to reduce greenhouse gas emissions.
    - Better air quality and reduced air pollution to support better health outcomes.

8.3.2 Building Design

8.3.2.1 Passive Design Strategies

The most efficient energy source is energy that is not used. This means that one of the most effective solutions to creating an energy-efficient community is reducing the work that building systems must carry out to maintain a comfortable environment. Below are examples of passive design strategies that will be considered at Tewin for a variety of housing scales (i.e. low, mid or high-density) to reduce their total energy demand. This includes exploring funding and grant opportunities to maintain affordable housing offerings.

Building Envelope

At the CDP and Secondary Plan stage, Tewin's buildings (and their envelopes) have yet to be designed. This provides a unique opportunity to consider a wide variety of strategies to optimize envelope efficiency to minimize energy demand.

Given building design trends across Ontario, spandrel panels and a moderate window to wall ratio are anticipated for the higher density residential buildings on site, although alternative envelopes are possible. For the lower density building archetypes, such as townhouses and single detached homes, increasing insulation above minimum code requirements can improve envelope performance. These opportunities will be carefully considered during the detail design stage.

Glazing

High performance glazing products with low solar heat gain coefficients provide daylight while reducing over-heating in shoulder seasons and cooling loads in the summer. Given Tewin's building performance goals, glazing, and lower window to wall ratios will be considered to improve the overall envelope performance, where applicable.

Building and Street Orientation

The land use plan is premised on a well-connected grid network of local streets connecting in a logical and land-efficient way to the existing roads in the area. Optimizing solar orientation on a lot-by-lot basis will be done through the planning and design stages, to consider roof designs, layouts, and built form opportunities.

Other opportunities exist on a block-by-block basis to strategically locate buildings for solar exposure, including school sites, community facilities, and other non-residential buildings such as commercial sites.

8.3.2.2 Active Design Strategies

Once the thermal loads of buildings are reduced as much as is reasonable through passive design strategies, efficient building systems are used to further reduce energy use intensity. The following solutions are aligned with Tewin's zero-carbon approach, i.e. solutions that do not leverage combustion as a means of building heating.

Given that building systems vary significantly between low density residential and higher density, multi-use residential buildings, they have been listed out separately. Examples of active design strategies are listed below.

Low-Density Building Archetypes

The project team will consider the following (and other) active design strategies in order to ensure that Tewin's low-density building archetypes are able to achieve their EUI targets:

- EnergySTAR appliances
- EnergySTAR homes
- High-efficiency LED lighting, daylight and occupancy controls
- Designing to achieve reductions in domestic hot water energy use through low-flow plumbing fixtures
- Support for solar photovoltaic panels on individual roofs to reduce electricity requirements for individual homes
- High efficiency HVAC and domestic hot water systems where appropriate, including:
    - Cold climate air source heat pumps
    - Dedicated ground source heat pumps, either on a dedicated loop for each home, or on shared loop in smaller quantities (i.e. a block of townhouses may share a single loop, but each unit will maintain its own heat pump)

Mid to High Density Building Archetypes

The Tewin Team will consider the following active design strategies in order to ensure that Tewin's mid to high-density building archetypes are able to achieve their EUI targets:

- EnergySTAR appliances
- High-efficiency LED lighting, daylight and occupancy controls
- Designing to achieve reductions in domestic hot water energy use through low-flow plumbing fixtures
- High efficiency HVAC and domestic hot water systems should a centralized district energy not be available. This could include (but is not limited to):
    - Geoexchange heating and cooling systems
    - Corridor ventilation rate per ASHRAE 62.1 – requires compartmentalization to remove pressurization requirements
    - Air side heat recovery
    - Reduced corridor pressurization ventilation rate

Electrification

The Tewin Landowners recognize the importance of building homes with the AMP capacity to meet the ongoing transition towards electrification. Preparing for and ensuring capacity is available across the community is currently being explored to reduce the burden on future homeowners.

8.3.3 Occupant Behavior

As part of Tewin's Sustainability Plan, the project will explore ways in which it can educate future Tewin residents about lifestyle choices that can reduce both their carbon and ecological footprints. Details surrounding educational initiatives are expected to be developed and implemented as part of future development application processes, when the project is approaching detailed building designs and occupancies.

