North Caledonia Employment Land Feasibility and Servicing Study

Haldimand County

Phase 1 Final Report

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May 26, 2023

In association with:

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Executive Summary

Executive Summary

Introduction

The key objectives of the North Caledonia Employment Lands Feasibility and Servicing Study are to continue to promote economic development within the County by ensuring there is an adequate supply of serviced and developable employment land to attract target employment sectors and businesses. This study will provide direction on the type of employment which should be attracted to the North Caledonia employment lands, the competitiveness of employment lands in the County compared to the surrounding regional area, as well as a plan for how these lands should be serviced and financed. In accordance with this review, the following report represents Phase 1 of the Caledonia Employment Lands Feasibility and Servicing Study.

Haldimand County Economic Overview

Similar to the provincial economy as a whole, the nature of the County's economy is changing. Over the past decade, the composition of the County's employment base has gradually shifted from goods-producing sectors to services-providing sectors. Figure 3-4 illustrates the employment change by sector from 2011 to 2021 in the County. Over this period, the County has shown growth in number of jobs in a broad range of sectors including wholesale trade; health care and social assistance; agriculture, forestry, fishing and hunting; professional and technical services; and management of companies and enterprises. The remaining sectors have experienced a decline in the number of jobs compared to 2011, particularly in the manufacturing and utilities sectors.

A major factor in the future competitiveness of the County's economic base is dependent, in part, on the quantity and quality of its Employment Areas. As such, the County will look to ensure it contains an ample and marketable supply of employment lands to generate new employment opportunities within the County. Over the next 30 years, the County's local employment base is forecast to increase, generating new live/work opportunities within the County. The County is geographically well positioned in the economic heartland of southern Ontario to accommodate this increased growth.

Review of Haldimand County's Competitive Position within the Broader Regional Market Area

A significant factor influencing business decisions on where to locate is the cost competitiveness (both capital investment and operating costs) of the development in relation to market demand and potential return on investment. The cost competitiveness of development on employment lands is examined herein, through a series of pro-forma financial analyses assessing the cost of constructing and operating various prototypical industrial/office developments within the County, as well as several other comparator municipalities within the broader regional market area.

The County represents a cost competitive environment for employment land development. From examining the above prototypical developments, it is apparent that the development and operation of employment land uses within the County are affordable within the context of the broader economic region. This marks a competitive advantage for the County and future marketing efforts for the North Caledonia Employment Area could explore this as a selling feature. The County could also consider ways in which to further promote affordable employment lands development – in the Niagara Region, for example, upper-tier development charges are exempt for industrial developments. Incentivizing development on the North Caledonia Employment Area could allow the County to foster economic activity as well as attract skilled labour to the County; however, such initiatives would need to be examined within Phase 2 of this project to better understand the broader fiscal impacts to County.

Future North Caledonia Employment Area Target Sectors and Land Use Review

At both the regional and local levels, location requirements of industry can vary considerably depending on the nature of the employment sector/use. Employment sectors typically situated in Employment Areas have varying site-specific requirements. To be successful in attracting a broad range of employment sectors, it is recommended that the future Employment Area provide the corresponding industry requirements. The specific attributes that are required for an Employment Area to be successful are largely based on the intended function and designations.

The new North Caledonia Employment Area should be planned as a cohesive Employment Area, with prestige attributes to attract more knowledge-based sectors. Utilizing the strategic advantages of the Highway 6 corridor will allow the for the

attraction of a wider-range of potential employment uses and create a diverse Employment Area environment. With this vision in mind, the key target sectors for the new North Caledonia Employment Area are explored in detail in Figure 5-1 and are summarized below:

- Manufacturing/Advanced Manufacturing;
- Distribution and Logistics;
- Professional, Scientific, and Technical Services/Business Services;
- Research and Development;
- Agri-business; and
- Food and Accommodation Services, and other Employment-Supportive Uses.

The policy and regulatory environment for employment lands in the County is supportive of achieving the County's employment objectives over the planning horizon. The land use planning framework will need to be consistent with the Provincial Policy Statement (P.P.S.) and conform to the Growth Plan. Provincial policy requires rationalization that the Subject Lands are feasible for employment uses for the long-term. While the Subject Lands are currently zoned for rural and agricultural uses, the Official Plan has recently redesignated the lands for employment uses within the urban settlement boundary. This redesignation contemplates an enabling policy framework to facilitate the long-term redevelopment of the Subject Lands, including a broad range of permitted employment uses. Based on regulatory mapping and policies, there are some identified regulated areas and natural heritage features on the Subject Lands that will require further study. The Subject Lands are subject to provincial and local policy that must be considered through the Study to develop a comprehensive land use planning framework for the Subject Lands.

Report

Chapter 1
Introduction

1. Introduction

1.1 Terms of Reference

The Consultant Team of Watson & Associates Economists Ltd. (Watson), WSP Canada Group Limited (WSP) and GM BluePlan Engineering (GM BluePlan) was retained in the summer of 2022 to prepare an Employment Lands Feasibility and Servicing Study which ensures that Haldimand County (the "County") is well-positioned to accommodate a diverse range of employment growth over the coming decades. The County has identified a need for designated and serviced employment land to remain competitive in growing and changing markets and to accommodate forecasted employment growth within the County. The County has identified approximately 183 hectares of lands in north Caledonia (the "Subject Lands") as a candidate for future employment land uses.

To ensure continued growth and diversity of the County's Employment Areas, planning and marketing efforts must be geared toward both the broader strengths of its Employment Areas, as well as specific target sector investment attraction efforts. The County is forecast to experience significant population and employment growth to the year 2051. According to Watson's 2020 Growth Study Update, the County's reported 2021 population of 50,400 is expected to increase to 77,000 in 2051 with employment numbers increasing from 19,205 to 29,000 during that same horizon. The Growth Study also demonstrates that 50% of employment growth in the area is forecast to occur in Caledonia.

The key objectives of the North Caledonia Employment Lands Feasibility and Servicing Study are to continue to promote economic development within the County by ensuring there is an adequate supply of serviced and developable employment land to attract target employment sectors and businesses. This study will provide direction on the type of employment which should be attracted to the North Caledonia employment lands, the competitiveness of employment lands in the County compared to the surrounding regional area, as well as a plan for how these lands should be serviced and financed. In accordance with this review, the following report represents Phase 1 of the Caledonia Employment Lands Feasibility and Servicing Study.

This report represents Phase 1 of the North Caledonia Employment Land Feasibility and Servicing Study. Appendix B of this Phase 1 Report contains a detailed appendix

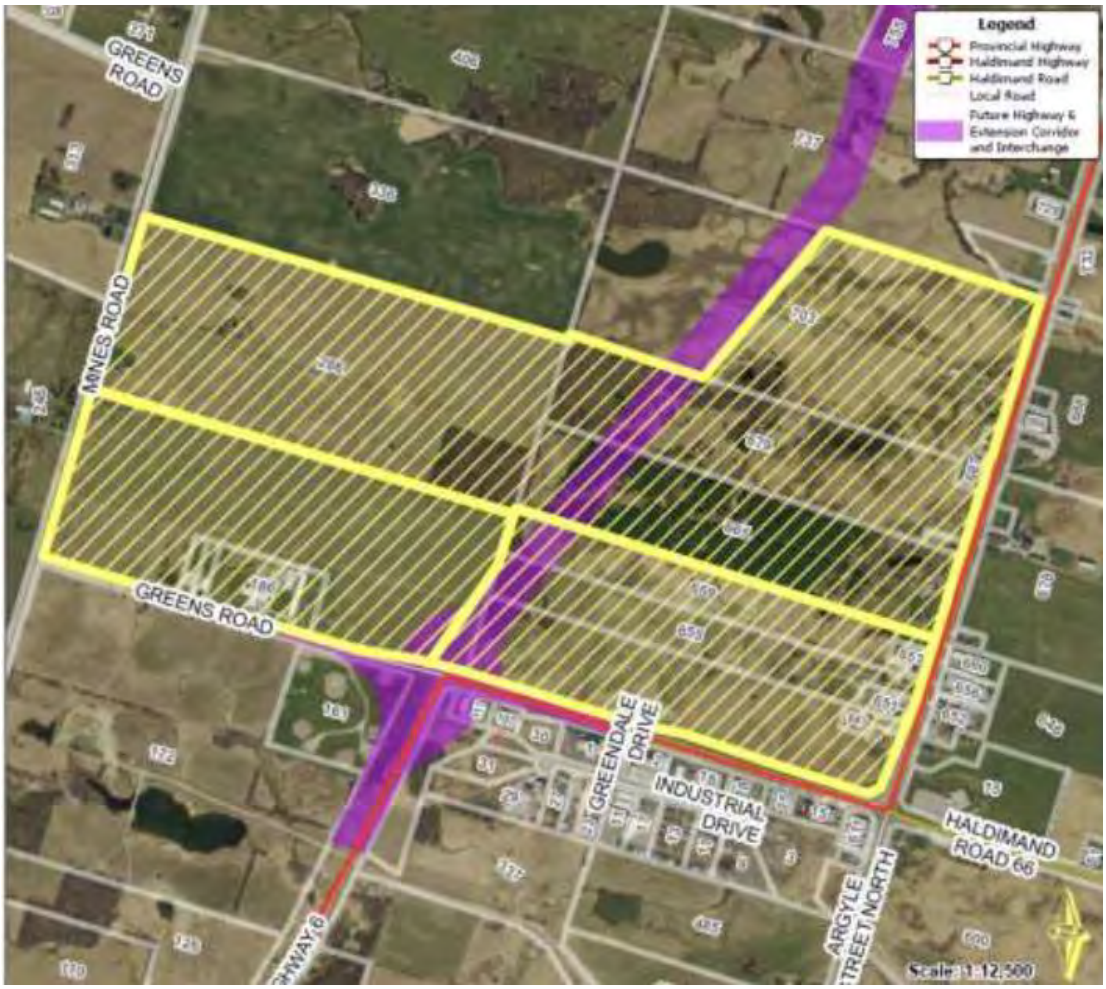
which determines how the North Caledonia Employment Area is serviced and the costs associated with infrastructure development. Phase 2 will then include a detailed financial analysis and business plan to take the findings from Phase 1 and quantify the impact on the County. Following Council's direction on Phases 1 and 2, the Consultant Team will commence Phase 3 which involves recommendations regarding property administration and management marketing as well as an implementation plan.

1.2 Study Context

The Subject Lands are located in north Caledonia, bounded by Greens Road to the south, Mines Road to the west, and Highway 6 to the east (see Figure 1-1). The predominant use of the Subject Lands is agriculture with some light industrial and agriculture-related employment uses to the south and east, fronting onto and with access from Greens Road and Highway 6. South of Greens Road is an existing unserviced industrial area that is designated by the County's Official Plan as Urban Business Park with businesses that appear targeted to logistics and construction. The Ministry of Transportation Ontario (M.T.O.) has identified a protected corridor to facilitate a long-term plan to construct a Highway 6 bypass that transects the Subject Lands, as shown on Figure 1-1.

The Subject Lands are strategically located being in proximity to major transportation corridors including Highway 6, Highway 403, and the John C. Munro Hamilton International Airport. The Hamilton International Airport is the third largest cargo airport in Canada and the largest overnight express cargo airport, giving any future employment uses within the Subject Lands direct access to a much broader market. This strategic location gives it access to the regional markets of Hamilton, Brantford, Toronto, and Niagara, and international markets via the John C. Munro Airport and the land border with the United States of America via Niagara.

Figure 1-1
Haldimand County
North Caledonia Subject Lands



1.3 Engagement and Consultation Program

The Study work plan includes a robust program for public engagement and consultation.. A range of participants have been identified to engage and consult with throughout the Study, including:

- Elected representatives from the County;
- County staff;
- Two committees of Council, including the Agricultural Advisory Committee and Business Development and Planning Advisory Committee;

- Grand River Conservation Authority (G.R.C.A.);
- M.T.O.;
- Six Nations of the Grand River First Nation; and
- Mississaugas of the Credit First Nation.

Through preliminary feedback from some participants in the Study, the Project Team determined that a more comprehensive public engagement and consultation program was appropriate. In September 2022, the Program was updated to reflect a more robust process based on the three phases of the work plan, as follows:

- **Phase 1**: This Phase initiated with the preparation and finalization of the Engagement and Consultation Program. Following finalization of the Engagement and Consultation Program, the Project Team held one-on-one meetings with a range of stakeholders during Summer 2022, including elected representatives, County staff, the Agriculture Advisory Committee and Business and Planning Development Advisory Committee, and the G.R.C.A. The Project Team also held a introductory meeting with the Six Nations of the Grand River First Nation and the Mississaugas of the Credit First Nation. Prior to the conclusion of Phase 1, staff will present a report to Council for information purposes and a meeting with landowners within the subject lands will subsequently be held. Lastly, a dedicated webpage will be developed for the Study.
- **Phase 2**: Phase 2 will include the establishment of an Advisory Group that is inclusive of some of the participants noted above. A total of one meeting with the Advisory Group will be held during Phase 2. This Phase will also include a meeting with landowners within the Subject Lands, as well as one-on-one consultation with each of the Six Nations of the Grand River First Nation and the Mississaugas of the Credit First Nation. Additional engagement and consultation activities contemplated during Phase 2 include a Public Information Centre and a delegation to the Business Development Advisory Committee and the Agricultural Advisory Committee. Phase 2 will conclude with a presentation to Council for information purposes.
- **Phase 3**: The engagement and consultation program for Phase 3 is largely consistent with Phase 2. The intent of this is to ensure there is appropriate opportunity for a range of stakeholders to meaningfully participate and contribute

to the Study, while also ensuring opportunity for consultation between the County and the First Nations.

It is anticipated that the Engagement and Consultation Program will be evaluated throughout the Study with regular updates made available to the community through various opportunities, including updates to the dedicated webpage. All engagement and consultation activities contemplated under the Program offer an important opportunity for participants to meaningfully engage, consult and participate in the Study throughout the work plan.

Chapter 2
Overview of Macro-Economic and Demographic Trends

2. Overview of Macro-Economic and Demographic Trends

The following chapter provides a summary of the macro-economic trends influencing regional labour force and employment trends within Ontario, the County, and the surrounding economic region over the past two decades. In examining the County's employment lands, it is essential to understand the broader influences and factors that affect the regional economy as a whole. This section briefly examines recent macro-economic trends influencing labour force and employment trends at all levels, including; internationally, nationally, provincially, sub-provincial area (Greater Golden Horseshoe (G.G.H.)) and regionally.

2.1 Global Economic Trends and International Trade

While coronavirus disease (COVID-19) has impacted global economic output it has also accelerated technological disruptions which were already taking place prior to the pandemic. Such disruption has had a profound influence on global trade, commerce and the physical nature of work. These trends are anticipated to have a direct influence on commercial and industrial real estate needs over both the near- and longer-term. In light of these anticipated trends, it is important to consider the manner in which these impacts are likely to influence the nature of employment by type, as well as by place of work.

While the long-term global and Canadian economic outlook remains positive, it is important to recognize that there are economic headwinds of which to be cautious going forward. Global supply shortages of goods due to trade disruption, labour shortages, geo-political conflicts, pent-up demand from consumers, and increased commodity prices are resulting in multi-decade-high inflation rates, which were initially elevated through federal economic support and fiscal stimulus measures in response to COVID-19. Record levels of public-sector debt due to pandemic response measures and increasing household debt loads resulting from soaring housing prices in many areas of Canada are also a concern. Interest rate hikes are expected to help keep inflation levels in check, with Canada's inflation rate reaching 7.6% in August 2022, a

level not seen since 1991.[1] Subject to the influence of national and global monetary policy, high inflation levels and interest rate increases could result in potential setbacks in the recovery path towards a stable economy.

The national housing market is now starting to show cooling signs as a result of higher mortgage rates, rising borrowing costs, fuel costs and upward pressures on rents. These factors are further exacerbating challenges associated with declining housing affordability through increases in monthly household carrying costs. These impacts, combined with the broader inflationary concerns outlined, are increasingly likely to result in potential near-term setbacks in the recovery path towards stable national and provincial economies. Despite the consequences of COVID-19 and the near-term economic headwinds discussed above, the long-term economic outlook for the region and Ontario remains positive as the region continues to be attractive to investment.

2.2 Emerging Industry Sector and Labour Force Trends

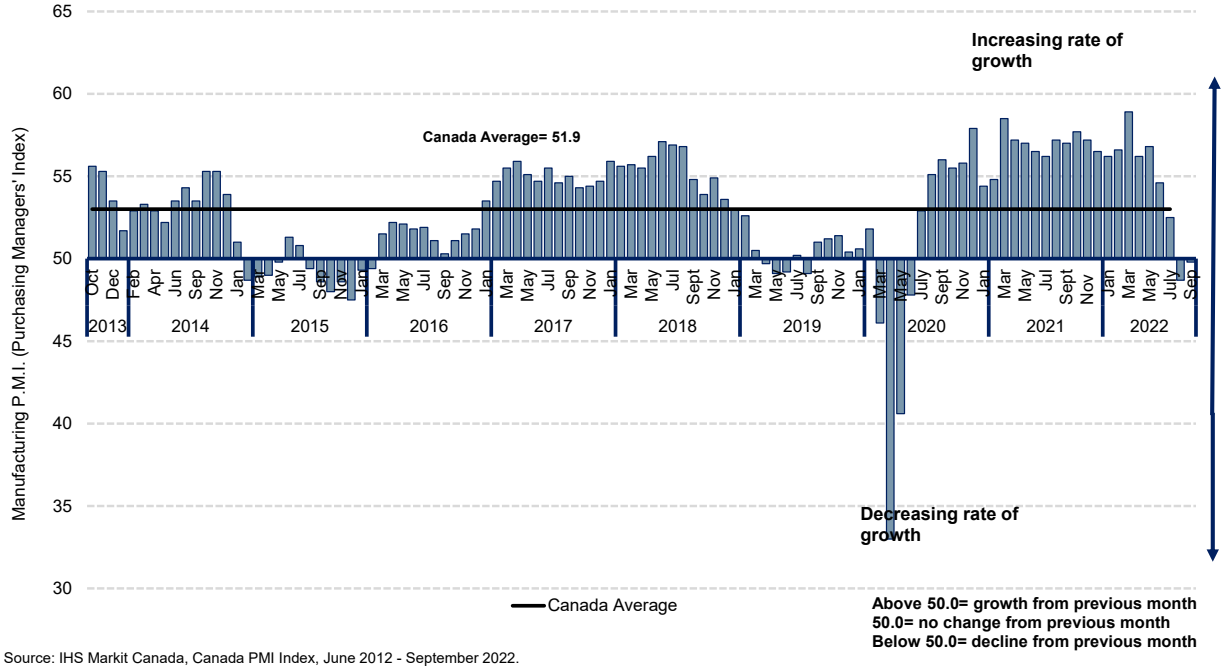
2.2.1 Outlook for the Manufacturing Sector

The Purchasing Managers' Index (P.M.I.) is a prevailing economic indicator for economic trends in the manufacturing and services sectors which is based on the purchasing managers' market condition outlook and serves as a key measure of the direction of the manufacturing sector on a monthly basis. The P.M.I. index ranges between a number from 1 to 100. A P.M.I. value greater than 50 represents an expansion relative to the previous month, while a P.M.I. value less than 50 represents a contraction. Figure 2-1 summarizes the P.M.I. index for Canada between 2013 and 2022 (September). As illustrated in Figure 2-1, the P.M.I. index largely indicated moderate to strong expansion between 2013 and 2022, with the exception of 2015, 2019 and 2020 where the index showed sustained monthly contractions. The P.M.I. index presents steep contractions at the beginning of March 2020 in manufacturing due to the negative effects of COVID-19 on the global economy, international trade, and the general demand for goods and services. These conditions worsened into April 2020; however, they showed signs of a strong rebound by July 2020 before moderating by

[1] The Globe and Mail, Canada's inflation rate hits new 31-year high in April as grocery prices soar. May 18, 2022.

May 2022. September 2022 represents the first contraction since the initial recovery from the effects of COVID-19.

Figure 2-1
Purchasing Managers' Index for Canada, 2001 to July 2022



Source: IHS Markit Canada, Canada PMI Index, June 2012 - September 2022.

Note: Above 50.0 indicates growth from the previous month, 50.0 indicates no change from the previous month, and values below 50.0 indicate a decline from the previous month.
Source: HIS Markit Canada, Canada P.M.I. Index, June 2012 to July 2022 summarized by Watson & Associates Economists Ltd., 2023.

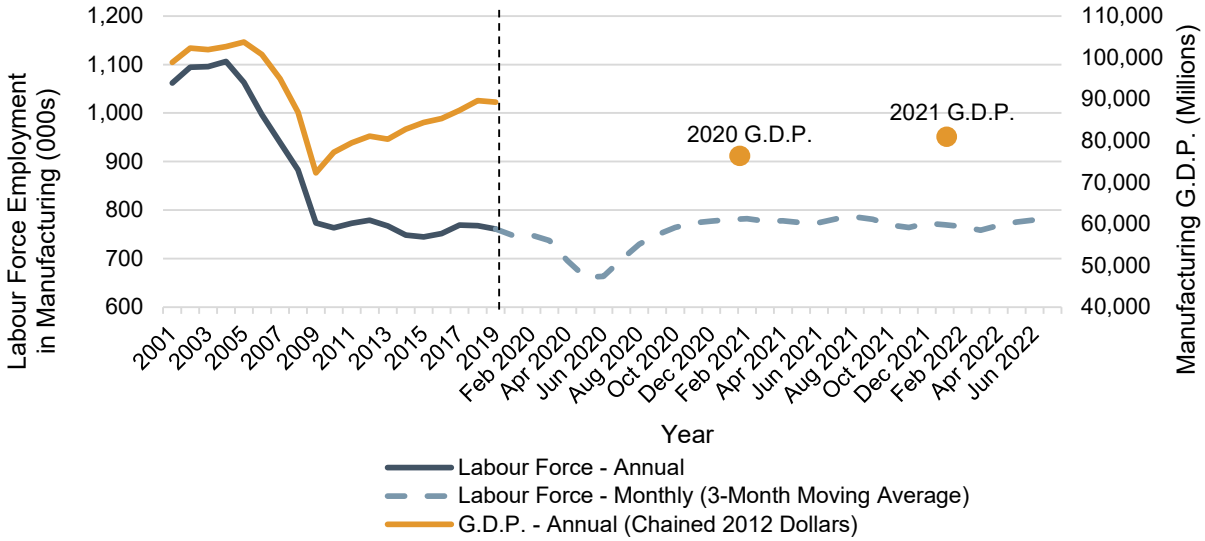
While manufacturing remains vitally important to the provincial economy with respect to jobs and economic output, this sector is not anticipated to generate significant labour-force growth across the Province over the coming decades. While there will continue to be a manufacturing focus in Ontario, industrial processes have become more capital/ technology intensive and automated.

As summarized in Figure 2-2, the manufacturing sector in Ontario experienced significant declines between 2004 and 2009 with respect to labour force and gross domestic product (G.D.P.). Between 2009 and 2019, however, provincial labour force levels in the manufacturing sector stabilized, while G.D.P. output steadily increased.

Since stabilizing in 2010, labour force levels in the manufacturing sector have remained relatively steady except for the mid-2020 decline and sharp recovery following the onset of COVID-19.

The highly competitive nature of the manufacturing sector will require production to be increasingly cost effective and value-added oriented, which bodes well for firms that are specialized and capital/technology intensive. As a result of increased technological efficiencies in the manufacturing sector, provincial G.D.P. levels related to the manufacturing sector have moderately increased over the past decade compared to generally flat labour force trends, indicating increasing G.D.P. output per employee. Figure 2-2 displays this trend, as provincial manufacturing G.D.P. has grown at a faster rate than the manufacturing labour force, indicating more capital efficient industrial processes less reliant on labour to generate value.

Figure 2-2
Manufacturing Labour Force Trends in Ontario, 2001 to July 2022



Source: Annual labour force data from Statistics Canada Labour Force Survey, Table 282-0125, 2020 monthly data from Table 14-10-0091-01, and 2021 monthly data from Table 14-10-0388-01. Annual G.D.P. data from Statistics Canada Table 36-10-0402-01, by Watson & Associates Economists Ltd.

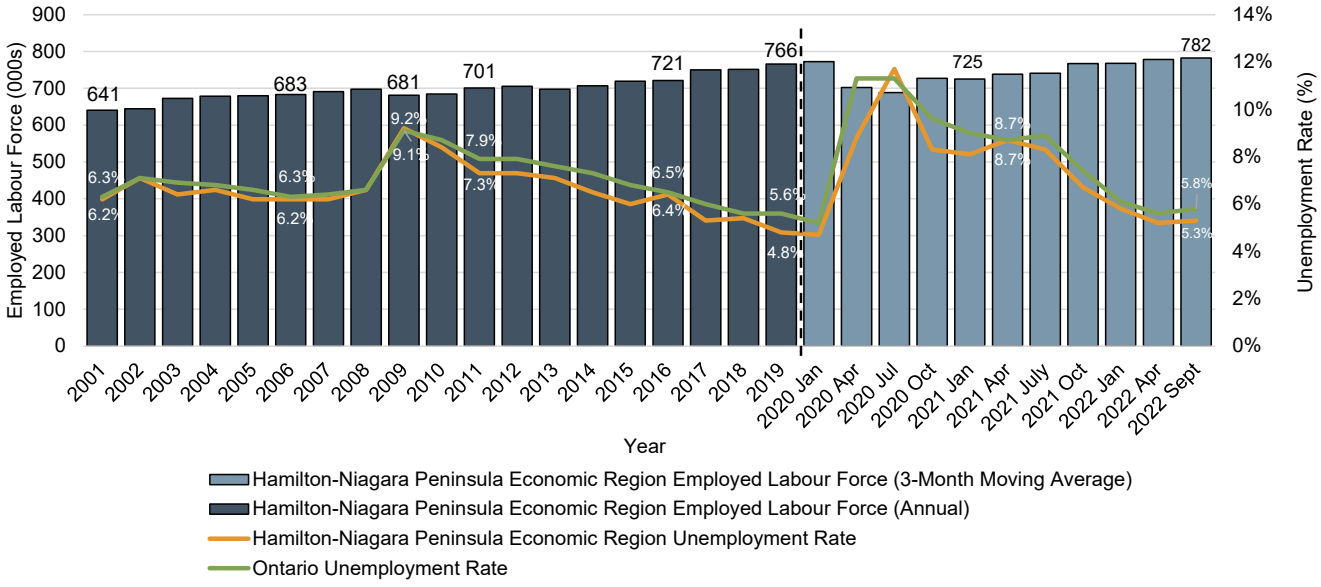
2.2.2 Regional Labour Force Trends

Figure 2-3 summarizes total labour force and unemployment rate trends for the Hamilton-Niagara Peninsula Economic Region.[1] Key observations include the following:

- The total labour force within the Hamilton-Niagara Peninsula Economic Region grew from 641,000 in 2001 to 766,000 in 2019, an increase of 125,000. From 2001 to 2019 the total labour force grew at a steady annual rate of 0.9%.
- Between 2001 and 2019, the unemployment rate in the Hamilton-Niagara Peninsula Economic Region peaked at 9.2% in 2009, coinciding with the 2008 global recession, followed by a steady decline to a recent historical low of 4.6% in July 2022;
- Despite the strong recent historical performance of the Hamilton-Niagara Peninsula Economic Region labour market, the unemployment rate peaked in July 2020 at 11.7% as a result of the COVID-19 pandemic; and
- The unemployment has declined since the onset of COVID-19, reaching a low of 4.6% in April of 2022, and increasing slightly to 5.3% by September 2022.

[1] The Hamilton-Niagara Peninsula Economic Region includes Haldimand County and represents the lowest level of geography this dataset is available for.

Figure 2-3
Hamilton Niagara Peninsula Economic Region
Total Labour Force and Unemployment Rate Trends, 2001 to 2022 YTD



Note: Statistics Canada Labour Force Survey and Census labour force statistics may differ.
Source: Hamilton-Niagara Peninsula Economic Region employed labour force and unemployment rate from Statistics Canada Table 14-10-0090-01 and 2020 monthly data from Table 14-10-0293-01. Annual Province of Ontario unemployment rate from Statistics Canada Table 14-10-0090-01 and 2020 monthly data from Table 14-10-0295-02. 2021 monthly data from Table 14-10-0387-02. By Watson & Associates Economists Ltd.

2.3 Economic Trends and Growth Drivers within a Regional Context

This section examines labour force trends over the past 15 years in the County in relation to the broader economic Region and the Province of Ontario. These trends are important to understand given the close relationship between regional labour force growth, net migration, and population growth.

2.3.1 Outward Growth Pressure

The County is located in the southwest of one of the fastest growing Regions in North America, known as the G.G.H. This region comprises the municipalities that make up the Greater Toronto and Hamilton Area (G.T.H.A.), as well as the surrounding Regions/ Counties within Central Ontario, known as the G.G.H. "Outer Ring," which extends from Haldimand County in the southwest to Simcoe County in the north, to Niagara Region in the southeast (refer to Figure 2-4). The strength of the broader regional G.G.H. economy presents a key opportunity for the County's economy and its residents within

commuting distance to many of the growing regional employment markets within this region, particularly within the west G.G.H.

As identified in the Growth Plan, 2019 and Proposed Amendment 1 to A Place to Grow (2020), the long-term outlook for the G.G.H. is positive, characterized by strong population growth primarily through migration, fueled by economic growth that is increasingly concentrated in large urban centres. The population of the G.G.H. is forecast to increase from 10 million in 2021 to 14.9 million in 2051.[1] This represents a population increase of 4.9 million people (162,000 annually), or 1.3% annually between 2021 and 2051. With respect to the region's economic potential, the G.G.H. employment base is forecast to increase from 4.6 million in 2016 to 7 million in 2051. This represents an employment increase of 2.4 million jobs (69,000 annually), or 1.2% annually between 2016 and 2051. Currently, the G.G.H. represents the fourth largest and one of the fastest growing larger City/Regions in North America.

The G.G.H. represents the economic powerhouse of Ontario and the centre of a large portion of the economic activity in Canada. The G.G.H. is also economically diverse with most of the top 20 traded industry clusters throughout North America having a strong presence in this region. Within the G.G.H., the G.T.H.A. industrial and office commercial real estate markets are significant, having the third and sixth largest inventories, respectively, in North America.[2]

With a robust economy and diverse mix of export-based employment sectors, the G.G.H. is highly attractive on an international level to new businesses and investors. The G.G.H. also has a strong appeal given the area's regional infrastructure (i.e., Toronto Pearson International Airport, other regional airports, provincial highways, inter-modal facilities), access to labour force, post-secondary institutions, and proximity to the United States border. This continues to support steady population and housing growth within this region, largely driven by international and inter-provincial net migration.

[1] As previously mentioned, proposed Amendment 1 to the Growth Plan extends the Schedule 3 forecast to 2051.
[2] Source: Derived from Cushman & Wakefield Toronto Industrial Market Beat and U.S. Industrial Market Beat Snapshot, Q3 2017, and Cushman & Wakefield Toronto Office Market Beat and U.S. Office Market Beat Snapshot, Q3 2017 by Watson & Associates Economists Ltd.

Figure 2-4
Haldimand County within the Context of the G.G.H.

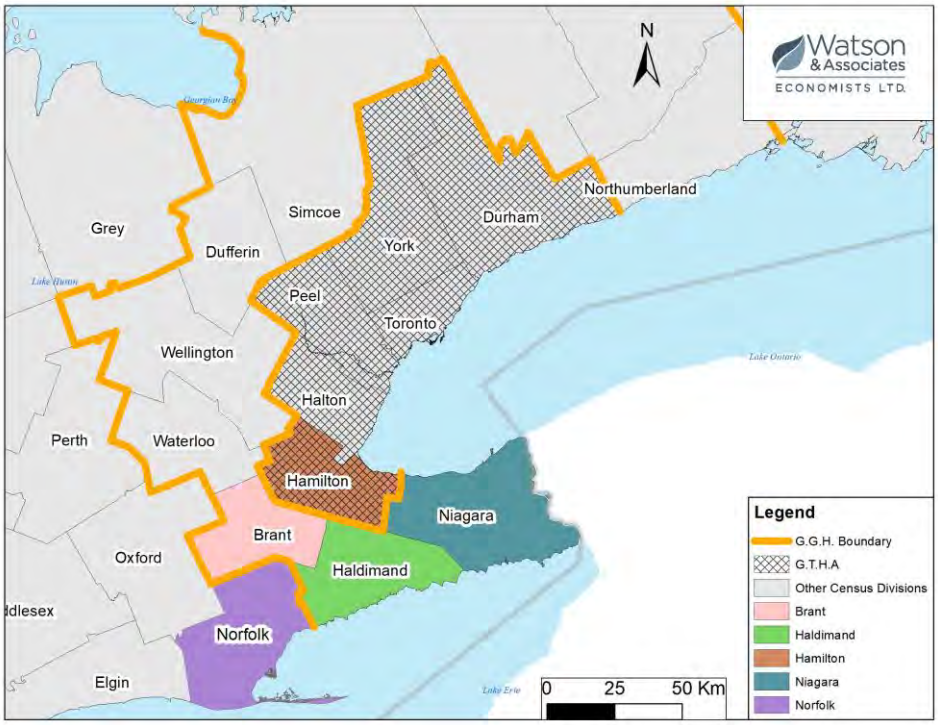


Figure 2-5 and Figure 2-6 summarize the long-term population and employment growth forecast for the G.G.H. between the G.T.H.A. and the G.G.H. Outer Ring. Figure 2-5 identifies that the G.T.H.A. has historically experienced greater population and employment growth relative to the G.G.H. over the 2001 to 2021 period. Looking forward, forecast annual population and employment growth within the G.G.H. Outer Ring is anticipated to increase significantly, driven by continued outward growth pressure from the G.T.H.A.

Figure 2-5
Historical and Forecast Population Growth for the Greater Golden Horseshoe (G.G.H.), 2001 to 2051

	Population			2001 to 2021		2021 to 2051	
Area	**2001**	**2021**	**2051**	**Total Population Growth**	**Annual Population Growth**	**Total Population Growth**	**Annual Population Growth**
G.T.H.A.	5,807,000	7,518,000	11,170,000	1,711,000	85,600	3,652,000	121,700
G.G.H. Outer Ring	1,971,000	2,493,000	3,700,000	522,000	26,100	1,207,000	40,200
Total	**7,778,000**	**10,011,000**	**14,870,000**	**2,233,000**	**111,700**	**4,859,000**	**161,900**

Source: Derived from A Place to Grow: Growth Plan for the Greater Golden Horseshoe 2019 (Office Consolidation 2020). Figure by Watson & Associates Economists Ltd., 2022.

Note: Population for 2021 estimated using the 2016 net Census undercount. Figures may not sum to totals due to rounding.

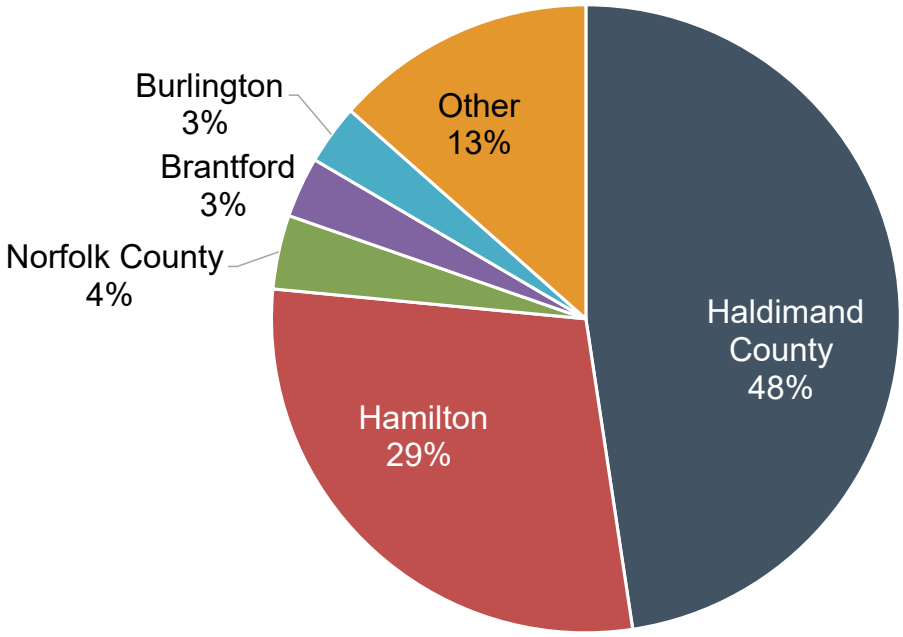
Figure 2-6
Historical and Forecast Employment Growth for the Greater Golden Horseshoe (G.G.H.), 2001 to 2051

	Employment			2001 to 2016		2016 to 2051	
Area	2001	2016	2051	Total Employment Growth	Annual Employment Growth	Total Employment Growth	Annual Employment Growth
G.T.H.A.	2,938,000	3,564,000	5,360,000	626,000	41,700	1,796,000	51,300
G.G.H. Outer Ring	890,000	1,034,000	1,650,000	144,000	9,600	616,000	17,600
Total G.G.H	**3,828,000**	**4,598,000**	**7,010,000**	**770,000**	**51,300**	**2,412,000**	**68,900**

Source: 2001 to 2016 derived from Statistics Canada Census. 2016 to 2051 derived from Greater Golden Horseshoe Growth Forecasts to 2051 Technical Report, June 16, 2020, Hemson Consulting Ltd. Figure by Watson & Associates Economists Ltd., 2020.

As previously mentioned, the strength of the broader regional G.G.H. economy, in particular the G.G.H. Outer Ring, presents a significant opportunity for the County's economy and its residents within commuting distance to this growing regional employment market. According to the 2021 Census, 48% of the County's residents work within the County, 29% in Hamilton and 4% in Norfolk County, while the rest commute to other areas for work. The G.T.A. represents the largest employment hub outside the three areas, as it employs 4% of the County's residents.

Figure 2-7
Haldimand County
Where Haldimand County Residents Commute to, 2021



Source: Statistics Canada Commuting Flow data, derived by Watson & Associates Economists Ltd., 2022.

2.3.2 Regional Economic Opportunities

Export-based economic growth throughout the local and surrounding regional economy will continue to generate demand for new housing within the County. New housing construction and associated local population growth is anticipated to generate demand for local industries within the County related to the construction sector as well population-related employment sectors such as retail, accommodation, and food, plus other personal service uses. Other local "knowledge-based" and "creative class" employment sectors such as information and cultural industries, arts, entertainment, and recreation, and professional, scientific and technical services are also beginning to experience moderate employment growth. Population growth combined with the aging of the existing population base will also place increasing demands on employment sectors and municipal services related to the growing population base of seniors, primarily related to the health care and social assistance sector.

The local economic base is also oriented towards small businesses and home-based occupations. Such businesses act as incubators for local economic development and

stimulate innovation and entrepreneurialism within the County. Home-based job growth will be facilitated by opportunities related to telecommuting and increased technology. Demographics also play a role in the employment outlook for work at home employment. As the population and labour force continue to age, it is likely that an increased number of working and semi-retired residents will be seeking lifestyles that will allow them to work from home on a full-time or part-time basis.

2.3.3 Assessing the Impacts of Technology and Innovation on Economic Development and Population Growth

Long-term labour force growth potential across the national, provincial, regional, and local levels, will be directly influenced by continued structural changes and disruptions driven by technology and automation. In addition to its broader impacts on the economy, COVID-19 has accelerated changes in work and commerce as a result of technological disruptions which were already taking place prior to the pandemic. Businesses are increasingly required to rethink the way they conduct business with an increased emphasis on remote work enabled by technologies such as virtual private networks, virtual meetings, cloud technology and other remote work collaboration tools. These disruptive forces continue to broadly impact the nature of employment by place of work and sector, and have a direct influence on commercial, institutional and industrial real estate space needs. As of 2021, it is estimated that approximately 28% of the County's workforce is working from home on a full-time basis, and percentage of workers who reported having no fixed place of work was approximately 15% in 2021.[1] [2]

Going forward, to prevent an undesirable, lose-lose scenario associated with anticipated technological change in the economy – talent shortages, unemployment, and growing inequality – a number of critical actions are needed. This includes businesses assuming an active role in supporting their existing workforce through reskilling and

[1] Work at home and no fixed place of work employment derived from 2021 Statistics Canada Census data. It is important to note that the 2021 Census enumeration occurred during the COVID-19 pandemic, where many employees across Canada were required to work remotely.

[2] Statistics Canada defines no fixed place of work employees as "persons who do not go from home to the same workplace location at the beginning of each shift. Such persons include building and landscape contractors, travelling salespersons, independent truck drivers, etc."

upskilling, individuals taking a proactive approach to their own lifelong learning, and governments creating an enabling environment to assist in these efforts.[1]

While the long-term net economic impacts of automation and/or artificial intelligence appear to be positive, global competition from both established and emerging markets looking to capitalize on potential opportunities related to this technology will be increasingly fierce. Building on its strong community foundations above, the County can influence their readiness towards an ever-evolving knowledge-based economy through on-going leadership and investment. Ultimately, these efforts are important to enhance youth in-migration, talent attraction, and local employment opportunities geared towards an increasingly skilled labour force.

[1] World Economic Forum. Insight Report. The Future of Jobs Report. Centre for the New Economy and Society. 2018.

Chapter 3
Haldimand County Economic Overview

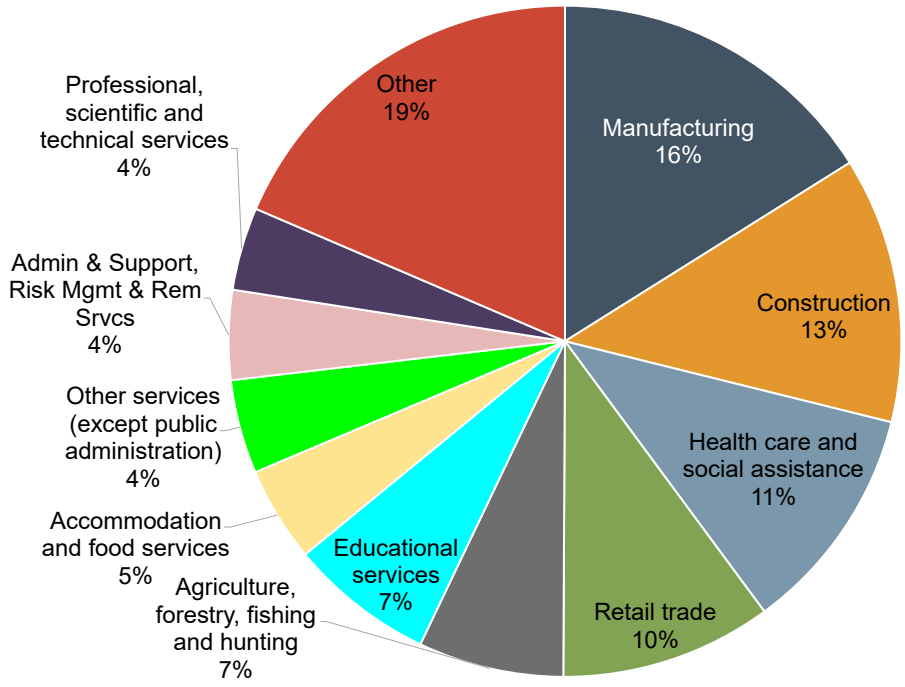
3. Haldimand County Economic Overview

The following chapter provides an overview of the County's economic base, including concentrated industry sectors (i.e., clusters) as well as a comparison of the County's recent employment growth trends in relation to the Province.

3.1 Employment and Business Structure

The County has an estimated employment of 19,000 jobs, as of 2021.[1] These jobs are across a diverse employment base, as illustrated in Figure 3-1. The largest sector in the County is manufacturing, which accounts for 16% of total employment. Other key sectors include construction; health care and social assistance; retail trade; agriculture, forestry, fishing and hunting; and educational services.

Figure 3-1
Haldimand County Employment Base by Major Industry Sector, 2021



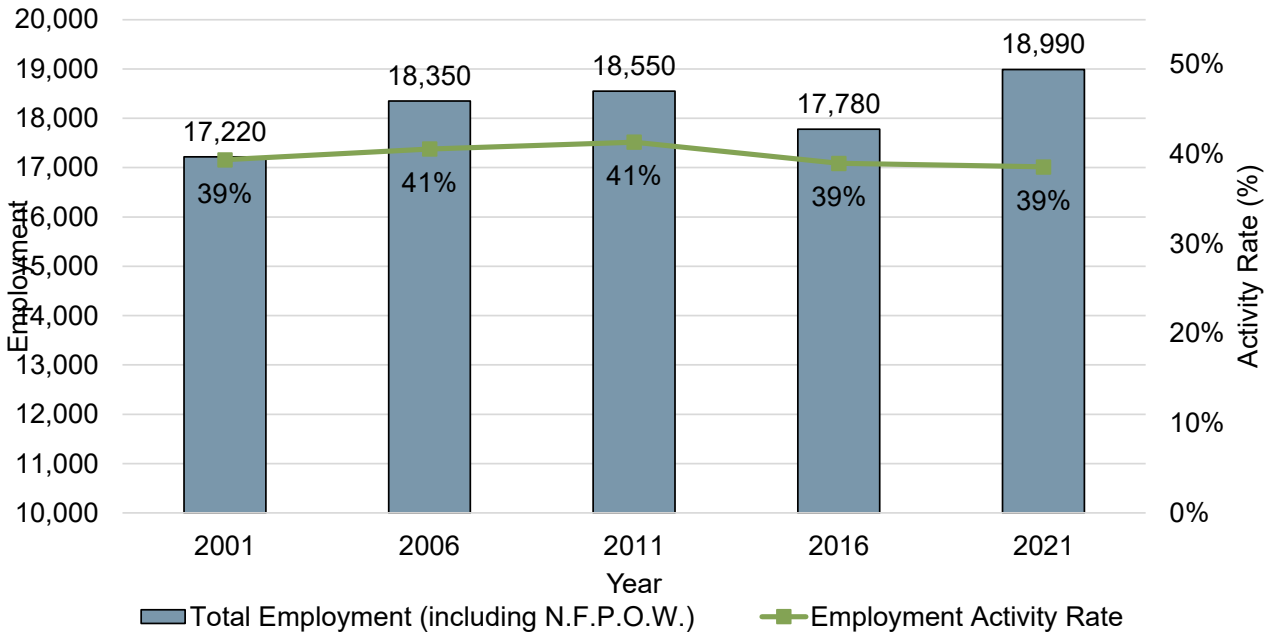
Source: Derived from 2021 Statistics Canada Census, presented by Watson & Associates Economists Ltd., 2023.

[1] Based on 2021 Statistics Canada Census data.

3.2 Employment and Economic Growth Trends

The total employment base for the County grew from approximately 17,215 jobs in 2001 to 17,780 jobs in 2016, as illustrated in Figure 3-2. Over the 15-year period (2001 to 2016), employment growth peaked in 2011 and averaged 0.2% annually, which is lower than the growth rate of 1.2% in the G.G.H. The County's 2021 employment base is estimated at a total of approximately 19,000, having increased by an estimated 1,210 over the 2016 to 2021 period, despite Census enumeration occurring during a Provincial lockdown caused by COVID-19. As illustrated in Figure 3-2, over the 2001 to 2021 period, the County's employment activity rate (ratio of jobs to population) has remained stable, ranging from 39 to 41% over the Census periods. This indicates that the local population base increases at a similar rate to the local employment base over the 20-year period.

Figure 3-2
Haldimand County Employment Base and Activity Rate, 2001 to 2021



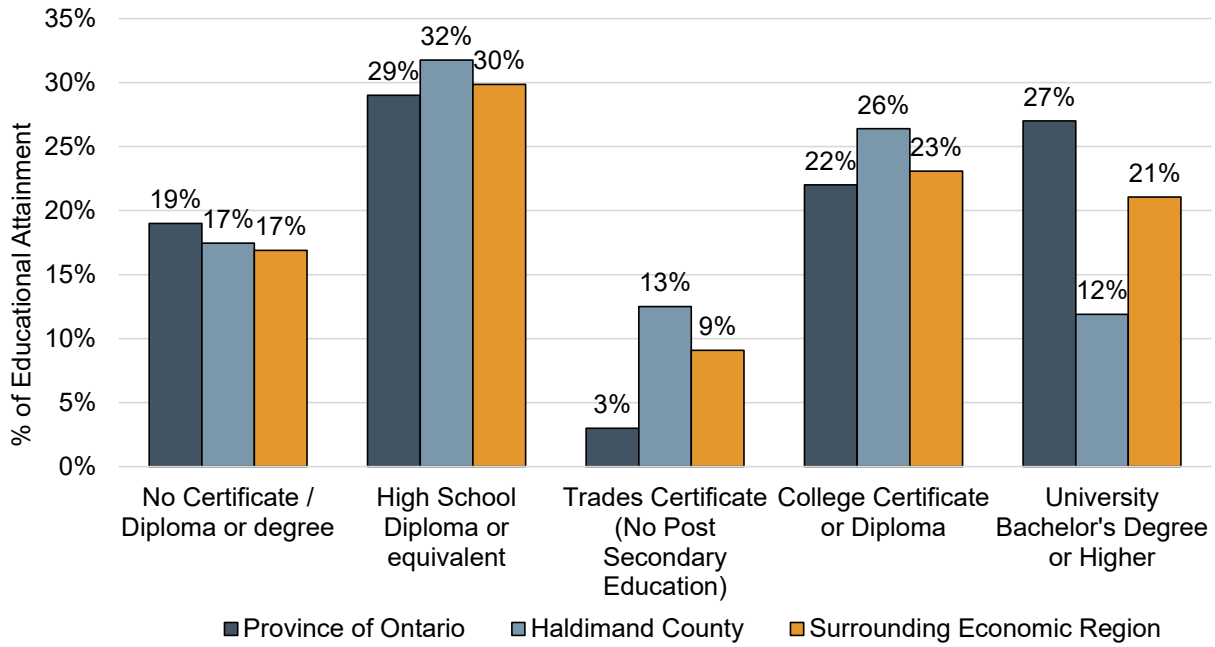
Source: 2001 to 2021 using Statistics Canada Census Data. Derived by Watson & Associates Economists Ltd., 2023.