8.3.4 Embodied Carbon

This section highlights embodied carbon targets and reduction strategies that will be considered at Tewin to further reduce greenhouse gas emissions.

Embodied carbon, the greenhouse gas emissions resulting from the extraction, production, transportation, and installation of building materials (as well as their end-of-life disposal), plays a significant role in the total carbon footprint of new development. Unlike operational carbon (emitted during a building's use), embodied carbon is "locked in" from the construction phase. Embodied carbon is important as it remains a significant portion of a building's emissions, more so as energy-efficient technologies reduce operational carbon.

Currently, there is very little guidance on the reduction of embodied carbon from material use and construction, particularly for Part 9 buildings. As such, Tewin is developing its own embodied carbon targets (see Table 4: Example Embodied Carbon Targets), drawing from other relevant resources from across the Province, where applicable. The example targets below have been defined for both low-rise residential and mid to high-rise residential buildings, which also include industrial, commercial, and institutional developments.

The targets apply to upfront embodied carbon from life cycle stages A1 to A5.[8] Stages B (related to building use) and Stage C (end of life) are not included below but may be considered in the future. A1 to A5 (summarized below) typically represent more than 75% of a buildings' embodied emissions and are the focus of most industry standards.

- A1: Raw Material Supply
- A2: Transport (of Raw Materials to Manufacturer)
- A3: Manufacturing
- A4: Transport (of manufactured goods to construction site)
- A5: Construction/installation processes

All targets, including those for single family homes and townhomes, will be further evaluated during future CEP Reports/Briefs, where required, as part of future development application processes (i.e. Draft Plan of Subdivision application and/or conditions of approval).

[8] Aligning with CaGBC's Zero Carbon Building Standard methodology

Table 4: Example Embodied Carbon Targets (per TGS v4)

Building Type	Embodied Carbon Target
Single Family Homes / Towns (less than 10 units)	TBD
Low-Rise Residential (10 units or more and less than 4 storeys)	250 $kgCO2e/m^2$ (A1 to A5)
Mid to High-Rise Residential & Non-Residential development (greater than 4 storeys)	350 $kgCO2e/m^2$ (A1 to A5)

8.3.4.1 Strategies to Reduce Embodied Carbon

The following embodied carbon reduction strategies will be considered, developed and finalized in advance of future development applications as additional building details are advanced.

Pre-design Stage

Low-Rise

- Prefabrication: Modular and prefabricated components, such as those currently constructed at the Caivan ABIC manufacturing facility, can be lower in embodied carbon because they are manufactured in controlled environments thereby reducing material waste, optimizing resource use, and minimizing energy-intensive on-site processes.
- Framing Techniques: Optimizing the structural framing via stud and joist spacing can help reduce the amount of lumber used and thus lower carbon impact.

Mid to High-Rise

- Mass Timber: A mass timber structure can lower embodied carbon due to it sequestering carbon and requiring less energy to produce compared to steel or concrete.
- Foundation Design: Reducing below-grade parking can dramatically cut the embodied carbon associated with foundations and speed up the construction schedule.
- Building Setbacks: Minimizing the number of transfer floors and setbacks in building design for efficient transfer systems can reduce the need for large quantities of reinforced concrete.
- Post-Tensioned Slabs: These slabs, which incorporate pre-stressed steel cables, require less concrete compared to conventional reinforced slabs, lowering embodied carbon.
- Lateral Structural Systems: Replacing shear walls with discrete columns can help reduce the overall mass of structural elements, significantly lowering embodied carbon while maintaining structural stability.

Design Stage

Low-Rise

- Low Carbon Insulation: Where applicable in the assembly, substituting to a lower Global Warming Potential insulation will help lower impact.
- Local Lumber: Ensuring that lumber sourced is produced locally, where possible, can minimize transportation emissions and support sustainable forestry practices in the region.

- Salvaged Material: Incorporating salvaged timber, brick, or fixtures from deconstructed buildings, if available, can reduce demand for virgin materials.