The County boasts a diverse pool of skilled labour which is attractive for both international and locally based industries over a wide range of export-based sectors. As

shown in Figure 3-3, the County has a relatively well-rounded population with about half the population having a trades certificate, college certificate or diploma, or a university degree.

The share of the County's population without any diploma or degree is less than the surrounding economic region or provincial averages, representing a strong labour force. Compared to the other geographies, the County has a significantly higher proportion of the population with a trades certificate or a college certificate or diploma yet has a much lower share of the population with a University Bachelor's Degree or Higher. This educational attainment suggests that the County can retain workers typically associated with the trades industries, however, a low concentration of jobs within the knowledge-based sector suggests that County residents have less opportunity to be employed in a knowledge-based sector than the other geographies surveyed. Looking forward, the County should consider ways in which it can promote university degree attainment while also retaining the educated workforce.

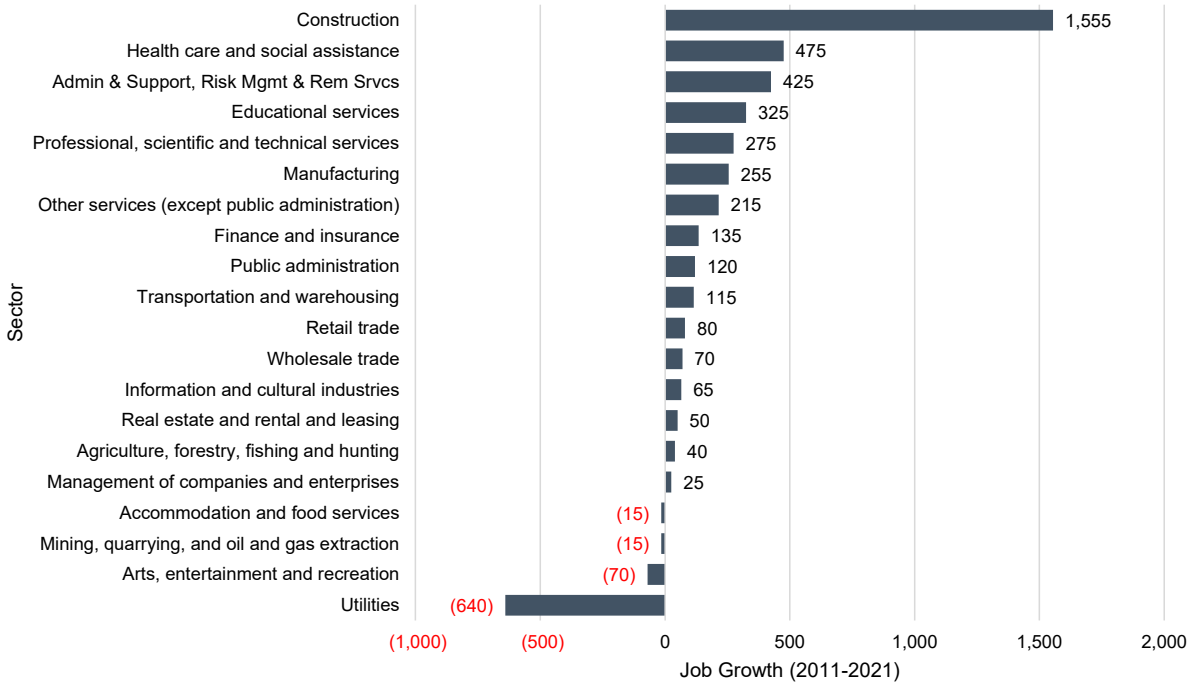
Figure 3-3
Province of Ontario, Haldimand County, and the Surrounding Economic Region
Highest Level of Education Attained, 2021



Note: Surrounding Economic Region includes Norfolk, Niagara, Brant, Brantford, and Hamilton.
Source: Derived from Statistics Canada Place of Work data by Watson & Associates Economists Ltd., 2022.

Similar to the provincial economy as a whole, the nature of the County's economy is changing. Over the past decade, the composition of the County's employment base has gradually shifted from goods-producing sectors to services-providing sectors. Figure 3-4 illustrates the employment change by sector from 2011 to 2021 in the County. Over this period, the County has shown growth in number of jobs in a broad range of sectors including construction; health care and social assistance; educational services; professional and technical services; and manufacturing.

Figure 3-4
Haldimand County Employment Growth by Sector, 2011 to 2021



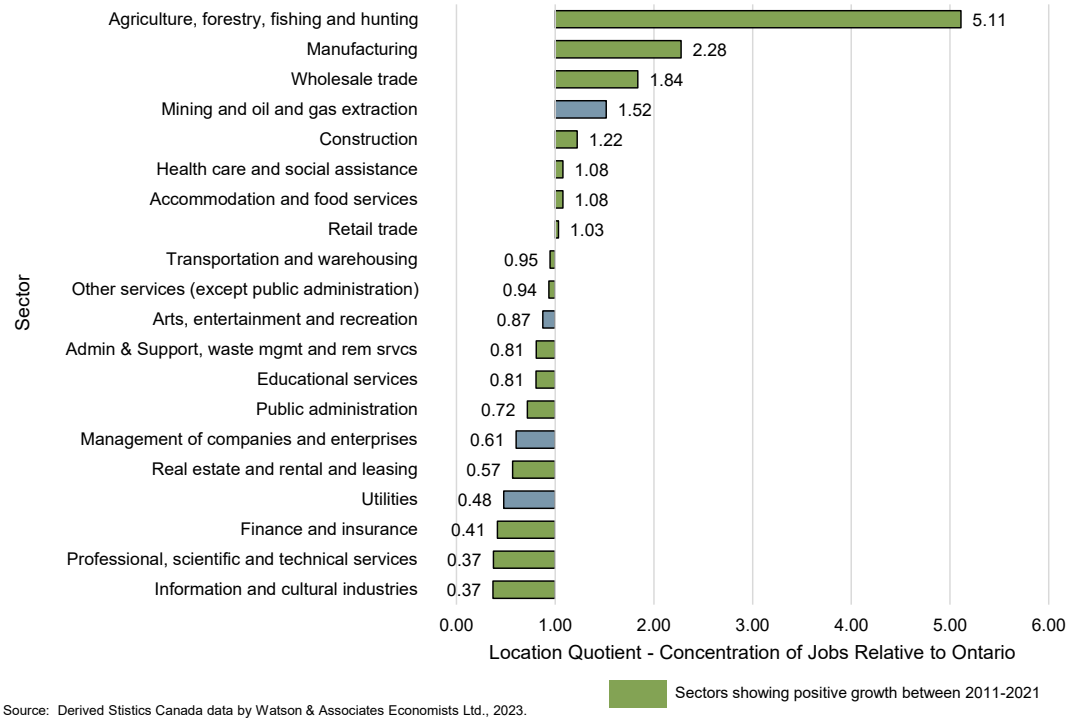
Source: Employment data from Statistics Canada Census, derived by Watson & Associates Economists Ltd., 2023.

To assess the relative strength of business growth within the County, Figure 3-5 examines employment growth by industry sector over the 2011 to 2021 period in the County, relative to Ontario. This comparative share analysis is helpful in identifying how much faster or slower employment is growing in the County relative to Ontario as a whole, by sector. Industry sectors that generate a strong positive value indicate employment clusters where the County potentially has a competitive advantage relative to the surrounding market with respect to business growth. On the other hand, industry

sectors that exhibit a negative value suggest areas where the County may be at a competitive disadvantage to other select municipalities or the Province.

As shown in Figure 3-5, of the employment sectors within the County that experienced positive employment growth between 2011 and 2021, agriculture, manufacturing, wholesale trade, and construction currently exhibit significantly higher employment concentrations relative to the Province, indicating the presence of an employment cluster and high potential within these sectors. The County also has a low concentration in many of the traditional knowledge-based sectors, such as real estate and rental and leasing, finance and insurance, and professional, scientific and technical services, and information and cultural industries.

Figure 3-5
Haldimand County Location Quotient Relative to Ontario, 2011 to 2021



Source: Derived Stistics Canada data by Watson & Associates Economists Ltd., 2023.

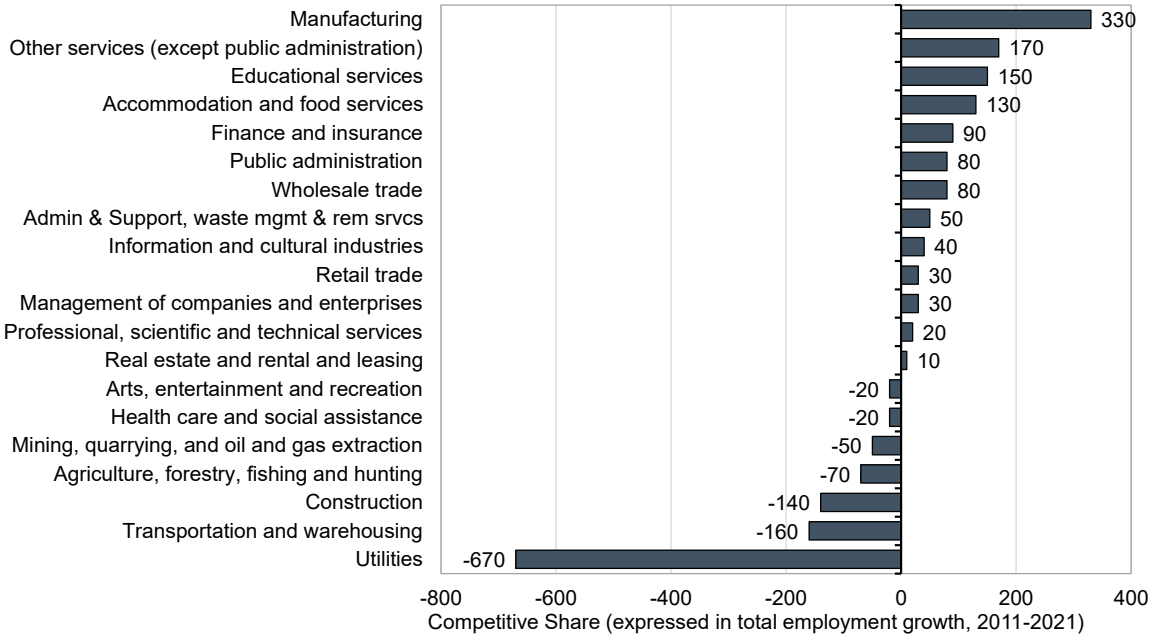
These established and emerging industrial sectors summarized above, particularly those that are identified as steadily growing, are anticipated to represent a large share of the County's employment growth in Employment Areas over the next several decades.

3.3 Haldimand County Shift Share Analysis

Another measure of assessing the competitive share of County's economy as compared to the Province is a shift share analysis. This analysis helps determine if a specific regional industry showed faster or slower growth in comparison with the regional economy. For example, if regional growth in a given employment sector is similar to the pace of provincial or national growth, the regional growth can be attributed to trends occurring on a broader scale and does not represent a unique regional growth context.

As seen in Figure 3-6, the competitive share of manufacturing; educational services; accommodation and food services; finance and insurance; as well as many other sectors have outpaced growth that can be attributed to shifting provincial patterns. These industries can be considered leading, i.e., they outperform the Province in terms of competitive share. Interestingly, construction has been the largest growing sector in the County over the past 10 years but this analysis would indicate that those gains should have been even more pronounced over the last decade. Similarly, the utilities sector has shown to be the sector lagging the furthest behind provincial patterns.

Figure 3-6
Haldimand County Competitive Share Relative to Ontario, 2011 to 2021

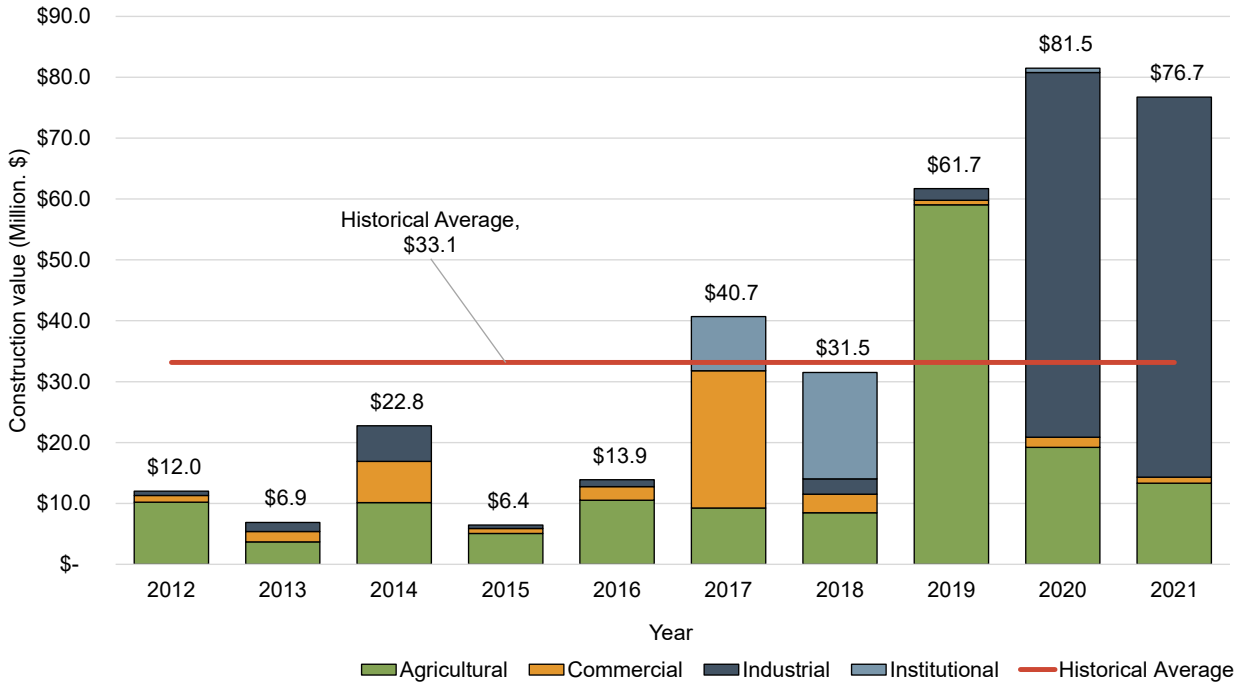


Source: Derived from Statisics Canada Census, by Watson & Associates Economists Ltd., 2023.

3.4 Recent Non-Residential Development Activity

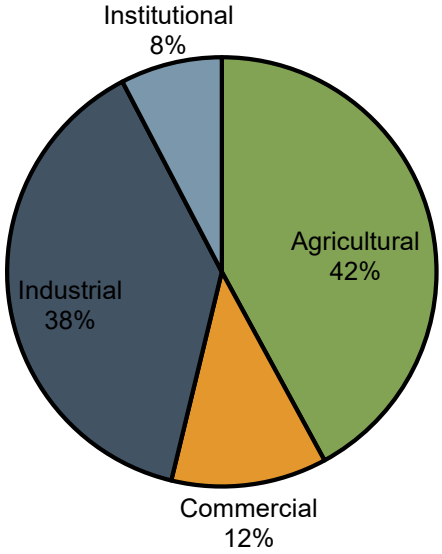
Figure 3-7 provides a summary of recent annual non-residential development activity (2012 to 2022) for the County, expressed in construction value. As illustrated, the County averaged $33.1 million of non-residential development construction value annually from 2012 to 2021. During this period, industrial development accounted for 39% of total construction value, compared to 42% for agricultural development and 12% and 8% for commercial and institutional development, respectively (see Figure 3-8). 2020 and 2021 represent a significant shift in the County, as industrial developments accounted for 77% of permit value over the two-year period.

Figure 3-7
Haldimand County Non-Residential Development Activity, 2012 to 2021



Source: Building permit data provided by Haldimand County. Figure by Watson & Associates Economists Ltd., 2022.

Figure 3-8
Haldimand County Non-Residential Development Activity by Major Sector, 2012 to 2021



Source: Building permit data provided by Haldimand County. Figure by Watson & Associates Economists Ltd., 2022.

3.5 Observations

A key driver of population growth for the County is its proximity to the G.T.H.A. and the growing potential for the County to accommodate new business and skilled labour. Future employment growth within the County is strongly correlated with the growth outlook and competitiveness of the broader Economic Region and G.G.H. economy. Historical employment growth within the County has occurred at a slower rate than observed provincially. Manufacturing remains the largest industry within the County, but this sector has been experiencing declines over the past decade.

A major factor in the future competitiveness of the County's economic base is dependent, in part, on the quantity and quality of its Employment Areas. As such, the County will look to ensure it contains an ample and marketable supply of employment lands to generate new employment opportunities within the County. Over the next 30 years, the County's local employment base is forecast to increase, generating new live/work opportunities within the County. The County is geographically well positioned in the economic heartland of southern Ontario to accommodate this increased growth.

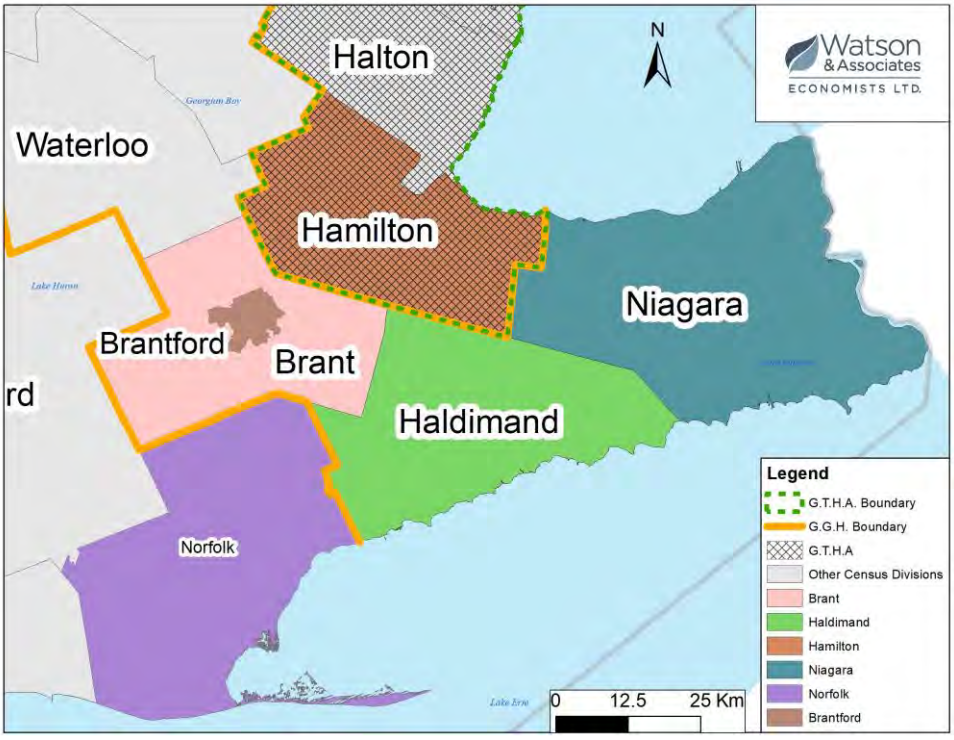
Chapter 4
Review of Haldimand County's Competitive Position within the Broader Regional Market Area

4. Review of Haldimand County's Competitive Position within the Broader Regional Market Area

Employment lands development conditions and forecast development trends for a number of selected Ontario municipalities were reviewed to better assess the County's competitive position within the broader regional market area. As shown in Figure 4-1, comparator geographies reviewed include:

- The City of Hamilton;
- Niagara Region;
- The City of Brantford;
- Brant County; and
- Norfolk County.

Figure 4-1
Haldimand County
Broader Regional Market Area



Each of the above-listed comparator municipalities were reviewed against a number of economic, physical and fiscal attributes, including:

- land value;
- hard construction costs (e.g., materials, labour) and soft costs (e.g., engineering, consulting services);
- development/permit fees;
- development charges; and
- developer project profit.

4.1 Employment Land Supply and Demand Analysis

According to the County's Official Plan (subsection C.1.23, and Schedule 1.1 to 1.5), the County has four separate industrial classifications:

- Major Industrial;
- Industrial;
- Urban Business Parks; and
- Rural Industrial.

The County has a large industrial employment presence outside the urban areas and within rural industrial areas. The County's 2019 Municipal Comprehensive Review report identifies urban industrial employment as of 2018 is estimated to represent 44% of the County's industrial employment base. The Urban Employment Area Employment growth between 2021 and 2051 is estimated at 3,380 or 113 jobs annually.[1] Furthermore, according to the County's Growth Forecast and Land Needs Assessment Report,[2] the County has a vacant urban employment land inventory of 154 gross ha. Based on the assessment, it is estimated that the County has a deficit of employment

[1] Haldimand County, 2020, Revised Growth Analysis to 2051, Watson & Associates Economists Ltd.
[2] https://www.haldimandcounty.ca/wp-content/uploads/2021/06/Growth-Strategy-Revised-Report-MRA-June-2021-Final-compressed-again.pdf

lands at 2051. Figure 4-2 provides a summary of the Employment Area land need by 2051 for the County and the Caledonia area.

Figure 4-2
Haldimand County
Employment Area Land Need Summary

Parameter	Haldimand County	Caledonia
Total Employment	6,400	3,280
Urban Employment Lands Employment Growth (2021 to 2051)	3,380	2,190
Employment Lands Employment Growth Adjusted for Intensification	3,211	2,081
Proposed Employment Area Density	**15**	**15**
Urban Employment Land Supply (ha)	154	46
Employment Land Demand	214	139
Deficit at 2051 (according to Growth Strategy Report)	**60**	**93**

Source: Watson & Associates Economists Ltd., Haldimand County, Revised Growth Analysis to 2051, September 2020. Matt Reniers and Associates, Haldimand County Official Plan Update: Growth Strategy Report, June 2021.

It is noted that the based-on Phase 1 of the O.P., the County expanded the North Caledonia Employment Area boundary, providing an additional 51 developable hectares of land. Additional lands outside of the current study area will be required to accommodate the remaining 42 developable hectares required by 2051.

In order to understand the competitiveness of employment land supply, the competitor municipalities have been reviewed in terms of their employment land availability. With respect to long-term employment land needs, the following observations can be made regarding the above-listed comparator geographies:

- As shown in Figure 4-3, relative to the other municipalities surveyed, the County's Growth Strategy identifies a supply of vacant urban employment land of approximately 154 ha in the County and 46 ha in North Caledonia. As noted above, after the Phase 1 of the O.P. Update, the vacant supply of employment lands has increased to 205 ha and 97 ha for Haldimand County and North Caledonia, respectively.

- With respect to the small/medium-sized municipalities surveyed, the County's urban employment lands are estimated to be absorbed at a slower rate of 7 ha annually, compared to surrounding municipalities like Brant, where annual employment demand is 13 ha annually, respectively; and
- Employment land absorption within larger urban municipalities has been focused towards multi-tenant industrial development as well as standalone industrial development within the warehousing/distribution and transportation sector. In contrast, recent employment land development within the smaller municipalities surveyed has been more concentrated in the manufacturing sector.

For each of the comparator municipalities surveyed, a broad assessment of forecast employment land supply and demand was prepared to the year 2051. This is based on the M.C.R.s conducted by these Municipalities and in some cases have resulted in O.P. updates to expand their Employment Areas. The results of this assessment are summarized below in Figure 4-3. In accordance with approved Official Plan forecasts for each of the comparator municipalities, employment land absorption rates within the surrounding market area are anticipated to significantly increase between 2021 and 2051, relative to the County's estimated land absorption levels.

Figure 4-3
Forecast Annual Employment Land Demand and Employment Land Supply for Comparator Municipalities, 2021 to 2051

Comparator Municipality	Available Net Vacant Employment Land Supply (ha)	Expansion proposed according to M.C.R. (ha)	Annual Employment Land Demand (ha)
Haldimand County	154	51	7
Niagara Region	716	255	32
City of Hamilton	1,290	-	36
Brant County	344	108	13

Source: Compiled from Recent Municipal Comprehensive Review reports by Watson & Associates Economists Ltd., 2023.
Note: The Expansion Areas mentioned may not be final and might be subject to change through the O.P.R. process. Furthermore, these do not include employment area conversions / change in designations of existing employment areas.

4.2 Cost Competitiveness Analysis

A significant factor influencing business decisions on where to locate is the cost competitiveness (both capital investment and operating costs) of the development in relation to market demand and potential return on investment. The cost competitiveness of development on employment lands is examined herein, through a series of pro-forma financial analyses assessing the cost of constructing and operating various prototypical industrial/office developments within the County, as well as several other comparator municipalities within the broader regional market area.

For the purposes of this exercise, three prototypical developments were assessed, including a one-storey 30,000 sq.ft. manufacturing facility, a two- to four-storey 20,000 sq.ft. office, and a 60,000 sq.ft. warehouse. The physical characteristics of the three building typologies and their respective land requirements are summarized in Figure 4-4.

Figure 4-4
Prototypical Building Typologies

Building Type	Gross Floor Area sq.m	Gross Floor Area sq.ft.	Floor Space Index	Land Area net ha	Land Area net acres
1-Storey Factory	2,800	30,000	30%	0.9	2.3
2- to 4-Storey Office	1,900	20,000	40%	0.5	1.2
1-Storey Warehouse	5,600	60,000	30%	1.9	4.6

Source: Watson & Associates Economists Ltd., 2023.

The cost competitiveness of the select prototypical industrial/office developments was assessed through a review of total development cost and the impact of operating costs (including property taxes and utility costs) in the County and the comparator municipalities.

In the generation of the total development cost of the prototypical developments (expressed in dollars per sq.ft.), the following input costs were included (see Appendix A for more details):

- **Land Cost** – average price of serviced vacant employment land per acre based on market data, multiplied by the acreage requirement based on an assumed F.S.I.,[1] e.g., 30%, divided by the gross floor area for the building size being considered (e.g., 30,000 sq.ft.);
- **Construction Costs**[2] – reflects hard construction costs (e.g., materials, labour) and soft costs (e.g., engineering, consulting services) – average construction costs per sq.ft. vary by development type;
- **Development Charges** – on a sq.ft. basis, calculated based on the current upper- and lower-tier or single-tier municipal schedules and school board development charges schedules;
- **Building Permit Fees** – on a sq.ft. basis per current municipal schedules; and
- **Developer Project Profit** – a flat percentage of the total cost (land + construction + development charges + building permit fees per sq.ft.) at 5%.

The total development cost was then annualized to determine the average annual cost of developing a building over a defined period (i.e., 25 years) to compare with annual operating costs.[3]

Annual operating costs for each prototypical development were determined based on an assessment of the following:

- **Utility Costs** – Important operating costs for businesses are utility costs, particularly for high consumption users and, for the purposes of this assignment, these include the cost of water/wastewater, electricity and natural gas. Consumption rates for each prototypical development were determined on an

[1] Floor Space Index (F.S.I.).
[2] Construction costs vary by municipality based on location factors provided in 2022 RSMeans Building Construction Costs data.
[3] Annualized costs determined using an annualization factor of 6.5% which is based on a 25-year period and discount rate of 4.1% which is representative of industry trends.

annual gross floor area per sq.ft. basis and held constant across all geographic locations. Annual costs were determined in accordance with the following:

  - **Water/wastewater costs** – multiplying the annual consumption by the average cost per cubic metre within each municipality, reflected on a sq.ft. basis;
  - **Electricity costs** – multiplying the annual consumption by the average cost per kWh within each municipality, reflected on a sq.ft. basis;
  - **Natural gas costs** – multiplying the annual consumption by the average cost per cubic metre within each market, reflected on a sq.ft. basis; and

- **Property Taxes** – Property taxation estimates for the comparator municipalities were based on approximate assessment values utilizing current local taxation rates. Property assessment values were derived based on a survey of comparative developments utilizing MPAC property assessment data.

The annual operating costs (i.e., property taxes and utility costs) were combined with the annualized development costs to generate the total annualized cost per sq.ft. within each location surveyed.

4.2.1 Total Annualized Costs

Total annualized costs (development and operating costs) for the three prototypical developments in the County and the comparator municipalities are summarized in Figure 4-5 to Figure 4-7. Additional details are provided in Appendix A. Key findings include:

Development Costs

- Development costs are relatively similar across the County, Norfolk County, Brant County, and the City of Brantford. The Niagara Region has slightly higher development costs on average than these municipalities and the City of Hamilton has consistently higher development costs than all other municipalities surveyed;
- Land cost per acre within the County is lower than the average cost of land across the surveyed municipalities, largely due to the high land costs in Hamilton inflating the survey average. Land costs per acre are more expensive in the County compared to Norfolk County, Brant County, and the City of Brantford;

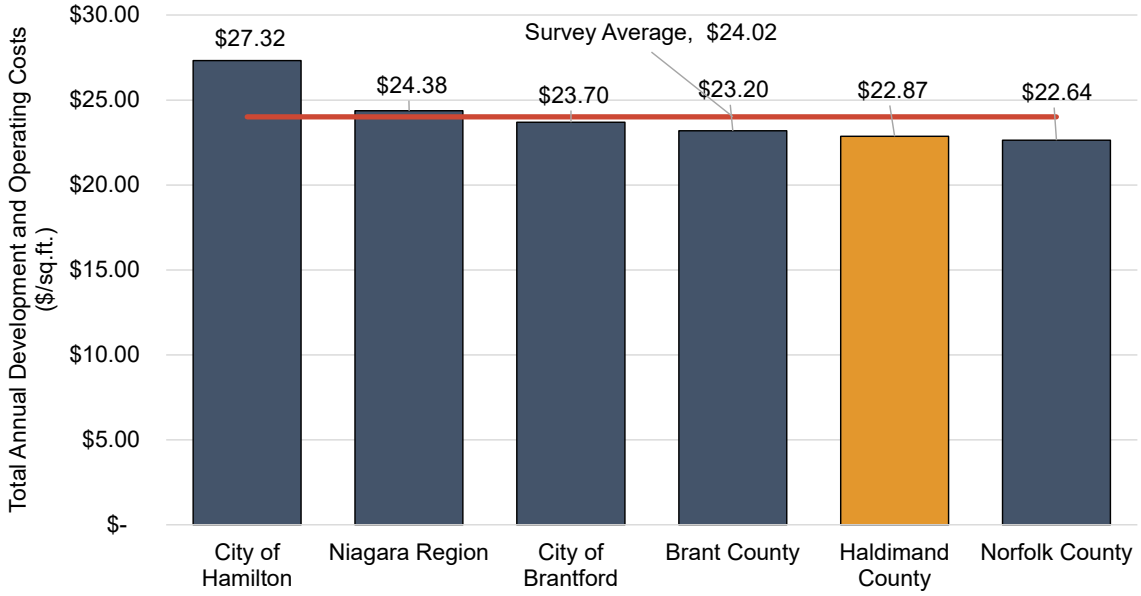
- Development charges per sq.ft. are lowest within the County compared to all other municipalities surveyed and building permit fees are also quite low compared to the survey average;
- Overall, the County is competitive in respect to development costs due to moderate land prices and low development charge and building permit rates.

Annual Operating Costs

- The County has the second lowest operating costs among the surveyed municipalities, with only Norfolk County having marginally lower operating costs per sq.ft.;
- While the County has relatively average tax rates, the average assessment value (based on MPAC averages) results in a relatively low taxes per sq.ft. compared to the other municipalities surveyed (with only Norfolk County lower);
- Water and wastewater costs in the County are the lowest across all surveyed municipalities, while electricity costs are highest per sq.ft.; and
- The high electricity costs are generally offset by the low property taxes and water/wastewater fees within the County.

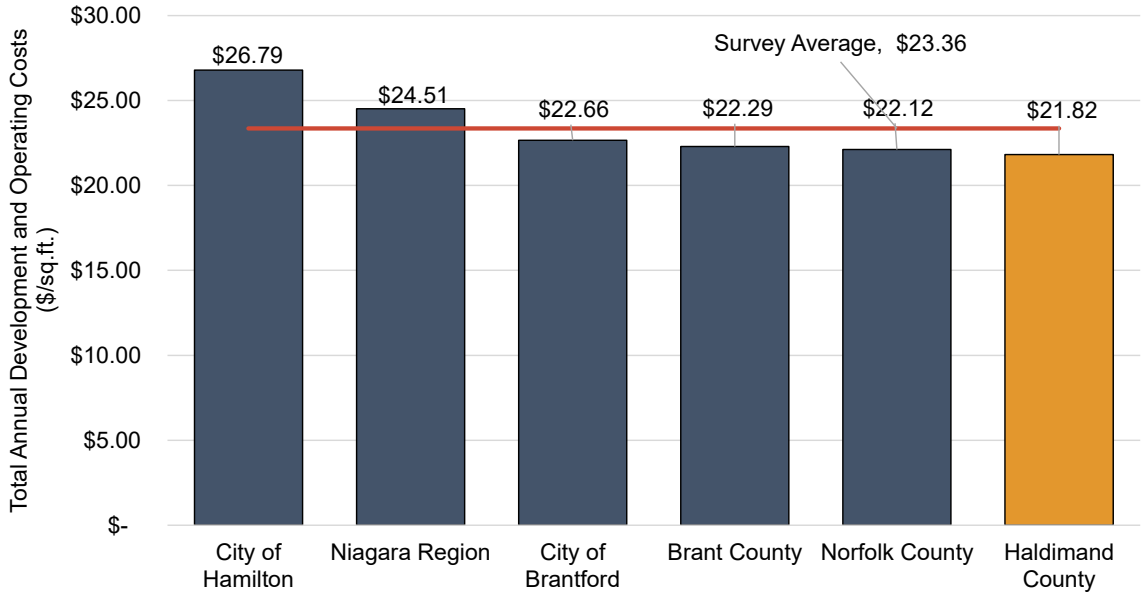
On average, the County is cost competitive among the comparator markets for industrial and office development. This is largely attributed to lower operating costs and development costs relative to the adjacent urban municipalities. The County is significantly more competitive from a cost perspective than the City of Hamilton and moderately more affordable compared to the Niagara Region. Brant County and Brantford may have closer access to the G.T.H.A. market, but this locational advantage may be offset by the County's more competitive development and operating costs for certain prospective industries. This is especially pronounced when examining the potential for office development (see Figure 4-6), as the County is the most cost-competitive location for a prototypical two- to four-storey office building.

Figure 4-5
One-Storey Factory Prototypical Development
Total Annualized Costs per Sq.ft.



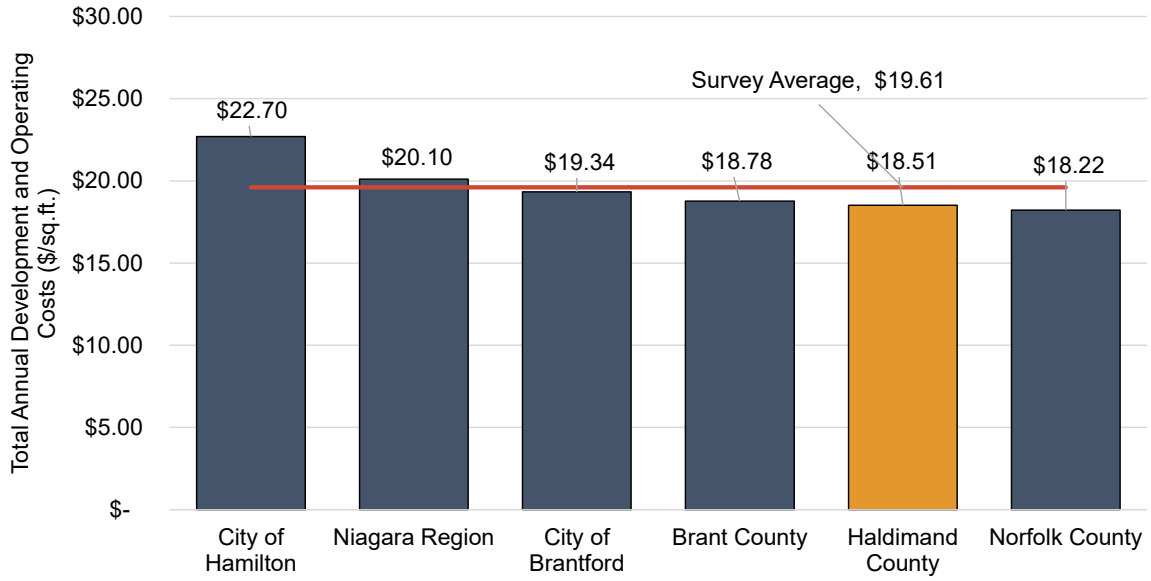
Source: Watson & Associates Economists Ltd., 2022.

Figure 4-6
Two- to Four-Storey Office Prototypical Development
Total Annualized Costs per Sq.ft.



Source: Watson & Associates Economists Ltd., 2022.

Figure 4-7
One-Storey Warehouse Prototypical Development
Total Annualized Costs per Sq.ft.



Source: Watson & Associates Economists Ltd., 2022.

4.3 Observations

The County represents a cost competitive environment for employment land development. From examining the above prototypical developments, it is apparent that the development and operation of employment land uses within the County are affordable within the context of the broader economic region. This marks a competitive advantage for the County and future marketing efforts for the North Caledonia Employment Area could explore this as a selling feature. The County could also consider ways in which to further promote affordable industrial development – in the Niagara Region, for example, upper-tier development charges are exempt for industrial developments. Incentivizing development on the North Caledonia Employment Area could allow the County to foster economic activity as well as attract skilled labour to the County; however, such initiatives would need to be examined within the context of the broader fiscal impacts to County.

Chapter 5
Future North Caledonia Employment Area Target Sectors and Land Use Review

5. Future North Caledonia Employment Area Target Sectors and Land Use Review

5.1 Target Sector Analysis

This chapter identifies the key target sectors for the new Employment Area in North Caledonia. The target sectors established in this chapter have been established in consideration of the County's current labour force characteristics as well as changing Employment Area trends across the G.G.H and beyond. Based on this analysis, the ability of new North Caledonia Employment Area to support the target employment sectors was considered based on the following criteria:

- Locational requirements (i.e., prestige industrial or general industrial designation);
- Range of parcel sizes needed;
- Transportation access (route from highway, proximity to customer base, etc.);
- Labour force needs (skilled, unskilled, or mobile labour force);
- Land-use requirements (potential for expansion, buffers from surrounding land uses, integration with surrounding operations, etc.); and
- Development characteristics (building coverages, parking requirements, ceiling heights etc.)

5.1.1 General Characteristics of Employment Areas

Employment Areas require good access to regional transportation networks, on-site infrastructure including roadways and utilities, a critical mass, and available, zoned, shovel-ready lands. Employment Areas are typically located on flat to slightly rolling topography in areas with minimal environmental issues. Roadways within Employment Areas tend to be laid out in a grid system to optimize circulation and parcel configuration. Parcels are typically square or rectangular in shape to optimize site design. Many of these attributes help to optimize the end-users' speed to market, while minimizing development costs and project risk.

At both the regional and local levels, location requirements of industry can vary considerably depending on the nature of the employment sector/use. Employment sectors typically situated in Employment Areas have varying site-specific requirements. To be successful in attracting a broad range of employment sectors, it is recommended

that the future Employment Area provide the corresponding industry requirements. The specific attributes that are required for an Employment Area to be successful are largely based on the intended function and designations. These are discussed in more detail below within the context of general industrial parks, Employment Areas and research and development parks.

General Industrial Parks

Industrial parks have a more general industrial orientation and accommodate largely industrial uses such as advanced manufacturing, logistics, distribution, and transportation sectors. These areas typically offer the following physical requirements:

- **Access** – Proximity to controlled access highways (i.e., Highway 6) is critical for the success of general industrial parks that have a significant degree of manufacturing, warehousing, distribution, and logistics uses. These parks do not necessarily have to be adjacent to a controlled access highway but must be in proximity and easily accessible via major arterials that pass through limited residential or mixed-use commercial area(s);
- **Critical Mass** – Size is vital to ensure a wide selection/flexibility of land options, and parks must include a sufficient supply of large parcels. As a minimum, 80 ha (200 acres) is generally a suitable size for a park, in order to reach the critical mass needed to provide reasonable presence, choice and economies of scale;
- **Location** – The location must provide efficient and effective vehicular access and circulation, particularly for heavy truck traffic, with a minimum of two access points to enter/exit the industrial park;
- **Land-Use Compatibility** – Buffering is important for general industrial parks in order to minimize noise and air pollution to neighbouring residential and other sensitive land uses;
- **Market Choice** – Parcel size and configuration need to be conducive for a wide range of industrial land uses, especially for land-extensive uses such as wholesale trade and transportation; and
- **Competitive Development/Operating Costs** – Land prices must be competitive, given the land-extensive nature associated with many uses in general industrial parks.

Employment Areas

A strong employment growth outlook in knowledge-based sectors continues to generate an increasing need to accommodate light industrial and office uses on both employment lands and within commercial, mixed-use areas. In terms of built form, knowledge-based sectors are typically accommodated in multi-tenant and standalone industrial and office buildings. To address the broad needs of the knowledge-based sector, a range of lands by type, size, and location should be considered. In Employment Areas, prestige office uses are often positioned at gateway locations (i.e., at major highway interchanges) with direct highway access/exposure as well as strong connectivity to arterial roads. Employment Areas which are designated as Employment Areas typically have a more prestige character than general industrial parks.[1] The following are characteristics typically associated with prestige employment uses, such as:

- **Access** – Access and exposure/visibility to controlled access highways or major arterial roadways are more critical for Employment Areas, particularly for offices;
- **Critical Mass** – Size is less important to prestige Employment Areas relative to general industrial parks; however, the Employment Area must be generally large enough to foster a sense of place to allow for on-site amenities;
- **Land-Use Compatibility** – Buffering is often required for prestige Employment Areas located in proximity to general Employment Areas or residential uses. Open space/parkland and trails are also often provided for pedestrians; and
- **Character** – Employment Areas typically present a more prestigious image, created through higher quality building design, stricter urban design standards (i.e., curb and gutter, streetlighting, buried utilities, stormwater management, etc.) and landscaping requirements to create a campus style setting. Typically, such areas would also impose stricter land-use permission regarding heavy industrial uses and outdoor storage.

[1] Prestige or light industrial lands typically accommodate a larger share of office employment and a relatively higher share of employment-supportive employment uses when compared to general Employment Areas. For these reasons, prestige or light Employment Areas often have higher average density levels compared to general Employment Areas.

Research and Development Parks

Research parks represent communities of innovation that link industry with government and academia. These parks are typically developed in partnership with key stakeholders such as municipal, provincial, and federal governments, affiliated universities, and economic development agencies. Typically, research and development parks are developed with the objective to attract, accommodate, and facilitate business ventures and investment as well as to create synergies related to the commercialization of research activities. Research and development parks also tend to provide resources (i.e., incubators) to support existing and new business ventures. The sizes of research parks in Canada range from a single parcel with one building adjacent to a university to larger standalone campuses. In terms of uses, research parks are comprised primarily of office, institutional, research and development facilities and a limited retail base. Key features of research parks include:

- Large anchor;
- Cluster of firms and organization in the knowledge-based sector;
- Prestige "campus-like" setting for office and light industrial uses;
- Access and exposure to highways, arterial roads, and transportation networks;
- Access to skilled and unskilled labour;
- Proximity to markets and related industry clusters;
- Access to on-site amenities and proximity to off-site amenities;
- Availability of office space for lease or purchase;
- Partnership and support with government, organizations, and firms;
- Land area ranging from a single parcel with one building to a large campus with a developable land area of 30 to 50 ha;
- High quality design environment to stimulate creativity and innovation; and
- Availability of supporting infrastructure and resources (i.e., training/research and incubator facilities, synergies with post-secondary institutions).

5.1.2 Vision for the New North Caledonia Employment Area

The new North Caledonia Employment Area should be planned as a cohesive Employment Area, with prestige attributes to attract more knowledge-based sectors. Utilizing the strategic advantages of the Highway 6 corridor will allow the for the attraction of a wider-range of potential employment uses and create a diverse Employment Area environment. With this vision in mind, the key target sectors for the

new North Caledonia Employment Area are explored in detail in Figure 5-1 and are summarized below:

- Manufacturing/Advanced Manufacturing;
- Distribution and Logistics;
- Professional, Scientific, and Technical Services/Business Services;
- Research and Development;
- Agri-business; and
- Food and Accommodation Services, and other Employment-Supportive Uses.

Figure 5-1
Target Employment Sectors Profile for the Future North Caledonia Employment Area

Employment Sector/Land Use	Location	Parcel Sizes	Transportation	Labour Force	Surrounding Context	Development Characteristics
Manufacturing/Advanced Manufacturing	General or prestige setting.	1 to 4 ha and greater.	• Access to 400 series/controlled access highways. • Proximity to markets and related industries.	• Access to skilled and unskilled labour.	• Expansion potential. • Buffers from surrounding non-industrial uses. • Emphasis on integrated operations (logistics and office), landscaping and enclosed storage.	• Low to high design quality. • 10,000 to 250,000 sq.ft. High building coverage and on-site employment density. • Range of building types, including small, large single-tenant and multi-tenant buildings. • Loading/unloading areas.
Distribution and Logistics	General or prestige setting.	5 to 20 ha Flexibility in parcel configuration to accommodate large-scale users.	• Access to 400 series/controlled access Highway. • Excellent access/ traffic circulation for heavy truck traffic; Truck access, loading/unloading requirements. • Proximity to markets, customer base and related industries.	• Mobile labour force.	• Need for open storage or enclosed vertical storage. • Compatible surrounding land uses/ buffers from surrounding non-industrial uses. • Access to on-site and proximity to off-site services • Expansion potential.	• Low to moderate design quality. • 10,000-1,000,000 sq. ft. • Ceiling height - 30 ft.+ • Large parcels with flat topography. • Low to high building coverage and low on-site employment density. • Loading/unloading areas.

Employment Sector/Land Use	Location	Parcel Sizes	Transportation	Labour Force	Surrounding Context	Development Characteristics
Professional, Scientific, and Technical Services/Business Services	Prestige Industrial or Employment Areas.	Type of buildings: flexible leasing structures and market choice (multi-tenant vs. free standing office, Class A vs. B office space).	• Proximity to transit or within walkable environments.	• Access to skilled labour force.	• Access to on-site amenities and proximity to off-site services. • Prestige setting.	• Low to high design quality. • 2,000 to 10,000 sq.ft. • <1 to 2 ha lots. • Storefront entrance for general public. • High building coverage and on-site employment density. • Small multi-tenant and flex office space. • Street lighting.
Research and Development/"Knowledge-based" Sectors	Prestige Industrial or Employment Areas.	1 to 2 ha For stand-alone building or facility.	• Proximity to transit or within walkable environments.	• Access to skilled labour force.	• Proximity to related industry cluster (companies and public institutions). • Prestige "campus-like" setting. • Access to on-site amenities and proximity to off-site services.	• Low to high design quality. • 2,000 to 10,000 sq.ft. • 1-2 ha lots. • High building coverage and on-site employment density. • Space for manufacturing/ research as well as multi-tenant or flex office space.