Mid to High-Rise

- Low-Carbon Concrete and Steel: Using materials verified by Environmental Product Declarations (EPDs) can ensure they meet low-carbon performance standards. This includes innovative concrete, recycled steel, or alternative low-carbon products.
- Locally Sourced Materials: Specifying materials sourced within a certain radius of the construction site can ensure that emissions from transportation are reduced.

Construction Stage

Low-Rise and Mid to High-Rise

- Circular Economy Practices: Reusing or recycling surplus materials from construction, such as steel formwork or wood can minimize waste sent to landfills.
- Material Wastage: Collaborating with contractors to monitor and optimize material orders can help reduce waste. Implementing precise calculations can ensure efficient use of resources.

9 Energy and Carbon Emissions Analysis

9.1 Thermal and Total Energy Consumption

Figures 5 and 6 show a comparison between Tewin's proposed total and thermal energy consumption, the CEP Reference Scenarios and the Ontario Building Code. These graphs demonstrate that Tewin's proposed design scenario (Scenario 5) significantly improves upon the requirements of the Ontario Building Code and aligns with the City's "Business as Planned" scenario.

As outlined earlier in this report, the thermal demand projections are based on a set of early assumptions that are to be confirmed through future CEP Reports/Briefs, as applicable.

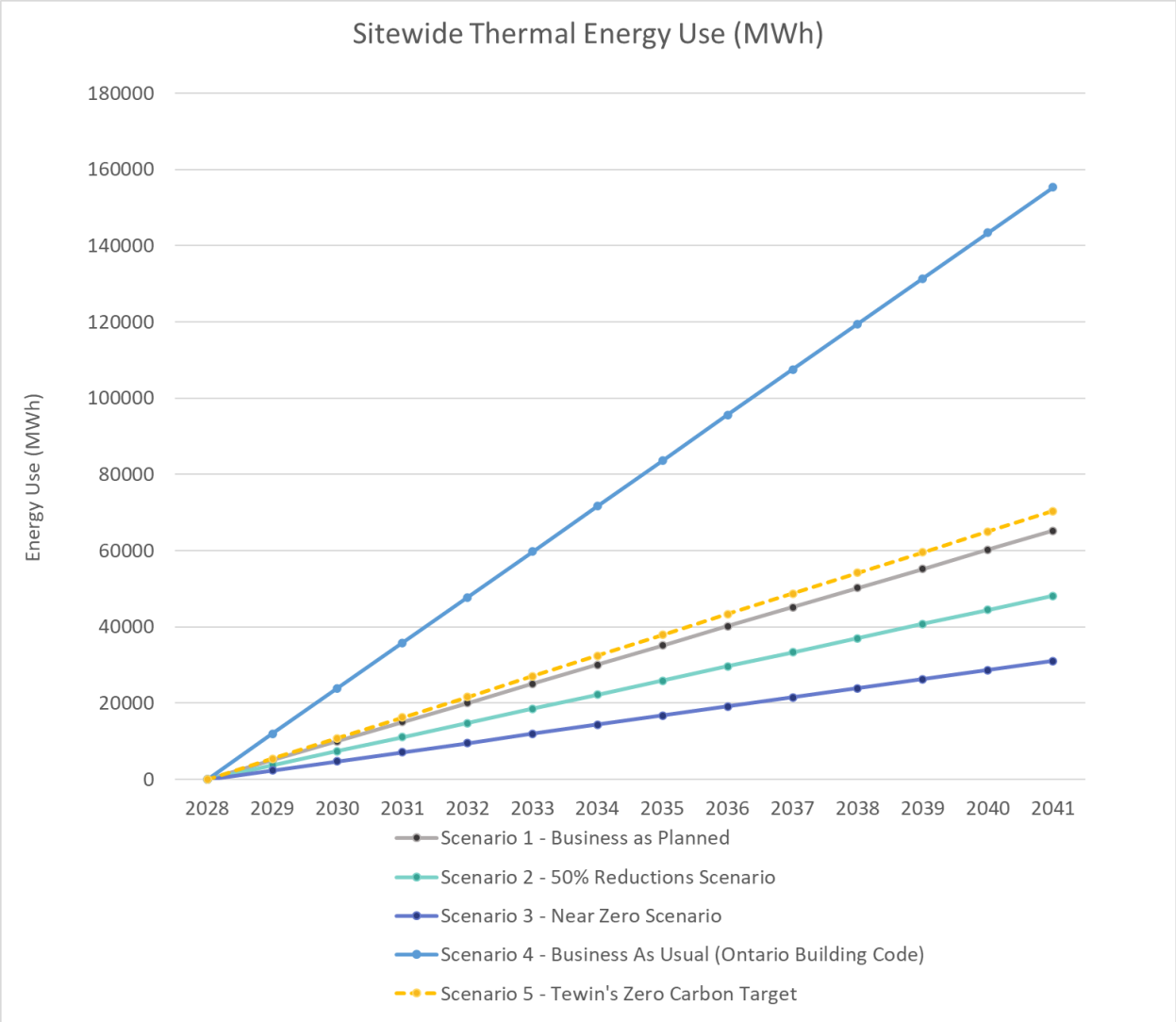

Figure 5: Tewin - Sitewide Thermal Energy Use for Scenarios 1-5 (MWh)

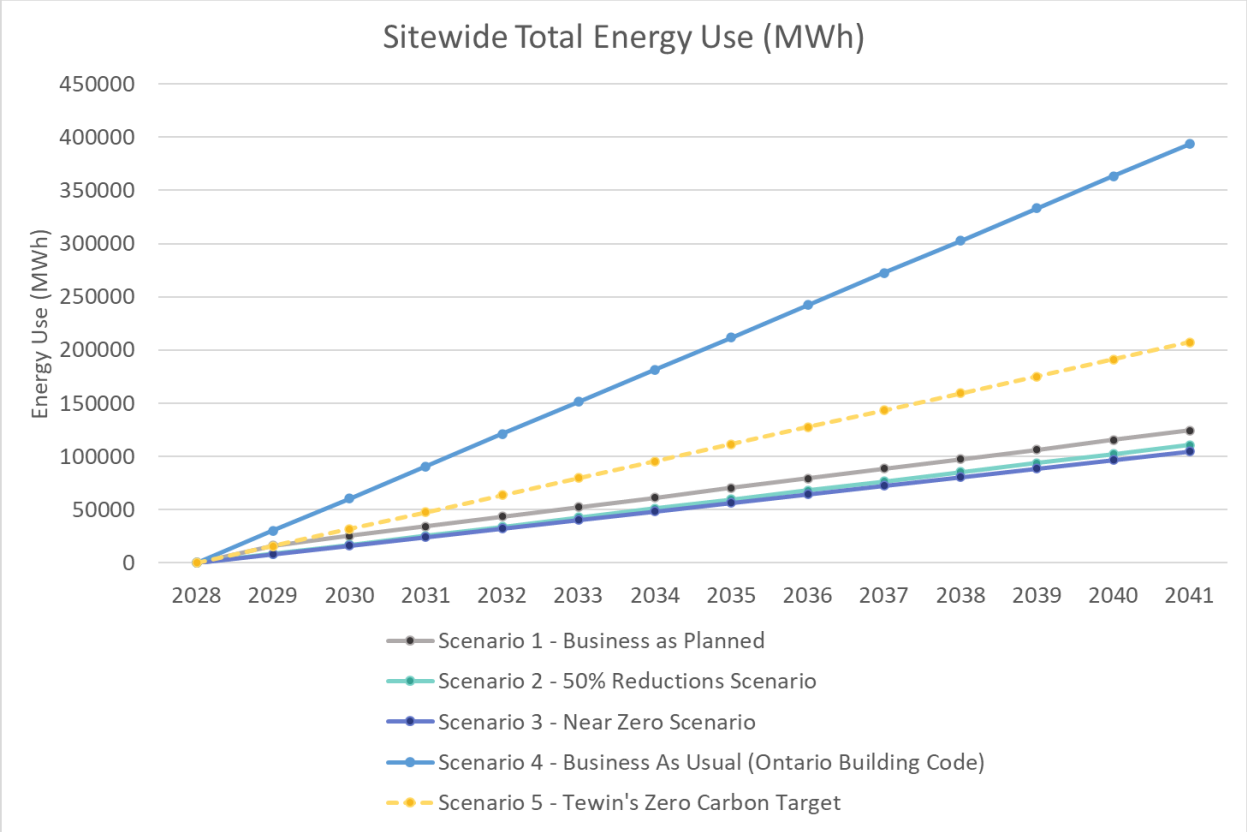

Figure 6: Tewin – Sitewide Total Energy Use for Scenarios 1-5 (MWh)