Employment Sector/Land Use	Location	Parcel Sizes	Transportation	Labour Force	Surrounding Context	Development Characteristics
Agri- Business	General or Light Industrial Setting.	1 to 4 ha and greater.	• Access to highways and multi modal facilities. • Access to warehousing, markets and distribution centres.	• Access to both skilled and semi-skilled labour force.	• Access to upstream & downstream industries. • Storage space for material and equipment. • Loading/unloading requirements.	• Low to high design quality. • High building coverage and on-site employment density. • Range of building types, including small, large single-tenant and multi-tenant buildings. • Loading/unloading areas.
Food and Accommodation Services and Other Employment-Supportive Uses	Prestige Industrial or General Industrial.	1 to 5 ha lots.	• High traffic exposure from major road and surrounding employment and commercial uses.	• Access to skilled and semi-skilled labour force.	• Prestige and general industrial setting. • Surrounding a large employment base. • Clustering of retail uses in a retail court or at high traffic areas (e.g., major intersections, gateway entrances to Employment Area).	• High design quality. • 2,000 (fast food restaurant) to 50,000 sq.ft. (hotel/convention centre). • Commercial floor space per acre ratio of 200 to 400 sq.ft. of retail/service space per acre of developed Employment Area. • High building coverage and on-site employment density. • Street lighting.

5.2 Land Use Review

This land use planning review identifies applicable land use planning context to inform Phase 1 of the Study. It reviews the provincial, regional and local land use planning framework and will be used to inform the land use planning perspective of the final report which will include background review, location analysis, market research and analysis, and functional servicing design.

5.2.1 Legislation and Policy Background

The *Planning Act*, R.S.O. 1990 legislates the planning process in Ontario and sets out tools for directing and regulating land uses:

- Section 2 of the *Planning Act* establishes the provincial interests for which planning authorities shall have regard. Provincial interests include the protection of ecological systems, natural areas, agricultural resources, the supply and efficient use and conservation of water and energy, the protections of public health and safety, the appropriate location for development, well designed built form and the adequate provision of employment opportunities.
- Section 3 establishes requirements for a Provincial Policy Statement.
- Section 16 prescribes rules for Official Plans, requiring that they contain goals, objectives, and policies to manage and direct physical change on the area within the municipality. Official Plans shall also contain descriptions of the measures and procedures for consulting the public for amendments to the Official Plan, zoning by-laws and plans of subdivision.
- Section 22 establishes rules for the process by which an Official Plan may be amended.
- Section 34 of the *Planning Act* establishes rules governing zoning by-laws and Part VI establishes rules for the subdivision of land.
- Section 41 established requirements for site plan control. Municipalities may designate areas as a site plan control area, which demands more stringent application and design requirements on development. Subsection 4 provides a process for the approval of plans or drawings, and subsection 6 provides a list of conditions of approval that a municipality may require from the owner of the land.

The *Planning Act* establishes the rules and directions by which any land use planning for Employment Areas must follow.

5.2.2 Provincial Policy Statement (2020)

The Provincial Policy Statement, 2020 (P.P.S.), is issued by the Province under section 3 of the *Planning Act*. The P.P.S. provides policy direction on matters of provincial interest relating to land use planning, development, and the wise management of resources. Municipal planning decisions must be consistent with the policies of the P.P.S. The P.P.S. includes policies relevant to the Study such as those that provide direction on employment.

The P.P.S. establishes that an appropriate mix and range of employment uses must be available to meet long-term needs to facilitate a diversified economic base (Policy 1.3.1). Specifically, the P.P.S. states that planning authorities shall plan for, protect, and preserve Employment Areas for current and future uses and ensure that necessary infrastructure is provided to support current and projected needs (Policy 1.3.2.1). Employment Areas planned for industrial or manufacturing uses should include appropriate transition to adjacent non-employment uses (Policy 1.3.2.3). The P.P.S. also identifies the importance of protecting Employment Areas in proximity to major goods movement facilities and corridors (Policy 1.3.2.6).

The P.P.S. also provides direction for energy conservation, air quality and climate change, as it affects Employment Areas. Development patterns should promote active transportation and transit to employment uses and areas and focus development on sites well-served by transit. Freight intensive uses should be located in areas well-served by major highways, airports, and rail facilities, and design should be considered to maximize energy efficiency as well as vegetation (Policy 1.8.1).

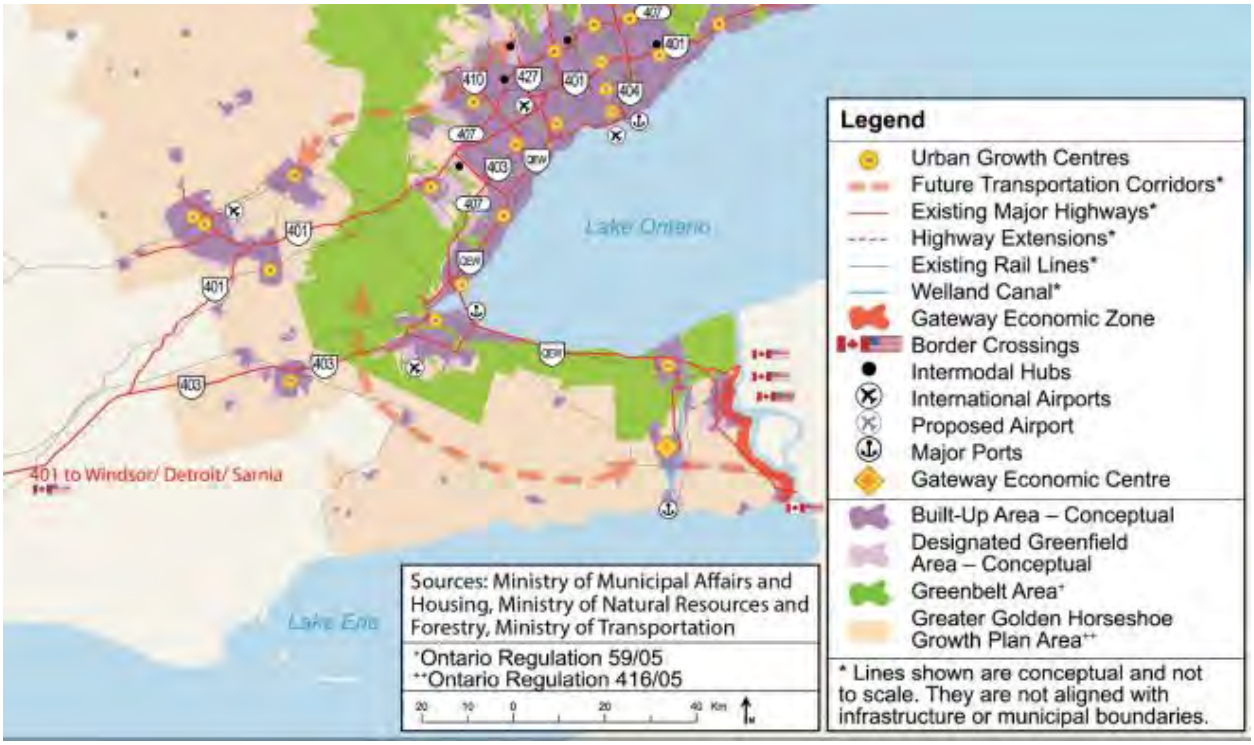
5.2.3 A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019)

A Place to Grow: Growth Plan for the Greater Golden Horseshoe, 2019, 2020 Office Consolidation, (the "Growth Plan"), is a comprehensive land use planning framework for implementing the Province's vision for building stronger, prosperous communities by better managing growth. It includes policies to promote economic development and competitiveness within the G.G.H., including the County.

Specifically, the Growth Plan requires the availability of sufficient land to support a variety of employment uses to accommodate forecasted employment growth (Policy 2.2.5.1.b). In planning for employment, Policy 2.2.5.4, directs Employment Areas to

minimize surface parking and facilitate the development of active transportation networks and transit-supportive built form. The Growth Plan anticipates a yet unnamed future transportation corridor that passes through Caledonia from the north and continues east towards the City of Welland and the Town of Fort Erie (see Figure 5-2).

Figure 5-2
Schedule 6 of the Growth Plan – Moving Goods



The Growth Plan requires that municipalities plan for Employment Areas within settlement areas by prohibiting or limiting sensitive land uses, prohibiting or limiting major retail uses, and providing an appropriate interface between Employment Areas and adjacent non-Employment Areas (Policy 2.2.5.7). Single-tier municipalities are also required to establish minimum density targets, measured in jobs per hectare, that reflect opportunities for intensification of Employment Areas and that will be implemented through Official Plan policies and designations and zoning by-laws (Policy 2.2.5.13). The County recently undertook a conformity exercise which is further detailed below.

5.2.4 Grand River Conservation Authority

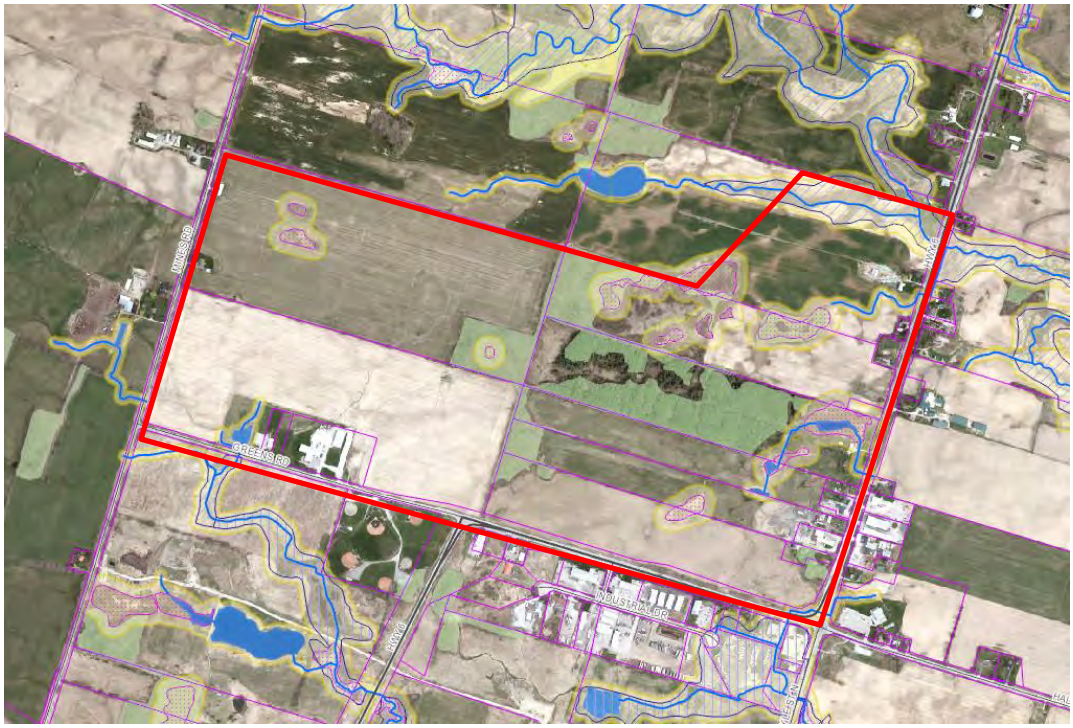
The Subject Lands fall within the jurisdiction of the G.R.C.A. The G.R.C.A. is established under the *Conservation Authorities Act*, R.S.O. 1990, c. C.27 and provides

land use regulation over the areas that fall within the Grand River Watershed. Its purpose is to further the conservation, restoration, development and management of natural resources and the watershed.

The Province delegates authority to Conservation Authorities (C.A.s) for regulatory powers through the development application and review process, including applications made under the *Planning Act*. It performs a plan review function through the Development Interference with Wetlands and Alterations to Shorelines and Watercourses regulation. Through this regulation, the G.R.C.A. controls land uses within its boundaries. Under the *Planning Act*, the G.R.C.A. also has an advisory role, providing input and review for municipal policy documents and development proposals.

The G.R.C.A. provides policy for erosion and sediment control, fill importation, wetlands, requirements for Environmental Impact Studies and submission requirements, a protocol for evaluating wetlands, and stormwater management submissions checklists. Provincial and G.R.C.A. mapping identifies several areas of wetlands within the site.

Figure 5-3
G.R.C.A. Map of Regulated Areas



Note: Wetlands are represented by pink outlines with pink dots. There are several small areas of regulated streams and woodlands within the Subject Lands.

5.2.5 Haldimand County Official Plan (2009)

The County's Official Plan was adopted by the County in June of 2006 and approved by the Province in June of 2009. It is established under section 16 of the *Planning Act* and replaces the Official Plans of the former Region of Haldimand-Norfolk, the former Towns of Dunnville and Haldimand, and the former City of Nanticoke. The Official Plan provides a vision, strategic direction, goals, objectives and policy direction for land use planning in the County and is required to be consistent with the P.P.S.

Section C.1) of the Official Plan establishes County-wide policies for industrial business parks, including four separate classifications for the development of industrial Employment Areas. The Subject Lands are designated as Urban Business Park with site specific policy area HCOP-63, as amended by By-law number 1234-HC/21. The Urban Business Park designation includes light industrial activities and some commercial uses which provide services to the industrial area or increase the attractiveness of industrial uses (subsection C.1)7). The Official Plan stipulates that, regarding the establishment of new Urban Business Parks, adequate water and wastewater services shall be available. Regard shall also be had for the impact on surrounding areas, proper design of industry and the adequacy of the road system (section C.9). Industrial uses that generate high volumes of vehicular traffic shall generally be located in proximity to arterial roads, and development near provincial highways or arterial roads shall be required to provide a higher standard of amenity related to landscaping, buffering and the provision of outdoor storage.

Permitted uses in the Urban Business Parks designation include manufacturing, fabrication, assembly and processing of partially processed material, goods and products, warehousing, bulk storage tanks, service and maintenance operations, public utilities, transportation facilities, trade schools, research and development laboratories and facilities and similar uses, commercial uses which provide services for the industrial area, and additional industrial-related commercial uses.

In August 2022, the County's Council adopted amendment No. 69 to the County's Official Plan to ensure the Plan is consistent with the P.P.S. and the Growth Plan. Applicable amendments to the County's Official Plan within the context of the Study include:

- Adding a minimum overall density of 15 jobs per hectare within Employment Areas;

- Reducing four classifications of industrial Employment Areas to three: industrial, urban business park and rural industrial; and,
- Permitting additional uses within the urban business park designation, including processing of agricultural products, building supply establishments, printing and publishing establishments, data processing centres and telecommunication facilities.

Site Specific Policy Area HCOP-63 establishes requirements that must be met before development can occur. It stipulates that access to the Subject Lands from the portion of Greens Road currently used as Highway 6 shall not be permitted until such time as Highway 6 has been developed. Development on the Subject Lands east of the future Highway 6 extension will require a transportation impact study and approval of access arrangement by the M.T.O. In addition, all development within the Subject Lands shall require the completion of certain technical studies and servicing strategies, including:

- Demonstration that municipal water and wastewater services can be extended to accommodate development, and that there is sufficient reserve capacity;
- A stormwater management plan that meets the standards of the M.T.O., County and the C.A.;
- An environmental analysis;
- A Cultural Heritage and Archaeological Assessment carried out in consultation with provincial ministries and local Indigenous communities;
- An urban design brief outlining the site and built form design criteria that recognizes the gateway significance of the area;
- An agricultural impact analysis that identifies mitigation and/or avoidance measures, and that is based on consultation with the Agricultural Advisory Committee; and,
- A road system that meets County and M.T.O. access requirements.

The County is preparing Phase 2 of its Official Plan Review which addresses other general Official Plan updates, including natural heritage system and hazards, community building and housing, leisure, culture and heritage, health and social services, and agriculture/commercial/industrial/lakeshore/hamlet areas. It is anticipated that the Study will need to consider these future amendments once adopted by Council.

5.2.6 Haldimand County Zoning By-law

The Haldimand County Comprehensive Zoning By-law HC1-2020 (the "Zoning By-law") was enacted in 2020 under section 34 of the *Planning Act*. The Zoning By-law amalgamates and replaces three former zoning by-laws for the municipalities of the City of Nanticoke, the Town of Haldimand, and the Town of Dunnville.

The Zoning By-law comprises a range of zones throughout the County to implement the various land use designations of the Official Plan. Each zone establishes permitted uses and certain regulations, such as defined terms, general provisions and parking requirements and regulations. There are seven distinct industrial zones, as follows:

- Specialized industrial zones for marine uses, and disposal and extractive industries,
- Rural Industrial (MR) zone which permits a broad range of uses with stricter zoning standards.
- Heavy Industrial (MH),
- General Industrial (MG), and
- Light Industrial (ML)

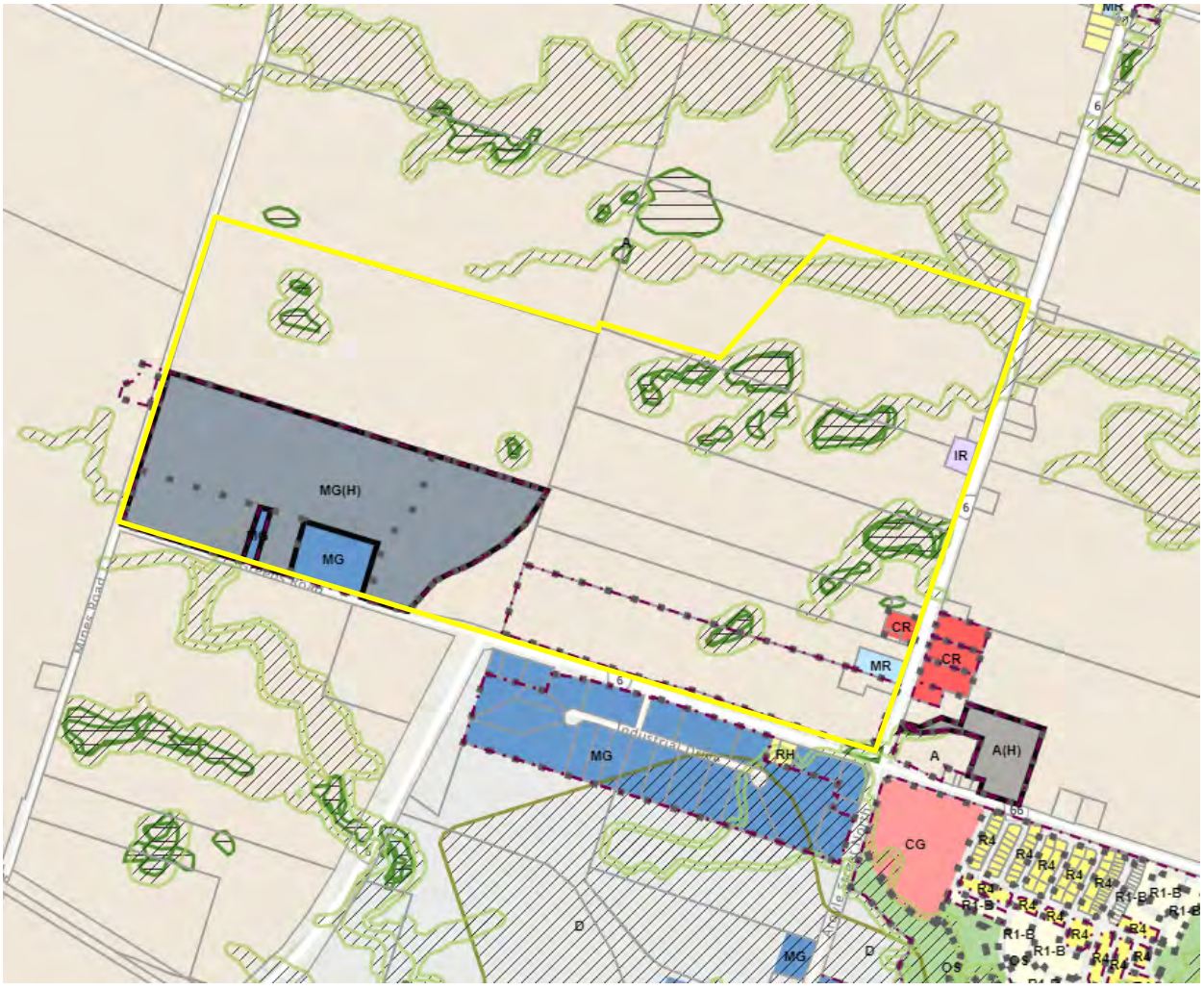
Generally, the Heavy Industrial (MH) Zone permits a broad range of employment and industrial related uses. The General Industrial (MG) Zone permits many industrial although excluding those with the most adverse impacts. The Light Industrial (ML) Zone permits even fewer uses.

The Subject Lands, as shown in Figure 5-4, are predominantly zoned Agriculture (A) Zone with portions in the southwest being zoned MG and General Industrial – Holding (MG(H)). Along the eastern portion of the Subject Lands, there are parcels zoned Rural Institutional (IR), Rural Commercial (CR), and Rural Industrial (MR). The Zoning By-law also establishes several overlays within the Subject Lands relating to natural heritage features and special provisions. Wetlands and Natural Environment Areas are identified as a zoning overlay with data provided from the G.R.C.A.

There are five Special Provisions applied within the subject area: HAL36.32; HAL36.93; HAL36.94; HAL36.95; and HAL36.369. Generally, each of these Special Provisions establish permissions for additional uses.

Lands to the periphery of the Subject Lands are largely zoned Agricultural (A) , with some lands zoned Rural Commercial (CR) to the south-east, and General Industrial (MG) to the south. Further south of Greens Road and west of Argyle Street North is a large area with a hazards overlay, which largely restricts development.

Figure 5-4
Haldimand County Comprehensive Zoning By-law HC 1-2020.



5.2.7 Haldimand County Economic Development Strategy

The County issued the Economic Development Strategy in January 2017. The Strategy was developed to facilitate economic development and tourism, and to ensure that the County is investment ready. The Strategy provided a summary of and consultation for the County demographic and economic position and then performed a strengths,

weaknesses, opportunities and threats (SWOT) analysis. The five resulting strategic themes are:

- Becoming investment ready: This theme focusses on competing in an investment environment, which entails the ability to provide key data to business inquiries, having an inventory of available land and buildings including the current zoning and any limitations. This theme contemplates business investment in the County as a product that can be marketed and sold, which requires knowing the strengths and weaknesses of the County and being able to communicate those effectively to investors.
- Ensuring the County is a great place to invest and to do business: This theme focuses on developing capacity to support business growth into the future. It suggests ongoing monitoring and review of the County's business friendliness, fostering partnerships with the County's business community, adopting a coordinated approach to business development, and recognize the importance of businesses in the County.
- Creating a unique Haldimand County economic development identity: This theme focuses on developing a strong brand, that includes a value proposition for business investment, and economic development identity, and marketing strategy.
- Building stronger economic development partnerships: This theme focuses on creating business partnerships. It contemplates partnerships with the business community, neighbouring communities, the implementation of the Tourism strategy, and aligning economic development efforts with regional partners.
- Building a more unified County: The focus of this theme is unifying the several smaller communities within the county. It suggests undertaking a County-based community strategy, and addressing youth engagement and youth employment.

Each of the strategic themes are supported by recommended actions.

5.2.8 Corporate Strategic Pillars

The County follows three corporate strategic pillars to serve as guiding principles. They are:

- Growing our local economy by creating economic opportunity;
- Community vibrancy and healthy community; and

- Corporate image and efficient government.

Council also typically holds a strategic planning exercise to identify major initiatives and administrative improvement objects it wishes to achieve during its tenure, which translate into Council priorities.

5.2.9 Discussion

The policy and regulatory environment for employment lands in the County is supportive of achieving the County's employment objectives over the planning horizon. The land use planning framework will need to be consistent with the P.P.S. and conform to the Growth Plan. Provincial policy requires rationalization that the Subject Lands are feasible for employment uses for the long-term.

While the Subject Lands are currently zoned for rural and agricultural uses, the Official Plan has recently redesignated the lands for employment uses within the urban settlement boundary. This redesignation contemplates an enabling policy framework to facilitate the long-term redevelopment of the Subject Lands, including a broad range of permitted employment uses. Based on regulatory mapping and policies, there are some identified regulated areas and natural heritage features on the Subject Lands that will require further study.

The Subject Lands are subject to provincial and local policy that must be considered through the Study to develop a comprehensive land use planning framework for the Subject Lands.

5.2.10 Preliminary Directions

Any land use plan for the Subject Lands will be required to conform to Site Specific Policy HCOP-63, which sets out limitations on access to Greens Road prior to the completion of the future Highway 6. In addition, it requires the following to be completed prior to any development:

- Demonstration that municipal water and wastewater services can be extended to accommodate development, and that there is sufficient reserve capacity;
- A stormwater management plan that meets the standards of the M.T.O., County and the C.A.;
- An environmental analysis;

- A Cultural Heritage and Archaeological Assessment carried out in consultation with provincial ministries and local Indigenous communities;
- An urban design brief outlining the site and built form design criteria that recognizes the gateway significance of the area;
- An agricultural impact analysis that identifies mitigation and/or avoidance measures, and that is based on consultation with the Agricultural Advisory Committee; and,
- A road system that meets County and M.T.O. access requirements.

There are several considerations for implementing an updated land use planning framework on the Subject Lands:

- Implement a land use planning framework for the Employment Area using existing land use designations and zones. This would require minimum amendments to the Zoning By-law to rezone the lands currently designated by the Official Plan for employment uses and would largely implement the existing zones under the Zoning By-law.
- Establish site specific policies and provisions for the employment lands, which would offer more specific land use planning direction. This could be achieved through establishing new policy and implementing zones that are specific to the Subject Lands.
- Develop a more detailed policy framework applicable to the Subject Lands, such as a secondary plan. This approach would offer the most detailed implementation framework for the Subject Lands but may require additional detailed study.

At this time, establishing policies and provisions that are specific to the employment lands is emerging as the preferred option. This approach should be re-evaluated as the Study evolves, taking into consideration additional study as well as input and feedback through engagement with the public, key stakeholders and Indigenous communities.

The Study will need to further evaluate the following land use planning considerations:

- Evaluation if the County's current land use planning framework is appropriate and sufficient to ensure the lands are feasible for future employment uses. If they are not, the land use approach will need to consider amendments to the Zoning By-law and the Official Plan.

- Ensure additional matters that impact land use planning decisions are considered, such as restrictions on servicing capacity, traffic considerations, or design considerations are evaluated.
- Future land use planning recommendations will need to be considerate of stakeholder and community interests, as well as consultation with Indigenous communities.

This land use review has provided an overview of applicable land use planning policy that will need to be considered through the Study. There are several approaches to developing an applicable land use planning framework for the Subject Lands as identified above. There is currently no recommended option, however establishing site specific policies and provision is emerging as the preferred. It is anticipated that this will be further evaluated as the Study evolves.

Chapter 6
Conclusions

6. Conclusions

The County has experienced moderate employment growth over the past two decades. While the County contains a strong manufacturing base compared to the rest of the Province, this sector has been declining. This decline can partially be attributable to the continued automation and technology-intensive uses within the manufacturing sector lessening the need for skilled labour. With that being said, the County is forecast to increase its industrial employment based as well as accommodate a shift towards growth in knowledge-based employment sectors. Having serviced employment land to accommodate this growth over the next several decades will be vital.

This report has examined the target sectors on the North Caledonia employment lands and the land configurations required to accommodate various target employment uses. Further to this, the analysis has explored the land use structure which will be required to accommodate the target growth sectors. Beyond planning for future growth, it is also vital the County consider how they can market the North Caledonia Employment Area. As shown through this analysis, the County represents a cost competitive environment for employment land development compared to the surrounding economic region. Leveraging this cost competitiveness will help attract forecast employment growth to the County.

This report represents Phase 1 of the North Caledonia Employment Land Feasibility and Servicing Study. Appendix B of this Phase 1 Report contains a detailed appendix which determines how the North Caledonia Employment Area is serviced and the costs associated with infrastructure development. Phase 2 will then include a detailed financial analysis and business plan to take the findings from Phase 1 and quantify the impact on the County. Following Council's direction on Phases 1 and 2, the Consultant Team will commence Phase 3 which involves recommendations regarding property administration and management marketing as well as an implementation plan.

Appendix A

Assessment of Development and Operating Annualized Costs

Appendix A: Assessment of Development and Operating Annualized Costs

1-Storey Factory

Building	30,000 square feet
Land	2.3 Acres (30% FSI)
Annualization Factor	6.5%

Development Costs

Market Area	Land Cost per Acre[1]	Land Cost per Sq.ft. of Building GFA	Construction Cost per Sq.ft.[2]	Development Charges per Sq.ft.[3]	Building Permit Fees per Sq.ft.[3]	Developer Profit (5%) Per Sq.ft.	Total Development Cost Per Sq.ft.	Annualized Development Cost (6.5%) Per Sq.ft.
	A	B = A * 2.3 / 30,000	C	D	E	F = 5% * (B+C+D+E)	F = B + C + D + E + F	G = F * 6.5%
Haldimand County	$ 140,615	$ 10.76	$ 209.29	$ 6.11	$ 1.12	$ 11.36	$ 238.64	$ 15.51
City of Hamilton	$ 373,096	$ 28.55	$ 221.84	$ 13.94	$ 1.19	$ 13.28	$ 278.80	$ 18.12
Norfolk County	$ 113,682	$ 8.70	$ 209.29	$ 6.94	$ 2.72	$ 11.38	$ 239.03	$ 15.54
Niagara Region	$ 185,379	$ 14.19	$ 205.10	$ 3.46	$ 1.10	$ 11.19	$ 235.04	$ 15.28
Brant County	$ 87,986	$ 6.73	$ 209.29	$ 8.49	$ 2.93	$ 11.37	$ 238.81	$ 15.52
City of Brantford	$ 119,082	$ 9.11	$ 209.29	$ 9.18	$ 0.83	$ 11.42	$ 239.83	$ 15.59

Operating Costs

Market Area	Tax Rate[4]	Assessment per Sq.ft.[5]	Taxes per Sq.ft	Water/Wastewater Costs per Sq.ft.[6]	Electricity Costs per Sq.ft.[6]	Natural Gas Costs per Sq.ft.[6]	Total Annual Operating Costs per Sq.ft.	Combined Development (Annualized) and Operating Costs per Sq.ft.
	H	I	J = H * I	K	L	M	N = J + K + L + M	O = G + N
Haldimand County	3.4%	$ 47.52	$ 1.60	$ 0.42	$ 3.77	$ 1.57	$ 7.36	$ 22.87
City of Hamilton	4.4%	$ 77.40	$ 3.43	$ 0.62	$ 3.58	$ 1.57	$ 9.20	$ 27.32
Norfolk County	2.9%	$ 50.45	$ 1.46	$ 0.67	$ 3.40	$ 1.57	$ 7.10	$ 22.64
Niagara Region	4.0%	$ 78.61	$ 3.18	$ 0.59	$ 3.66	$ 1.67	$ 9.10	$ 24.38
Brant County	3.1%	$ 67.65	$ 2.07	$ 0.53	$ 3.50	$ 1.57	$ 7.67	$ 23.20
City of Brantford	3.6%	$ 64.16	$ 2.30	$ 0.74	$ 3.50	$ 1.57	$ 8.11	$ 23.70

Source: Watson & Associates Economists Ltd., 2022.

[1] Land prices are based sample sale data from from the Municipal Property Assessment Corporation (MPAC), compiled by Watson & Associates Economists Ltd., 2022.

[2] Based on RSMeans locational factor data.

[3] Most recent development charge rates are based on an area municipal average where applicable.

[4] Based on most up-to-date area municipal averages.

[5] Assessment per sq.ft. is based on Watson & Associates Economists Ltd. survey averages from MPAC.

[6] Costs for water/wastewater, natural gas and electricity are based on industry average consumption rates and local cost data.

2-4 Storey Office

Building	20,000 square feet
Land	1.15 Acres (40% FSI)
Annualization Factor	6.5%

Development Costs

Market Area	Land Cost per Acre[1]	Land Cost per Sq.ft. of Building GFA	Construction Cost per Sq.ft.[2]	Development Charges per Sq.ft.[3]	Building Permit Fees per Sq.ft.[3]	Developer Profit (5%) Per Sq.ft.	Total Development Cost Per Sq.ft.	Annualized Development Cost (6.5%) Per Sq.ft.
	A	B = A * 1.15 / 20,000	C	D	E	F = 5% * (B+C+D+E)	F = B + C + D + E + F	G = F * 6.5%
Haldimand County	$ 140,615	$ 8.09	$ 249.35	$ 6.11	$ 1.86	$ 13.27	$ 278.67	$ 18.11
City of Hamilton	$ 373,096	$ 21.45	$ 264.31	$ 23.42	$ 2.04	$ 15.56	$ 326.79	$ 21.24
Norfolk County	$ 113,682	$ 6.54	$ 249.35	$ 13.40	$ 3.24	$ 13.63	$ 286.15	$ 18.60
Niagara Region	$ 185,379	$ 10.66	$ 244.36	$ 24.29	$ 1.76	$ 14.05	$ 295.12	$ 19.18
Brant County	$ 87,986	$ 5.06	$ 249.35	$ 8.49	$ 3.49	$ 13.32	$ 279.71	$ 18.18
City of Brantford	$ 119,082	$ 6.85	$ 249.35	$ 9.18	$ 1.56	$ 13.35	$ 280.28	$ 18.22

Operating Costs

Market Area	Tax Rate[4]	Assessment per Sq.ft.[5]	Taxes per Sq.ft	Water/Wastewater Costs per Sq.ft.[6]	Electricity Costs per Sq.ft.[6]	Natural Gas Costs per Sq.ft.[6]	Total Annual Operating Costs per Sq.ft.	Combined Development (Annualized) and Operating Costs per Sq.ft.
	H	I	J = H * I	K	L	M	N = J + K + L + M	O = G + N
Haldimand County	3.4%	$ 47.52	$ 1.60	$ 0.20	$ 1.63	$ 0.27	$ 3.70	$ 21.82
City of Hamilton	4.4%	$ 77.40	$ 3.43	$ 0.29	$ 1.55	$ 0.27	$ 5.54	$ 26.79
Norfolk County	2.9%	$ 50.45	$ 1.46	$ 0.32	$ 1.47	$ 0.27	$ 3.52	$ 22.12
Niagara Region	4.0%	$ 78.61	$ 3.18	$ 0.28	$ 1.58	$ 0.29	$ 5.33	$ 24.51
Brant County	3.1%	$ 67.65	$ 2.07	$ 0.25	$ 1.52	$ 0.27	$ 4.11	$ 22.29
City of Brantford	3.6%	$ 64.16	$ 2.30	$ 0.35	$ 1.52	$ 0.27	$ 4.44	$ 22.66

Source: Watson & Associates Economists Ltd., 2022.

[1] Land prices are based sample sale data from from the Municipal Property Assessment Corporation (MPAC), compiled by Watson & Associates Economists Ltd., 2022.

[2] Based on RSMeans locational factor data.

[3] Most recent development charge rates are based on an area municipal average where applicable.

[4] Based on most up-to-date area municipal averages.

[5] Assessment per sq.ft. is based on Watson & Associates Economists Ltd. survey averages from MPAC.

[6] Costs for water/wastewater, natural gas and electricity are based on industry average consumption rates and local cost data.

1-Storey Warehouse

Building	60,000 square feet
Land	4.6 Acres (30% FSI)
Annualization Factor	6.5%

Development Costs

Market Area	Land Cost per Acre[1]	Land Cost per Sq.ft. of Building GFA	Construction Cost per Sq.ft.[2]	Development Charges per Sq.ft.[3]	Building Permit Fees per Sq.ft.[3]	Developer Profit (5%) Per Sq.ft.	Total Development Cost Per Sq.ft.	Annualized Development Cost (6.5%) Per Sq.ft.
	A	B = A * 4.6 / 60,000	C	D	E	F = 5% * (B+C+D+E)	F = B + C + D + E + F	G = F * 6.5%
Haldimand County	$ 140,615	$ 10.78	$ 145.40	$ 6.11	$ 1.12	$ 8.17	$ 171.58	$ 11.15
City of Hamilton	$ 373,096	$ 28.60	$ 154.12	$ 13.94	$ 1.19	$ 9.89	$ 207.75	$ 13.50
Norfolk County	$ 113,682	$ 8.72	$ 145.40	$ 6.94	$ 1.89	$ 8.15	$ 171.09	$ 11.12
Niagara Region	$ 185,379	$ 14.21	$ 142.49	$ 3.46	$ 1.10	$ 8.06	$ 169.33	$ 11.01
Brant County	$ 87,986	$ 6.75	$ 145.40	$ 8.49	$ 2.04	$ 8.13	$ 170.80	$ 11.10
City of Brantford	$ 119,082	$ 9.13	$ 145.40	$ 9.18	$ 0.83	$ 8.23	$ 172.76	$ 11.23

Operating Costs

Market Area	Tax Rate[4]	Assessment per Sq.ft.[5]	Taxes per Sq.ft	Water/Wastewater Costs per Sq.ft.[6]	Electricity Costs per Sq.ft.[6]	Natural Gas Costs per Sq.ft.[6]	Total Annual Operating Costs per Sq.ft.	Combined Development (Annualized) and Operating Costs per Sq.ft.
	H	I	J = H * I	K	L	M	N = J + K + L + M	O = G + N
Haldimand County	3.4%	$ 47.52	$ 1.60	$ 0.42	$ 3.77	$ 1.57	$ 7.36	$ 18.51
City of Hamilton	4.4%	$ 77.40	$ 3.43	$ 0.62	$ 3.58	$ 1.57	$ 9.20	$ 22.70
Norfolk County	2.9%	$ 50.45	$ 1.46	$ 0.67	$ 3.40	$ 1.57	$ 7.10	$ 18.22
Niagara Region	4.0%	$ 78.61	$ 3.18	$ 0.59	$ 3.66	$ 1.67	$ 9.10	$ 20.10
Brant County	3.1%	$ 67.65	$ 2.07	$ 0.53	$ 3.50	$ 1.57	$ 7.67	$ 18.78
City of Brantford	3.6%	$ 64.16	$ 2.30	$ 0.74	$ 3.50	$ 1.57	$ 8.11	$ 19.34

Source: Watson & Associates Economists Ltd., 2022.

[1] Land prices are based sample sale data from from the Municipal Property Assessment Corporation (MPAC), compiled by Watson & Associates Economists Ltd., 2022.

[2] Based on RSMeans locational factor data.

[3] Most recent development charge rates are based on an area municipal average where applicable.

[4] Based on most up-to-date area municipal averages.

[5] Assessment per sq.ft. is based on Watson & Associates Economists Ltd. survey averages from MPAC.

[6] Costs for water/wastewater, natural gas and electricity are based on industry average consumption rates and local cost data.

Appendix B
Employment Area Servicing Analysis

North Caledonia Employment Land Feasibility and Servicing Study

GMBP File No. 722015
August 2023

Prepared by GM BluePlan Engineering for Haldimand County, in association with Watson & Economists and WSP

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VERSION LOG

Version	Date	Author(s)	Reviewed By	Description
1	March 31st, 2023	Benjamin Peachman, P.Eng.	Mark Zamojc, P.Eng.	Issued for draft review
2	May 26, 2023	Benjamin Peachman, P.Eng.	Mark Zamojc, P.Eng.	Revised per County comments
3	August 18th, 2023	Benjamin Peachman, P.Eng.	Mark Zamojc, P.Eng.	Revised per County comments
4	August 31st, 2023	Benjamin Peachman, P.Eng.	Mark Zamojc, P.Eng.	Revised per County comments

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APPENDICES

APPENDIX A: DESIGN CALCULATIONS – WATER INFRASTRUCTURE

APPENDIX B: DESIGN CALCULATIONS – WASTEWATER INFRASTRUCTURE

APPENDIX C: DESIGN CALCULATIONS – STORMWATER INFRASTRUCTURE

1. INTRODUCTION

Haldimand County (County) is a single-tier municipality located on the Niagara Peninsula on the north shore of Lake Erie. The County is adjacent to Norfolk County, the County of Brant, the City of Hamilton, and Niagara Region, and includes the communities of Caledonia, Dunnville, Hagersville, Jarvis, Townsend, and Cayuga. The County is located in the Greater Golden Horseshoe (GGH) which is one of the fastest growing regions in North America. The County has seen a substantial increase in residential development over the last 10 years, along with increased interest in business development. Upon completion of Phase 1 of the County's Official Plan Update in 2021, the following was identified and approved for Haldimand County:

- Accommodate the Provincial 2051 forecast of 77,000 residents and 29,000 jobs;
- Accommodate an additional population of 30,000 new residents, 12,700 new households, and 11,000 new jobs by 2051;
- Set a minimum target of 40 residents and jobs per hectare in new community areas; and,
- Plan for and protect employment land.

A key driver of Haldimand's future population growth is its location within the southwest region of the GGH. As the remaining greenfield areas within the mature areas of the GGH gradually build out, increased growth pressure will be placed on the outer ring of the GGH which includes Haldimand County. This population growth is anticipated to be located in the County's larger urban centres, including Caledonia. As the County's 2021 Official Plan Update identified Caledonia as the highest demand area, an area in North Caledonia of approximately 138 hectares (ha) was added to the urban boundary of Caledonia and allocated for employment uses. This area was adjacent to existing land allocated for employment uses for a total employment area of approximately 184 ha. The consolidated employment area is henceforth referred to as the Study Area in this report and is identified on **Figure 1-1**.

Currently, the Study Area is primarily agricultural with some commercial and residential uses along the boundary roads of Highway 6, Greens Road, and Mines Road. The Study Area does not have access to municipal servicing and the existing properties are serviced by private (on-site) systems. The purpose of this report will be to review the existing development constraints for the Study Area and provide recommendations for site servicing and a conceptual subdivision layout. This report will include servicing analysis to support the development of a conceptual subdivision layout based on the identified constraints. High Level cost estimates will be provided for the infrastructure required for the conceptual subdivision layout to support future planning purposes.

This report is being completed in association with Watson & Associates Economists Ltd. (Watson) and WSP, who are completing market research assessment and planning review, respectively, for the Study Area.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

- Conceptual Highway 6 Extension
- Conceptual Highway 6 Right-of-Way (90m)
- Current Limits of Highway 6 Corridor
- North Caledonia Employment Lands

General Features

- Railways
- Parcels
- Urban Boundary
- Parks
- Grand River Conservation Authority Regional Floodline
- Grand River Conservation Authority Regulation Limit
- Significant Natural Heritage Features
- Wetland
- Woodlot
- Core Natural Environment Areas
- Waterbody and Watercourse
- Municipal Boundary

Figure 1-1

Study Area

BluePlan Engineering

May, 2023
722015-001
Projection EPSG:26917

0 0.5 1 km

1.1 Physical Constraints to Study Area

Caledonia is located in the northern portion of Haldimand County, approximately 2 km south of the City of Hamilton. The Grand River runs through Caledonia, splitting the community into north and south areas. North Caledonia has several new growth areas including the Study Area, which is located at the northern limit of the urban area settlement boundary. The following sub-sections identify various physical and natural environmental constraints specific to the Study Area, along with the assumptions carried for each constraint.

1.1.1 Topography

Elevations within the Study Area range from approximately 203 metres to 213 metres above sea level (masl) and generally consist of gradually sloping agricultural fields. The Study Area does not appear to contain any significant elevation changes that would impact developable yield. The lowest elevations are along the streams which discharge to the Grand River.

1.1.2 Watercourses and Waterbodies

There are several streams identified throughout the Study Area by Grand River Conservation Authority (GRCA) mapping, however only the creek in the northeast section of the Study Area has a Regulatory floodplain associated with it. The remainder of the streams within the Study Area discharge through small waterbodies and/or wetlands to outlet at the south, east, and north limits of the Study Area (refer to **Figure 1-2**). For the purposes of this report, watercourses and waterbodies that have GRCA regulation limits associated with them are considered constraints to development. These features will be maintained on the landscape with appropriate development buffers applied to them. For drainage features that are not regulated by the GRCA, it was assumed that these features can be incorporated into the stormwater management and drainage systems where necessary.

1.1.3 Wetlands

There are approximately twelve wetland areas throughout the central portion of the Study Area which range in size from 0.05 to 1.3 ha. Several of these wetland areas are surrounded by agricultural fields and are therefore isolated on the landscape. However, several wetland areas are located in wooded areas and are hydraulically connected to the watercourses noted in **Section 1.1.2**. The ecological significance of the wetland features was not evaluated as part of this report and therefore it was assumed that these features are constraints to development and will be maintained on the landscape with appropriate development buffers applied to them. If impacts to the existing wetland features are deemed necessary to accommodate a functional concept plan, reconstructed wetland features would be required to replicate the form and function of the existing wetlands.

1.1.4 Woodlands

There is a Significant Woodland feature located in the central portion of the Study Area. The feature is approximately 26 hectares in size and coincides with several other environmental features including wetland features, watercourses, and waterbodies. As confirmed by the County, this Significant Woodland feature is to be protected and maintained on the landscape. Some minor modifications may

be considered in areas where there will be no negative impacts on the natural features or ecological functions. Similar to the existing wetland features, if impacts to the existing woodland features are deemed necessary to accommodate a functional concept plan, reconstructed woodland features would be required to replicate the form and function of the existing wetlands. The compensation rates for woodland removal are based on the age of the woodland as defined below:

- Pioneer: A community that has invaded disturbed or newly created sites and represents the early stages of either primary or secondary succession.
- Young: A community that has not yet undergone a series of natural thinning and replacements; plants are essentially growing as independent individuals rather than as members of a phytosociological community.
- Mid-aged: A community that has undergone natural thinning and replacement as a result of species interaction and often contains examples of both early successional and late successional species.
- Mature: A successionally maturing community dominated primarily by species that are replacing themselves and are likely to remain an important component of the community if not disturbed again; significant remnants of early seral stages may still be present.
- Climax: A self-perpetuating community composed primarily of late seral species that show uneven stand age distribution, including large old trees (generally older than 120 years) without open-grown characteristics.

11.2 hectares of the woodland feature is classified as 'Young' and 14.7 hectares of the feature is classified as 'Mid-Aged'. Per the field work completed to confirm these age designations, it was identified that the larger trees along the edges of the 'Young' plantation are considered part of the 'Young' plantation and in the event of their removal; they should be reforested at the 'Young' compensation rates. The compensation rates for woodland removal are presented in **Table 1-1**.

Table 1-1: Afforestation Rates

Existing Age of Woodland	Area of Woodlands Clear Cut	Afforestation Area Required on Subject Lands	Afforestation Area Required on Owner's Other Lands	Afforestation Area Required Cash-in-Lieu Payment to County
Pioneer	1 Hectare	1 Hectare	2 Hectares	3 Hectares
Young	1 Hectare	2 Hectares	4 Hectares	5 Hectares
Mid-Aged	1 Hectare	3 Hectares	6 Hectares	9 Hectares
Mature	1 Hectare	4 Hectares	8 Hectares	12 Hectares
Climax	1 Hectare	5 Hectares	10 Hectares	15 Hectares

As discussed with the County, the existing Significant Woodlands feature will be maintained on the landscape and protected with a 10 metre width buffer that is subject to change based on future Environmental Impact Studies (EIS). If impacts to the existing woodlands features are deemed necessary to accommodate a functional concept plan, woodland compensation areas will be identified per the ratios presented in **Table 1-1**.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Seneca Creek

Greens Road

Mines Road

Catchment 101 (69.4 Ha)

Catchment 102 (10.6 Ha)

Catchment 103 (53.0 Ha)

Catchment 104 (29.8 Ha)

Catchment 105 (7.3 Ha)

Catchment 106 (14.0 Ha)

C1

C2

C3

C4

C5

C6

C7

C8

B1

Haldimand Road 66

Industrial Drive

Argyle Street

6

0 250 500 m

North Caledonia Employment Lands

General Features

- Parcels
- Urban Boundary
- Existing Culverts
- Existing Stormwater Pond
- Pre-Development Drainage Catchment
- Parks
- Grand River Conservation Authority Regional Floodline
- Grand River Conservation Authority Regulation Limit
- Significant Natural Heritage Features
- Wetland
- Woodlot
- Core Natural Environment Areas
- Waterbody and Watercourse
- Overland Flow Direction

Figure 1-2

Existing Conditions and Pre-Development Drainage Plan

BluePlan Engineering

May, 2023
722015-001
Projection EPSG:26917

1.1.5 Easements

From a desktop review of the Study Area, no existing easements were identified that would impact development of the Study Area.

1.1.6 Highway 6

Based on a discussion with the Ministry of Transportation (MTO), an existing MTO corridor (Highway 6) follows the south & east limits of the Study Area. In the future, the MTO plans to extend Highway 6 through the Study Area as reflected in **Figure 1-3**. This highway extension includes the following constraints within the Study Area:

- New road access connections from within the Study Area to the future Highway 6 extension will not be allowed.
- New road access connections from within the Study Area to existing Highway 6 must exceed 800 metres in distance from existing intersections.
- Subsurface infrastructure crossings of the future Highway 6 extension should be minimized and consolidated where possible. Crossings must include sufficient vertical clearance to not preclude future design and construction of the highway extension.
- Extending services through the intersection of Highway 6 and Haldimand Road 66 will not be permitted. It was also noted that extending services within the Highway 6 / Greens Road corridor would not be permitted and service crossings of this corridor should be minimized wherever possible. Any services extended parallel to the Highway 6 / Greens Road corridor would need to be located within a separate easement in favour of the County.

As reflected in **Figure 1-3**, the Highway 6 extension coincides with several of the aforementioned natural features, including wetland features and portions of the Significant Woodlot. The required compensation for removal of these existing features will be assessed through the studies completed to support the design of the highway extension and are not reviewed or assessed within this report.