9.2 Operational Greenhouse Gas Emissions

The Tewin goal is to pursue a zero-carbon community aligned with the One Planet Living framework. This framework sets the ambitious goal for Tewin to exceed the Ottawa draft HDPS's Tier 3 greenhouse gas emission intensity (GHGI) target for operational emissions and achieve net-zero carbon across all building archetypes (see Figure 7).

This aspiration requires support from current and future interest-holders, including Hydro Ottawa and the City of Ottawa, and a community-scale effort. A detailed review of available technologies to determine their technical and financial feasibility will be needed. This review will assess current zero-carbon opportunities, their ability to work in the local / Ottawa context (ground conditions, cold winters), capital costs, end-user costs, regulatory barriers and partnership opportunities. These opportunities are outlined in more detail in Section 8.3 and will continue to be evaluated as design progresses. These targets will be confirmed as part of future CEP Reports/Briefs included in future development applications.

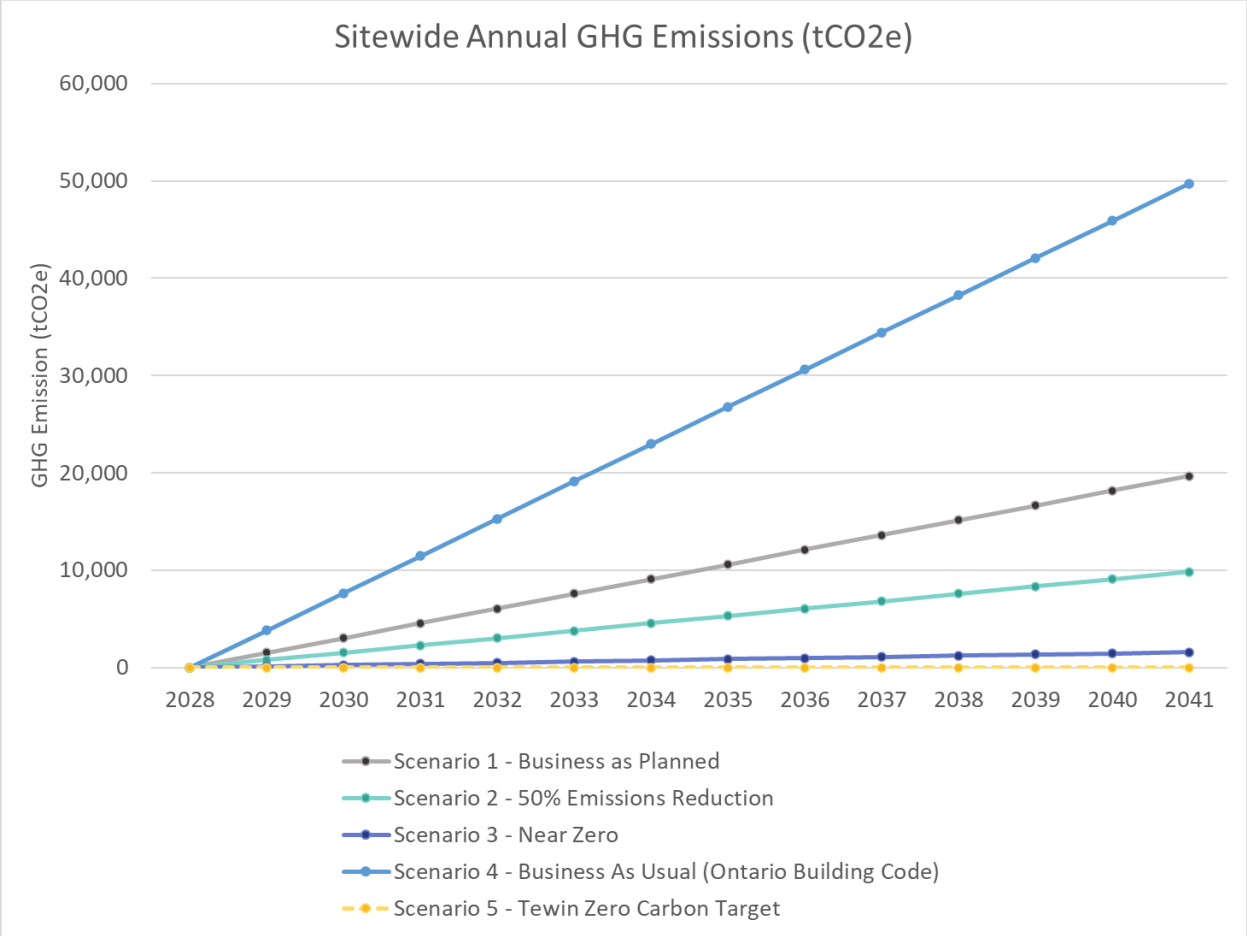

Figure 7: Tewin - Sitewide Annual GHG Emissions for Scenarios 1-5 (tCO2e)

10 Energy Resilience

As climate change progresses and weather events become more extreme and unpredictable, it will be critical for energy systems to be resilient to these changes. The shift towards higher average annual temperatures can lead to lower heating and higher cooling loads over the life of the building. Using up to date, or even predicted, weather data when doing early analysis can allow the project team to consider how the design will perform over the life of the building.

With increasing global temperatures, extreme weather events require designs to carefully evaluate back-up power solutions for emergency (life safety) requirements in certain buildings. Passive design strategies such as a relatively low window-wall ratio, high thermal mass elements within the building, and high R-values for the building insulation would assist in maintaining building temperature in the event of heating/cooling system failure.

As Tewin's design advances, the implementation of back-up power systems will be evaluated, as they will be specific to the building type, its energy requirements and energy supply characteristics.

For higher-density buildings use types, i.e. multi-unit residential, the differences between emergency and back-up power uses are as follows:

Table 5: Emergency vs. Back-up Power Requirements

	Emergency Power	Back-up Power