It is understood that once the MTO extends Highway 6 through the Study Area, the portion of existing Highway 6 that follows the south & east limits of the Study Area will be transferred to the County. Upon transfer of Highway 6 to the County, the feasibility of additional accesses onto this length of roadway will need to be further reviewed.

Haldimand County

North Caledonia Employment Lands
Feasibility and Servicing Study

Greens Road

Mines Road

Phase 1

Phase 2

Greens Road

6

Haldimand Road 66

Industrial Drive

Argyle Street

0 250 500 m

- Conceptual Highway 6 Extension
- Conceptual Highway 6 Right-of-Way (90m)
- North Caledonia Employment Lands
- Phase 1 North Employment Lands
- Phase 2 North Employment Lands

General Features

- Parcels
- Urban Boundary
- Parks
- Grand River Conservation Authority Regional Floodline
- Grand River Conservation Authority Regulation Limit
- Significant Natural Heritage Features
- Wetland
- Woodlot
- Core Natural Environment Areas
- Waterbody and Watercourse

Figure 1-3

MTO Extension (Hwy 6) and Phasing of Study Area

BluePlan Engineering

May, 2023
722015-001
Projection EPSG:26917

2. SERVICING DESIGN PARAMETERS

A review of servicing design criteria was conducted based on recent servicing studies conducted in Haldimand County and Caledonia. The following servicing studies were reviewed as part of this exercise:

1) Haldimand County Design Criteria: Section K - Wastewater Collection System (August 2018)
2) Haldimand County Design Criteria: Section J - Water Distribution System (August 2018)
3) Haldimand County Design Criteria: Section H - Storm Water Management and Drainage (2015)
4) Technical Memo: Caledonia North Sewage Pumping Station Design Basis (WSP, September 2019)
5) Water Servicing Review and Updates – Caledonia Master Servicing Plan Update (C3 Water, November 2020)
6) Wastewater Servicing Review and Updates – Caledonia Master Servicing Plan Update (J.L. Richards & Associates, December 2020)
7) Caledonia Urban Boundary Expansion Servicing Review (J.L. Richards & Associates, December 2020)

These studies were reviewed to confirm the design criteria to be applied to the Study Area, which is detailed in the sub-sections below.

2.1 Design Criteria

2.1.1 Water

Design criteria for estimating water supply demands are summarized in **Table 2-1**.

Table 2-1: Design Criteria for Estimating Future Water Demand

Parameter	Criteria	Source
Average Water Demand	365 L/cap/day	Gateway North SPS Tender Documents (Dry Weather Flow) (WSP, March 2020)
Maximum Daily Demand Factor	1.58	Caledonia Master Servicing Plan Update (MSP 2020)
Maximum Hourly Demand Factor	2.0	Haldimand County Design Guidelines

Per the County's Design Criteria (Section J, August 2018), the water system should be designed to meet the greater of either of the following demands:

a) Maximum daily demand plus fire flow; or
b) Maximum hourly demand.

Fire flows will be considered in accordance with the requirements of the latest edition of 'Water Supply For Public Fire Protection', which is a guide to recommended practices by the Fire Underwriters Survey (FUS).

2.1.2 Wastewater

Design criteria for estimating wastewater flows are summarized in **Table 2-2**.

Table 2-2: Design Criteria for Estimating Future Wastewater Flows

Parameter	Criteria	Source
Sewage Generation Rate – Collection System	365 L/capita/day	Gateway North SPS Tender Documents (Dry Weather Flow) (WSP, March 2020) Note: 12 m^3/ha/day / 33 people/ha = 365 L/cap/day
Infiltration Flow (Allowance)	0.23 L/s/ha	Haldimand County Design Criteria: Section K - Wastewater Collection System (August 2018)
Peaking Factor – Collection System	Modified Harmon Formula $Me = 0.8\left(1 + \frac{14}{4 + Pe^{0.5}}\right)$ Where: M_e = ratio of peak flow to average flow P_e = equivalent tributary population in thousands	Haldimand County Design Criteria: Section K - Wastewater Collection System (August 2018)
Sewage Generation Rate – Treatment	338 L/capita/day	MSP 2020 Note: Based on 2016 Actuals
Peaking Factor (Day) - Treatment	3.0	MSP 2020

Per the County's Design Criteria (Section K, August 2018), the design flow that the wastewater collection system must be able to convey is calculated as follows:

Design Flow = (Average Dry Weather Flow x Peaking Factor) + Infiltration Allowance

The following criteria from the County's Design Criteria are also relevant to the Study Area:

- For Commercial and Industrial areas, the minimum sewer diameter shall be 300 mm at a minimum grade of 0.25%.
- The maximum velocity shall not exceed 3.0 m/s with the pipe flowing full and the minimum velocity should not be less than 0.6 m/s. The actual velocity for a 200mm pipe (or greater) shall not be less than 0.5 m/s.
- The obvert of the sewer pipe shall be a minimum of 2.75 m below the centerline of the road.

2.1.3 Stormwater Management and Drainage

As outlined in Section H of the County's Design Criteria, the following stormwater management (SWM) and drainage criteria are applicable to the Study Area:

1) Quantity Control: In an area where no Subwatershed Impact Study (SIS) has been completed, it is the policy of Haldimand County to require that runoff peak flows are controlled to pre-development levels for the 2-year through 100-year events.
2) Quality Control: Per the 2003 MOE SWM Planning & Design Manual, water quality treatment will be required to maintain an Enhanced Level of Protection corresponding to the end-of-pipe storage volumes required for the long-term removal of 80% of suspended solids.
3) Erosion Control: Extended Detention Storage for the 25mm rainfall event is required as outlined in the Provincial Guidelines (SWM Planning & Design Manual, MOE, 2003).
4) Minor Conveyance System: Storm sewers are to be sized to convey the 5-year event.
5) Major Conveyance System: No new building should be subject to flood damage from the Regulatory Flood; which is defined as the greater of Hurricane Hazel (transposed), modelled 100-year flood, observed flood, or frequency-based 100-year flood. Major overland flow routes should be provided to convey drainage to appropriate outlets with flooding to not exceed 150mm depth over the crown of any roadway during a 100-year event and should be contained within the designated right-of-way.
6) Storm sewers and open channels can be designed using the Rational Formula.

As outlined in Table H1 of Appendix H of the County's Design Criteria, wet ponds are suitable for providing water quality and quantity treatment, therefore the use of wet ponds will be assumed for the SWM blocks within the Study Area.

Rooftop storage is also applicable to peak flow control for industrial/commercial applications per the County's Design Criteria, however it will not be used for the Study Area due to its proximity to existing and future Highway 6 and the MTO's policies regarding the use of rooftop storage.

As previously noted, it has been assumed that existing drainage features in the Study Area that are not regulated by the GRCA will be integrated into the stormwater infrastructure.

3. FUTURE GROWTH

3.1 Total Serviceable Lands

Using the natural hazard mapping provided by the County, the total serviceable land (or net developable area) was established for Phases 1 & 2 of the Study Area. The decision to advance Phase 1 versus Phase 2 was based on land availability, natural environment constraints, and the lack of confirmed timing for the Highway 6 extension which places limitations on the connection of the proposed Phase 2 road to existing Highway 6. While this preferred phasing has been identified in this report, it is anticipated that the re-development of lands within Phases 1 and/or 2 will proceed based predominantly on owner-driven development applications.

The natural hazard mapping included features within the Study Area identified as watercourses (with and without associated Regulatory floodplains), waterbodies, woodlands, wetlands, Natural Environment Areas, and Significant Natural Heritage features. The future Highway 6 extension was also identified as a constraint area for development. As previously noted, natural environment areas were assumed to be protected and maintained on the landscape with any impacts deemed necessary to accommodate a functional concept plan for the Study Area requiring suitable compensation to replicate the size, form, and function of the removed natural features. Landscaped buffers are required between these retained and/or re-constructed natural areas and adjacent development blocks. The buffers applied to inform the development of the Concept Plan are as follows:

- Significant Natural Heritage feature: 30 metre width buffer
- Significant Woodlands feature: 10 metre width buffer
- Wetland feature: 30 metre width buffer per GRCA Regulation limit
- Regional Floodplain: 15 metre width buffer per GRCA Regulation limit
- Watercourse and waterbody: 15 metre width buffer per GRCA Regulation limit
- Re-constructed natural features: 15 metre width buffer
- MTO development setback: 14 metre setback to buildings and/or structures

Public roads (20.0 m corridor width) were extended through Phases 1 & 2 with wet ponds within SWM blocks identified to achieve the SWM design objectives. A breakdown of the pre-development and post-development areas within the Study Area, including the net developable area, is included in **Table 3-1**.

Table 3-1: Area Breakdown in Study Area

	Phase 1 (ha)		Phase 2 (ha)	
	Existing Area	**Proposed Area**	**Existing Area**	**Proposed Area**
MTO Dedication	8.4			
Total Natural Features	15.7	16.4	39.0	38.6
Agriculture	70.0	-	51.3	-
Stormwater Ponds	-	5.4	-	7.7
Roads	-	3.5	-	2.4
Temporary Cul-de-sac	-	-	-	0.4
Re-constructed Woodlot	-	-	-	1.8
Natural Environment Setback	-	-	-	0.5
Development Blocks	-	60.4	-	38.9
TOTAL:	**85.7**	**85.7**	**90.3**	**90.3**

The total area of the Study Area is approximately 184.4 hectares, which includes 85.7 hectares in Phase 1, 90.3 hectares in Phase 2, and 8.4 hectares for the MTO dedication area required for the Highway 6 extension. As shown, Phases 1 & 2 have a combined developable area of 99.3 ha.

3.2 Equivalent Population Projections

An employment density and equivalent population was defined for Phases 1 and 2 of the Study Area based on the employment land needs identified by Watson in Table 4-2 of their Phase 1 report.

As identified in **Figure 4-2**, the southwest portion of the Study Area (approximately 46 ha) was already included within the urban boundary as of 2020. It was previously assumed that this area would have a gross employment density of 15 jobs/hectare or 690 jobs. In the context of this report, the gross employment density is the jobs per hectare when including the proposed areas allocated for development blocks, SWM ponds, and roads.

A summary of the equivalent populations by phase is provided in **Table 3-2**.

Table 3-2: Phased Equivalent Population Growth

Land Use Classification	Phase 1	Phase 2	Phases 1 & 2
Development blocks (ha):	60.4	38.9	99.3
Stormwater Ponds (ha):	5.4	7.7	13.1
Roads (ha):	3.5	2.2	5.7
Total Area (ha):	69.3	48.8	118.1
Total Population (persons):	**1,040**	**732**	**1,772**

As shown in **Table 3-2**, at an employment density of 15 jobs/hectare for a gross available area of 118.1 hectares, the Study Area can accommodate 1,772 jobs.

3.3 Parcel Sizing

As identified by Watson in Table 5-1 of the Phase 1 Report, the following key employment sectors are considered suitable for the Study Area:

- Manufacturing (Parcel size = 1 to 4 hectares or greater)
- Distribution and Logistics (Parcel size = 5 to 20 hectares or greater)
- Professional, Technical Services, Research and Development (Parcel size = 1 to 2 hectares)

As a range of parcel sizes may be required in the Study Area, the local road network was designed to ensure that adequate frontage and depth was available to accommodate parcels of the noted range in size.

	Phase 1		Phase 2	
	Existing Area	Proposed Area	Existing Area	Proposed Area
MTO Dedication	8.4 Ha			
Total Natural Features[1]	15.7 Ha	16.4 Ha	39.0 Ha	38.6 Ha
Agriculture	70.0 Ha	-	51.3 Ha	-
Stormwater Ponds	-	5.4 Ha	-	7.7 Ha
Proposed Roads	-	3.5 Ha	-	2.4 Ha
Temporary Cul-de-Sac	-	-	-	0.4 Ha
Reconstructed Woodlot[2]	-	-	-	1.8 Ha
Natural Environment Setback (15m)	-	-	-	0.5 Ha
Development Blocks	-	60.4 Ha	-	38.9 Ha
Total Areas	85.7 Ha	85.7 Ha	90.3 Ha	90.3 Ha

Phase 1

Phase 2

SWM-1

SWM-2

SWM-3

SWM-4

SWM-5

SWM-6

SWM-7

SWM-8

SWM-9

C1

C2

C3

C4

C5

C6

C7

C8

B1

12m width servicing easement

10m width drainage easement

12m width servicing easement

10m width servicing easement

12m width servicing easement

Mines Rd

Greens Rd

Greendale Dr

Industrial Dr

Haldimand Road 66

Argyle St N

6

N

0 250 500 m

Notes:

1) 'Total Natural Environment' includes regulation limits, significant natural features with 30m setback, core natural areas, woodlots with 10m setback, wetlands, and watercourses/waterbodies. Total Natural Environment does not include the MTO dedication area.

2) Assumed 4:1 compensation ratio based on 'Young' classification (0.405 ha removed for Phase 2 local road extension; 1.62 ha required compensation)

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

General Features
- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Culverts
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Proposed Conditions
- Servicing Easement
- Booster Pumping Station Area
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Pond Outlet
- Proposed Stormwater Pond
- Development Block
- Conceptual Primary Gateway
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback

Figure 3-1

Concept Plan

BluePlan ENGINEERING

February 2023
722015-003
Projection EPSG:26917

4. WATER INFRASTRUCTURE

4.1 Existing Infrastructure

As outlined in the 2020 Caledonia Master Servicing Plan Update study (henceforth referred to as the 2020 MSP), the Caledonia water system is supplied by the City of Hamilton via a trunk 450mm diameter watermain on Highway 6. The watermain conveys water from the Hamilton system to a County-owned in-ground reservoir and pump station, known as the Caledonia Reservoir & Pumping Station. This reservoir is located at 721 Highway 6, which is adjacent to the north limits of the Study Area (refer to **Figure 4-1**). The reservoir supplies the Caledonia water system which consists of one (1) standpipe and three (3) valve chambers.

4.1.1 Treatment

The Caledonia Water Treatment Plant (WTP) is comprised of the in-ground reservoir and pumping station at 721 Highway 6, which has a capacity of 2,004 m^3 and is fed by a 450mm watermain on Highway 6 from the City of Hamilton at an approximate hydraulic grade line (HGL) of 260 masl. The County has an agreement with the City of Hamilton that allows for a maximum daily supply of 13.8 Megalitres per day (MLD). The incoming water from Hamilton is chloraminated and treated with sodium hypochlorite at the reservoir to reach the breaking point and remove the ammonia from the water. The pumping station is equipped with four (4) high lift pumps that deliver water throughout the distribution network to maintain a pressure of 58 psi at an HGL of 245 masl. The firm capacity of the pumping station is approximately 143 L/s.

4.1.2 Standpipe

The Caledonia standpipe has a height of 31 metres, a capacity of 4,420 m^3, and a top water level (TWL) of 237 masl. The standpipe is located in South Caledonia, near the corner of Argyle Street South and Haddington Street and acts as a hydraulic control point for South Caledonia.

4.2 Water Demand

4.2.1 Historical Water Demand from Caledonia per 2020 MSP

Per the modelling completed to support the 2020 MSP, an existing maximum daily demand (MDD) of 4.78 MLD (or 55.3 L/s) was identified through a review of historical records from 2013 to 2018. This MDD of 4.78 MLD was selected as the 2018 baseline value for future growth projections. The MDD peaking factor was determined by dividing the MDD value (55.3 L/s) by the average daily demand (ADD) value measured from 2015 to 2018 and choosing the highest factor of 1.58, which was considered reasonable for a community of Caledonia's size. Therefore the 2018 baseline conditions were 3.02 MLD (35.0 L/s) for ADD and 4.78 MLD (55.3 L/s) for MDD when applying a peaking factor of 1.58.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Caledonia Reservoir and Pumping Station (to be upgraded per Caledonia MSP Update (2020)

Future North Elevated Tank

Future South Elevated Tank

10WBS02 Existing Standpipe

Seneca Creek

Greens Road

Mines Road

Industrial Drive

McClung Road

Tyneside Road

Haldimand Road 66

Argyle Street

Morrison Drive

Orkney Street

Sutherland Street

Caithness Street

Forfar Street

Oaktree Drive

Maclachlan Avenue

Larry Crescent

Harrison Road

Haldimand Highway 54

Stirling Street

Fife Street

Selkirk Street

Renfrew Street

Wigton Street

Berwick Street

Haddington Street

Kinross Street

McKenzie Road

McMaster Drive

Tartan Drive

Dunrobin Drive

Celtic Drive

Morgan Drive

Caledonia Avenue

Fuller Drive

Caledonia Drive

River Drive

River Road

Sims Lock Road

Oneida Road

6th Line

0 1 2 km

- Conceptual Highway 6 Extension
- Conceptual Highway 6 Right-of-Way (90m)
- North Caledonia Employment Lands
- Future Water Facility per Caledonia MSP Update (2020)
- Future Transmission Main per Caledonia MSP Update (2020)

Existing Infrastructure

- Water Treatment Plant
- Booster Station
- Reservoir
- Water Tower
- Transmission Main
- Distribution Main

General Features

- Railways
- Parcels
- Urban Boundary
- Parks
- Woodlot
- Core Natural Environment Areas
- Waterbody and Watercourse
- Municipal Boundary

Figure 4-1

Existing Water Infrastructure

BluePlan Engineering

March, 2023
722015-002
Projection EPSG:26917

4.2.2 Water Demand from Study Area per 2020 CUBE study

The Caledonia Urban Boundary Expansion study (J.L. Richards, December 2020) (henceforth referred to as the 2020 CUBE study) included a 126.2 ha portion of the Study Area as part of its assumed expansion area. This expansion area is identified in **Figure 4-2** as 'Caledonia 1' & 'Caledonia 2'. The remainder of the Study Area includes the southwest portion of the Study Area (46 ha) which was already within the urban boundary as of the completion date of the 2020 CUBE study and the northeast portion of the Study Area (12.2 ha) that was added to the urban boundary post-completion of the 2020 CUBE study. Refer to **Figure 4-2** for the location of the various expansion areas within the Study Area.

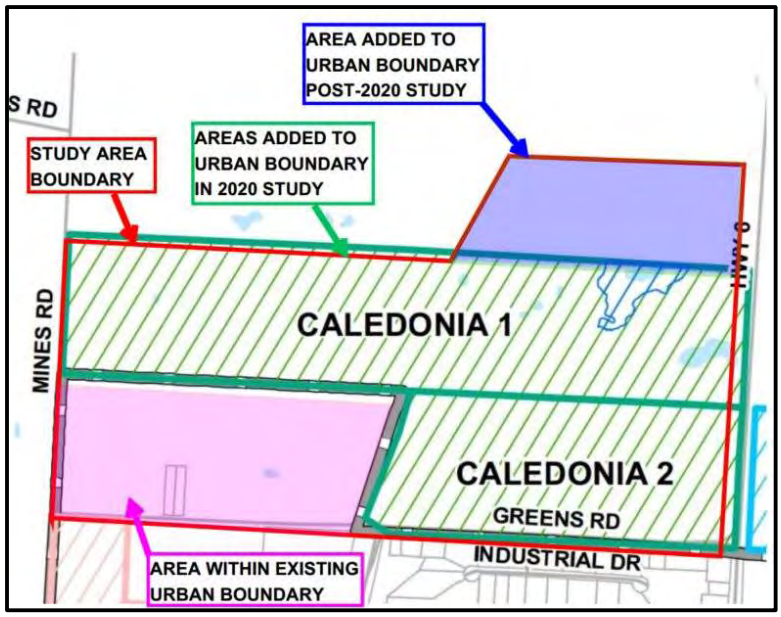


Figure 4-2: Boundary Expansion Areas from 2020 Report

Based on the 2020 CUBE study, an equivalent population of 6,232 persons was assumed for the 126.2 ha areas of 'Caledonia 1' & 'Caledonia 2', or 49.4 people per hectare (pph). An ADD of 1,514 m^3/day (1.51 MLD) and MDD of 2,392 m^3/day (2.39 MLD) was calculated for the 2020 CUBE study, corresponding to the ICI water demand rate of 243 L/capita/day, as assumed for the 2020 CUBE study. These populations and associated water demand projections were used to inform the infrastructure upgrades recommended through the 2020 CUBE study.

4.2.3 Water Demand from Study Area

Future water demand for the Study Area was calculated using the areas and populations noted in **Table 3-2**, and the water design criteria identified in **Table 2-1**. A summary of the projected water demand from the Study Area is provided in **Table 4-1**.

Table 4-1: Water Demand from Study Area

Phase	Equivalent Population (persons)	ADD		MDD	
		MLD	L/s	MLD	L/s
1	1,040	0.38	4.39	0.60	6.94
2	732	0.27	3.09	0.42	4.89
1 & 2	1,772	0.65	**7.48**	1.02	**11.82**

As outlined in **Table 4-1**, a MDD of 11.82 L/s (1.02 MLD) was calculated for the Study Area which is less than the MDD of 27.7 L/s (2.39 MLD) calculated as part of the 2020 CUBE study. The difference was due to the Study Area having a smaller net developable area and a lower population density estimate, albeit with a higher unitary demand rate.

Further details on the calculations for ADD, MDD, as well as fire flow, are provided in **Appendix A.**

4.3 External Infrastructure Upgrades

4.3.1 Recommendations per 2020 MSP

The 2020 MSP developed an all pipes model of Caledonia's water system in InfoWater Pro to assess the existing and future demand in the system. As part of the 2020 MSP, the existing system deficiencies were identified, future servicing strategies were evaluated, and a recommended servicing strategy was presented. The recommended servicing strategy included infrastructure upgrades to achieve the 2046 population growth projections. The upgrades are identified on **Figure 4-3** and outlined in **Table 4-2**.

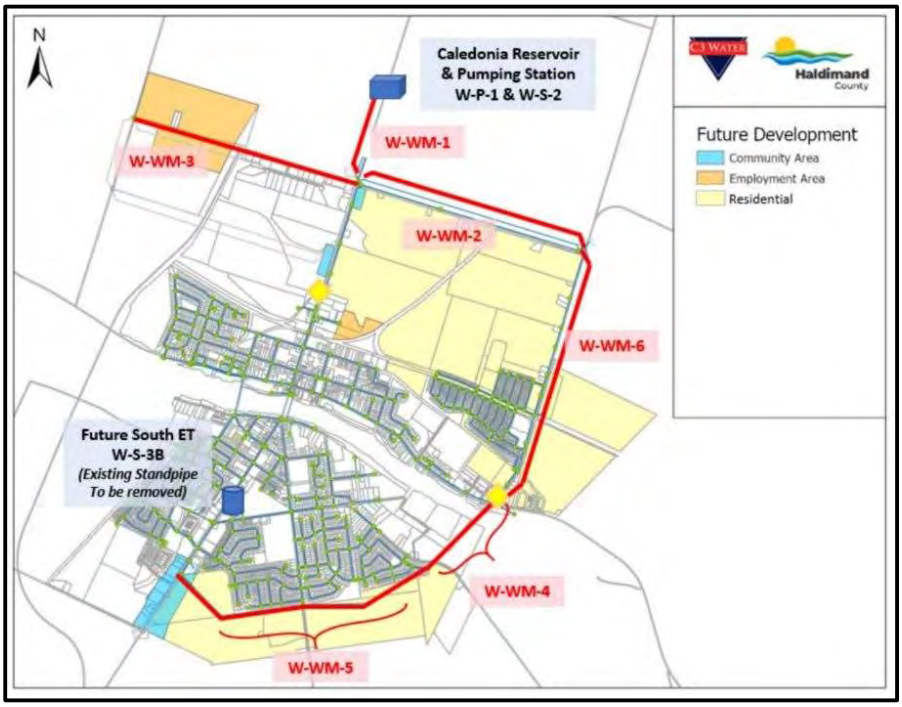


Figure 4-3: Recommended Servicing Strategy from 2020 MSP

Table 4-2: Summary of Infrastructure Upgrades per Recommended Servicing Strategy in 2020 MSP

Project Identifier	Project Description
W-WM-1	Twinning of 450mmø watermain (WM) along Highway 6
W-WM-2	Twinning of 350mmø WM along Haldimand Road 66
W-WM-3	350mmø WM along Greens Road
W-WM-4	300mmø river crossing
W-WM-5	300mmø looped river crossing from River Road to Argyle Street South
W-S-2	Increase in-ground reservoir capacity by 5,000 m^3
W-S-3B	New 5,000 m^3 South Elevated Tank (ET)

Of note, the W-WM-6 project identified on **Figure 4-3** was considered in the 2020 MSP, but not included in the recommended servicing strategy. This project included twinning the 350mmø watermain along McClung Road from Haldimand Road 66 to Caithness Street East. The purpose of the watermain was to service growth along the McClung Road corridor, reduce headloss in the water system to fill the existing standpipe and/or future South ET, and maintain reasonable pressure throughout the system.