Purpose	Minimum life safety requirements (firefighter and evacuation)	Non-life-safety requirements for occupant wellbeing
Duration	2 hours – building code requirement	72 hours – based on federal emergency preparedness guidelines
Loads	Fire pumps, fire elevator, stair pressurization fans, alarm system	Water supply, minimal space heating, power to a common refuge area, domestic booster pumps, additional elevators

With respect to low density and other ground-oriented building use types, increasing grid-side resiliency will be a topic of discussion to be covered with Hydro Ottawa as part of continued Working Group discussions. This could include Battery Energy Storage (BESS), community solar, and other electrical back-up solutions.

It is intended that Tewin's energy systems are resilient to excessive precipitation and flooding; meaning that the locations of all energy generation equipment as well as any distribution networks will need to be selected carefully. Tewin proponents will need to engage relevant authorities as community design progresses, to continue to identify potential areas for flooding (and other environmental risks). It should be noted that the land use plan has already strategically considered and located development areas outside of 100-year and 350-year flood risk areas, as provided by South Nation Conservation.

11 Implementation Measuring and Monitoring

Zero carbon and sustainable energy is a core goal of Tewin, and will be evaluated at every stage of development, in line with the level of detail available. Recognizing the scale and undertaking to achieve this goal, the Tewin Landowners are committed to evaluating this community-level CEP at each stage, starting at its current stage, CDP and Secondary Plan. As the design of Tewin progresses, the Tewin Team will continue to evaluate the feasibility of zero carbon energy strategies mentioned in this report alongside the relevant interest-holders and working groups.

12 Conclusions and Recommendations

This Community Energy Plan captures a holistic community-wide strategy based on preliminary assumptions, modelling and analyses used to support the design evolution of Tewin. It is intended to be a framework document that will serve as a guide to the preparation and review of future CEP Reports/Briefs that will follow during future development application processes (i.e. Draft Plan of Subdivision application and/or conditions of approval).

This report was completed by Urban Equation, including Steve Dulmage, Director Sustainability, Urban Equation and Fin MacDonald, Senior Consultant, Energy and Carbon.