4.3.2 Recommendations per 2020 CUBE study

Per the 2020 MSP, the baseline 2018 MDD for Caledonia was identified as 4.78 MLD and was projected to increase to 15.51 MLD by 2046, excluding the urban expansion areas identified in the 2020 CUBE study. The 2020 CUBE study estimated a total MDD of 6.17 MLD for the new expansion areas which would increase the system's MDD to 21.68 MLD by 2046.

In order to provide the additional capacity required within Caledonia's water system for the expansion areas, the CUBE study recommended the following additional infrastructure upgrades in addition to the recommended servicing strategy put forth in the 2020 MSP.

Water Treatment: The current water supply agreement with Hamilton will need to be increased from 13.8 MLD to 21.7 MLD to meet the MDD. Peak hour demands can be supplied by storage within the Caledonia Reservoir and new South Elevated Tank (ET).

Storage: As outlined in the 2020 MSP, there is currently a storage deficit in Caledonia with the current available storage being 4,484 m^3, while 8,648 m^3 is required for the 2018 baseline condition. The 2020 MSP identified a storage volume of 12,000 m^3 required to meet the demands of the 2046 growth projections and recommended the replacement of the existing standpipe with a new 5,000 m^3 South ET and a capacity increase of the Caledonia WTP in-ground reservoir by 5,000 m^3. As the current reservoir has a capacity of 2,004 m^3, the upgrades would increase the system's total capacity to 12,000 m^3. Updated storage calculations were completed as part of the 2020 CUBE study which identified the need for an additional 2,000 m^3 of storage to provide adequate balancing and equalization storage for the expansion areas. It was recommended that the additional 2,000 m^3 be added to the in-ground reservoir at the Caledonia WTP to achieve the total system capacity of 14,000 m^3.

Distribution System: As outlined in the 2020 MSP, distribution system upgrades W-WM-1, W-WM-2, W-WM-3, W-WM-4, and W-WM-5 were proposed to address the population growth projections to 2046. The 2020 CUBE study re-ran the InfoWater Pro model including the expansion areas and identified

impacts to the W-WM-1 and W-WM-2 projects, along with the requirement for the W-WM-6 project (which was identified, but not included, in the recommended servicing strategy put forth in the 2020 MSP). The 2020 CUBE study identified the following upgrades to meet the demand of the expansion areas:

- W-WM-1: Increase watermain diameter from 450mmø to 600mmø
- W-WM-2: Increase watermain diameter from 350mmø to 450mmø
- W-WM-6: Addition of 350mmø watermain along McClung Road

Pressure: The ground elevations in the 'Caledonia 1' and 'Caledonia 2' lands range from approximately 203 metres above sea level (masl) to 213 masl, with some localized areas reaching elevations of 215 masl. Based on the current water system, an elevation of 210 masl corresponds to the minimum target pressure (40 psi). Therefore, the 2020 CUBE study included the requirement for a booster pumping station to service these lands.

4.3.3 External Infrastructure Upgrades Required for Study Area

Upon review of recommendations of past studies and refinement of the Study Area's constraints, development potential and population growth estimates, the following external infrastructure upgrades were identified through this study to meet the water demand of the Study Area:

Water Treatment: As identified in **Table 4-1**, a MDD of 1.02 MLD was calculated for the Study Area which was less than the MDD of 2.39 MLD calculated as part of the 2020 CUBE study. Therefore, the updated MDD to 2046 is 20.31 MLD [21.68 MLD – (2.39 MLD – 1.02 MLD)]. As such, the current water supply agreement with Hamilton will need to be increased from 13.8 MLD to 20.3 MLD to meet the MDD demands to 2046, including the expansion areas and the updated water demand from the Study Area. Peak hour demands for Caledonia can be supplied by storage within the Caledonia Reservoir and the new South ET.

Storage: Updated storage calculations for the Study Area were completed and summarized in **Appendix B**, along with a comparison of the storage calculations from the 2020 MSP and 2020 CUBE studies. As noted in **Section 4.3.1**, the 2020 MSP recommended a storage capacity increase of 5,000 m^3 to the existing Caledonia WTP in-ground reservoir to achieve a total storage volume of 7,000 m^3. A new 5,000 m^3 South ET was also recommended to replace the existing standpipe for a total system storage capacity of 12,000 m^3 to meet demands to 2046. The 2020 CUBE study recommended that an additional 2,000 m^3 of balancing and equalization storage was required for the expansion areas for a total system storage capacity of 14,000 m^3. It was recommended that this additional storage be added to the in-ground reservoir at the Caledonia WTP. Based on the population density identified for the Study Area, the updated additional storage required for the Study Area is 1,502 m^3 for a total system storage requirement of 13,502 m^3 to 2046 including the expansion areas. Similar to the recommendations of the 2020 CUBE study, it is recommended that this storage be added to the in-ground reservoir at the Caledonia WTP.

Distribution: As identified in Section 4.3.1 and 4.3.2, the following distribution upgrades are required to service the Study Area:

- Construct 600mmø watermain along Highway 6 (W-WM-1)
- Construct 450mmø watermain along Haldimand Road 66 (W-WM-2)
- Construct 350mmø watermain along Greens Road (W-WM-3)
- Construct 350mmø watermain along McClung Road (W-WM-6)

The required distribution network upgrades for the Study Area do not change the planned projects put forward in the 2020 CUBE.

4.4 Proposed Internal Infrastructure

As identified on **Figure 4-4**, the internal water system will consist of a network of local 300mmø watermains (sizing to be confirmed at detailed design) located within future road right-of-ways or easements, with connections to the future trunk watermains on Highway 6, Greens Road, and Haldimand Road 66.

Parcels within Phase 1 of the Study Area will be serviced by a local watermain extension, which will extend from the local watermain in the future local road located in Phase 2, through an easement to the future local road in Phase 1. The easement will cross the future Highway 6 corridor and the watermain within this future MTO corridor will be steel encased. The local watermain will follow the local road in Phase 1 and connect to the future 350mmø watermain (W-WM-3) on Greens Road via an extension of the local watermain on Mines Road. A valve chamber (c/w bleeder valves) will be located at the connection between the local and trunk watermain at Greens Road and Mines Road to ensure adequate water circulation between the varying pressure boundaries.

Parcels within Phase 2 of the Study Area will also be serviced by a local watermain extension, located in an easement and the future local road in Phase 2. The local watermain will connect to the future 600mmø watermain (W-WM-1) on Highway 6, at the intersection of Haldimand Road 66 and approximately 880 m north of that intersection.

As previously noted, the ground elevation of the Study Area ranges from approximately 203 masl to 213 masl, with some localized areas reaching elevations of 215 masl. The current water system experiences pressure deficiencies for properties exceeding 210 masl. Based on the anticipated land use for the Study Area, it is expected that re-grading will be required, and the elevation of the majority of the Study will remain below 213 masl. In order to ensure flexibility in the future development potential of the Study Area, ensuring sufficient water pressure for a range of water demands is critical. Therefore, a booster pumping station is recommended to service the Study Area. Preliminary pumping station sizing is ~107 L/s (12 L/s MDD + 95 L/s Fire Flow), however, details on pump sizing and firm capacity should be confirmed/finalized during subsequent development analysis. Water pressure for the Study Area will be boosted by the proposed booster pumping station (BPS) located at the intersection of the local road in Phase 2 and Highway 6. The second connection to W-WM-1 at the intersection of Haldimand Road 66 and Highway 6 will include a valve chamber with bleeder valves to ensure adequate water circulation between the different pressure boundaries.

If construction of the internal water infrastructure is phased, looping of the internal watermain system should be considered to minimize dead ends where possible. If a dead end is required, regular flushing of the system may be required to maintain suitable water quality levels.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Seneca Creek

Greens Rd

Mines Rd

Caledonia Reservoir and Pumping Station

Phase 1

Phase 2

T/G = 210.0 ±

T/G = 208.0 ±

T/G = 205.0 ±

T/G = 203.0 ±

T/G = 209.0 ±

T/G = 210.0 ±

B1

C1

C2

C3

C4

C5

C6

C7

C8

Watermain located in Mines Rd

Watermain located in 12m width servicing easement

10m width drainage easement

10m width servicing easement

Watermain located in 12m width servicing easement

Greens Rd

Greendale Dr

Industrial Dr

Haldimand Road 66

Argyle St N

6

0 250 500 m

General Features
- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Culverts
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Existing Infrastructure
- Reservoir and Pumping Station
- Transmission Mains
- Watermain

Proposed Conditions
- Booster Pumping Station
- Local Watermain
- Future Transmission Main (per 2020 MSP)
- Servicing Easements
- Booster Pumping Station Area
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Proposed Stormwater Pond
- Conceptual Primary Gateway
- Development Block
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback

Figure 4-4

Proposed Water Infrastructure

BluePlan Engineering

February 2023
722015-003
Projection EPSG:26917

5. WASTEWATER INFRASTRUCTURE

5.1 Existing Infrastructure

As outlined in the 2020 MSP, the Caledonia wastewater system includes one (1) Wastewater Treatment Plant (WWTP), seven (7) sewage pump stations (SPSs), and a wastewater collection system. With the exception of several industrial properties located in the northwest area of Caledonia, including the properties on Industrial Drive and within the Study Area (186, 200, 202 Greens Road), all properties are serviced by municipal wastewater. Refer to **Figure 5-1** for the existing wastewater infrastructure within Caledonia.

5.1.1 Wastewater Treatment Plant

The Caledonia WWTP is located south of the Grand River in Caledonia and treats all wastewater flows from North and South Caledonia. The WWTP receives flows from North Caledonia via the Nairne SPS which pumps sewage across the Grand River via twin 300 mm diameter forcemains. Sewage from South Caledonia either flows by gravity to the Caledonia WWTP or is pumped by the Paisley SPS to a gravity main that flows to the plant. The WWTP has an on-site pumping station known as the Main SPS which has a rated capacity of 7.2 MLD. The plant uses a conventional activated sludge (CAS) system with biosolids used for land application and discharges treated effluent to the Grand River. The plant is owned by the County and currently operated by Veolia Water.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

- Conceptual Highway 6 Extension
- Conceptual Highway 6 Right-of-Way (90m)
- North Caledonia Employment Lands

Proposed Sanitary Infrastructure

- Future Sanitary Main per Caledonia 2020 MSP
- Undersizied Sewer per Caledonia 2020 MSP
- Conceptual Caledonia WWTP (New) Phased Expansion (per Caledonia MSP Update (2020))

Existing Infrastructure

- Wastewater Treatment Plant
- Sanitary Pumping Station (SPS)
- Sanitary Force Main
- Sanitary Mains

General Features

- Railways
- Parcels
- Urban Boundary
- Parks
- Woodlot
- Core Natural Environment Areas
- Waterbody and Watercourse
- Municipal Boundary

Figure 5-1

Existing Wastewater Infrastructure

BluePlan Engineering

May, 2023
722015-002
Projection EPSG:26917

0 1 2 km

5.1.2 Pumping Stations

The County has seven (7) SPSs, which are summarized in **Table 5-1**. The SPSs are owned by the County and operated by Veolia Water.

Table 5-1: Summary of Sewage Pumping Stations in Caledonia

Facility	Status	Rated Capacity (L/s)	Firm Capacity (L/s)
North			
Nairne SPS	Active; opened in 1990	207	138
McClung SPS	Active; opened in 2017	230[Note 1]	115[Note 2]
Orkney SPS	Active; opened in 1975	Unknown	Unknown
Kincardine SPS	Active; opened in 1960	27	14
Domtar SPS	To be decommissioned once Gateway SPS comes online	18	9
Gateway SPS	Substantially completed in 2022	200	100[Note 3]
South			
Main SPS	Active	293	114[Note 4]
Paisley SPS	Active; opened in 1975	104	50[Note 5]

Note 1: Requires verification per 2020 MSP.
Note 2: McClung SPS designed for an ultimate firm capacity of 160 L/s per 2020 MSP.
Note 3: Gateway SPS designed for an ultimate firm capacity of 150 L/s per 2020 MSP. The station is expandable to an estimated maximum capacity of 300 L/s per the Caledonia North SPS Design Basis TM (WSP, 2019)
Note 4: Based on the Capacity Evaluation of the Main SPS completed by Wood in 2018. The capacity does not include upstream flow equalization from the equalization tank at the WWTP (Wood, 2018).
Note 5: Based on the firm capacity identified in ECA. The Capacity Evaluation of the Paisley SPS completed by Wood in 2018 identified a firm capacity of 54 L/s.

As noted, the Nairne SPS pumps the wastewater flows generated from North Caledonia via 300mm diameter twin forcemains that join into a singular 300mm diameter forcemain across the river directly to the Caledonia WWTP. As identified in **Table 5-1**, there are four other SPSs located in North Caledonia which all pump to gravity mains that drain to the Nairne SPS.

The Paisley SPS collects wastewater flows from the southwest area of Caledonia and pumps via forcemain to the east gravity system on Haddington Street, which drains to the Caledonia WWTP. The remainder of the lands in South Caledonia drain by gravity to the Main SPS, which is located on the WWTP site.

5.1.3 Gateway Sewage Pumping Station

In March 2020, WSP completed the detailed design for the Gateway Sewage Pumping Station (SPS) and in April 2022, the County deemed the station construction substantially complete. As per the design report, the following design parameters apply to the station:

- New ±150 L/s SPS with a type 3 wet well configuration per the County's Design Standards

- Four (4) wet well submersible pumps (3 duty and 1 standby) with Variable Frequency Drive (VFD)
- Wet well with two (2) cells to provide approximately half-hour of emergency storage and a combined 1-hour of system emergency storage at 150 L/s
- An emergency overflow into a nearby SWM pond, if required
- 765 m length of 300mmø twin forcemain system along Argyle Street discharging from the new station into the existing sanitary sewer south of the existing Domtar SPS

The Gateway SPS is located at 350 Argyle Street North at an approximate elevation of 199.50 masl. The wet well depth is approximately 15 to 16 metres deep and the inlet sewer enters the wet well at approximately 12.5 metres below grade (invert elevation = ~186.50 masl).

5.2 Wastewater Flows

5.2.1 Study Area per 2020 MSP

Per the modelling completed to support the 2020 MSP, an existing average dry weather flow (ADWF) of 3.3 MLD (or 38.3 L/s) was identified for Caledonia as the 4-year average from 2016 to 2019. In order to calculate future treatment flows, a peaking factor of 3.0 and a per capita sewage generation rate of 338 L/capita/day was selected.

As reflected in **Figure 5-2**, a portion of the Study Area and an area south of Greens Road (identified as the 'North West Employment Area') is located in the urban boundary identified in the 2020 MSP. The 2020 MSP identified an equivalent population growth of 2,889 persons for this area from 2021 to 2046.

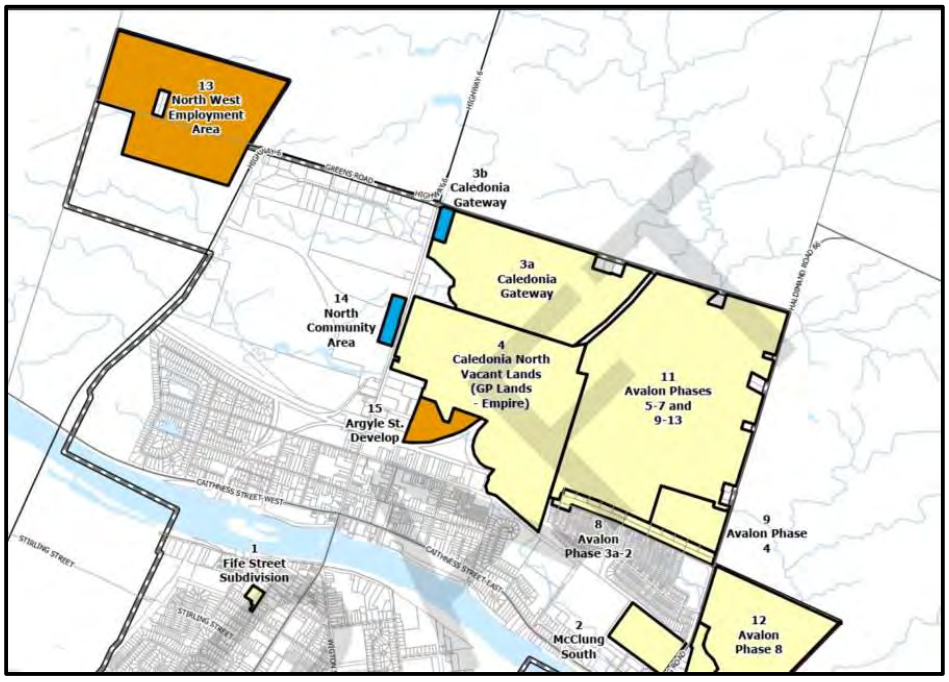


Figure 5-2: Caledonia Urban Boundary per 2020 MSP

Table 5-2 provides a summary of the projected wastewater treatment flows that the Caledonia WWTP will need to treat to 2046 per the 2020 MSP.

Table 5-2: Future Wastewater Treatment Flows per 2020 MSP

	Average Daily Flow (MLD)	Maximum Daily Flow (MLD)
2021	3.7	11.0
2031	8.0	24.0
2046[Note 1]	9.7	29.0

*Note 1: Represents build-out conditions to the urban boundary identified in the 2020 MSP (refer to **Figure 5-2**) less 400 potential units in Caledonia South Vacant Lands which are available to develop beyond 2046.*

As identified in **Table 5-2**, the average daily flow for treatment design purposes is 9.7 MLD to 2046 which exceeds the Caledonia WWTP's firm capacity of 7.2 MLD. The 2020 MSP estimated that the Caledonia WWTP would reach its rated capacity by 2029, however these estimates have been updated to reflect the Caledonia WWTP reaching 85% of its rated capacity by 2031. As noted in the 2020 MSP, the preferred alternative for accommodating future treatment flows is to construct a new 9.7 MLD WWTP on the north side of the Grand River, while continuing to operate the existing 7.2 MLD Caledonia WWTP until the end of its service life. The anticipated location of the new WWTP has since been updated to the south side of the Grand River per **Figure 5-1**.

5.2.2 Wastewater Flows from Study Area per 2020 CUBE study

The 2020 CUBE study included a 126.2 ha portion of the Study Area as part of its assumed expansion area. This expansion area is identified in **Figure 4-2** as 'Caledonia 1' & 'Caledonia 2'. The remainder of the Study Area includes the southwest portion of the Study Area (46 ha) which was already within the urban boundary as of the completion date of the 2020 CUBE study and the northeast portion of the Study Area (12.2 ha) that has been added to the urban boundary post-completion of the 2020 CUBE study. Refer to **Figure 4-2** for the location of the various expansion areas within the Study Area.

Based on the 2020 CUBE study, an equivalent population of 6,232 persons was assumed for the 126.2 ha areas of 'Caledonia 1' & 'Caledonia 2', or 49.4 pph. An ADWF of 1,514 m^3/day (17.5 L/s) was calculated for the 2020 CUBE study. Future treatment flows for Caledonia '1' & Caledonia '2' were estimated at rates of 2,107 m^3/day (24.4 L/s) for Average Daily Flow (ADF) and 6,319 m^3/day (73.1 L/s) for Maximum Daily Flow (MDF), based on a peaking factor of 3. These populations and associated wastewater generation flow projections were used to inform the infrastructure upgrades recommended through the 2020 CUBE study.

5.2.3 Wastewater Flows from Study Area per 2019 'Caledonia North Sewage Pumping Station Design Basis' Technical Memorandum

The Caledonia North Sewage Pumping Station Design Basis Technical Memorandum (TM) (WSP, September 13, 2019) was completed to outline the detailed design of the Caledonia North SPS, or Gateway SPS as it was referred to in previous master planning studies. For the purposes of this report, it will be referred to as the Gateway SPS TM. The Gateway SPS TM also outlined the construction of a

forcemain on Argyle Street North and identified the decommissioning of the existing Domtar SPS and associated forcemain system.

The Gateway SPS TM identified several sewersheds that will be tributary to the station, which are identified in **Figure 5-3** and summarized in **Table 5-3**. As shown in **Figure 5-3**, approximately 33 hectares of the Study Area was identified as a portion of the service area identified for future Light Industrial

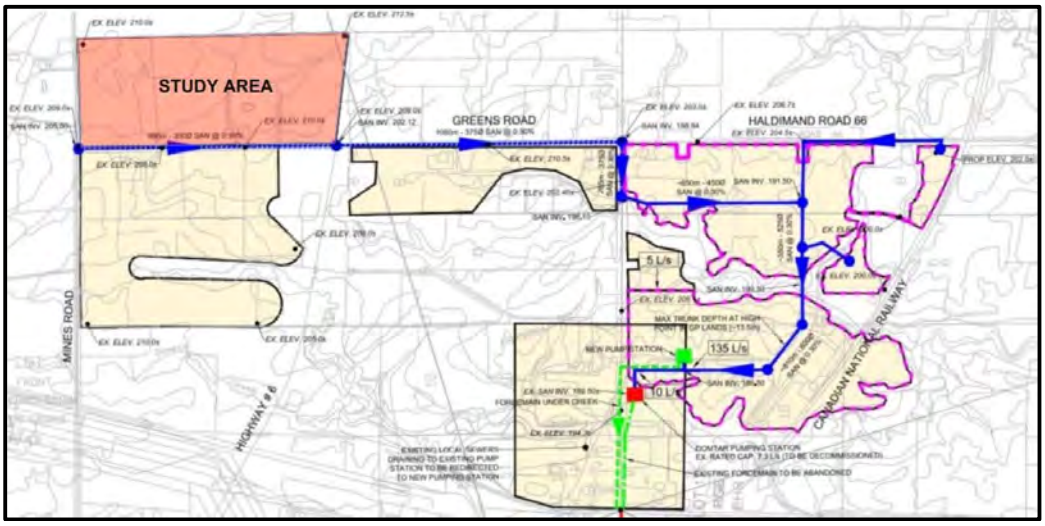


Figure 5-3: Gateway SPS Service Areas per Gateway SPS TM

uses. As identified in **Table 5-3**, this area corresponded to a population of 1,089 person (at an assumed population density of 33 people/ha) and a peak flow rate of 25.0 L/s.

The Gateway SPS detailed design report applied the Harmon Peaking Factor, a sanitary flow rate of 365 L/capita/day, and an infiltration allowance of 0.23 L/s/ha, which is reflected in the design criteria identified in **Table 2-2**. As summarized in **Table 5-3**, the firm capacity for the station was based on conveying wastewater flows from the proposed commercial and residential development east of Argyle Street North, existing wastewater flows form the Domtar SPS, future development on Slack Developments land, and wastewater flows from future Light Industrial lands, some of which included the Study Area.

Table 5-3: Summary of Service Areas to Gateway SPS per Gateway SPS TM

Gateway SPS Service Area	Equivalent Population (persons)	Tributary Area (ha)	Average Dry Weather Flow (ADWF) (L/s)	Peaking Factor (PF)	I&I Allowance (L/s)	Peak Flow (L/s)
Caledonia Gateway community and Georgia Pacific community	4,082	48.65	17.2	3.3	11.2	68.0
Slack Developments land	292	2.16	0.9	4.1	0.5	4.2
Light Industrial lands	2,919	88.44	12.3	3.5	20.3	62.7
Study Area	**1,089**	**~33.0**	**4.6**	**3.7**	**7.6**	**25.0**
Existing Domtar SPS service area	N/A	N/A	N/A	N/A	N/A	7.3
					Required Station Capacity (L/s)	**142.2**
					Provided Station Capacity (L/s)	**150.0**

It was also identified in the Gateway SPS TM that the County has future plans to expand the urban boundary north along Highway 6 therefore the station was designed to be modular, with expansion capacity up to 300 L/s. The following features associated with the expansion were identified:

- Twin wet well, complete with 2 pumps per wet well with separate discharge headers connecting into each respective forcemain. This enables each wet well to be upgraded with larger pumps, and larger discharge piping and valves, while the opposite wet well and forcemain configuration remains in service during the upgrade.
- Exterior generator can be twinned, or a larger generator installed in the event of a capacity upgrade.
- Motor control centre can be upgraded or replaced in the event of a capacity upgrade.
- Electrical, instrumentation and control, as well as process mechanical upgrades would be required for a capacity upgrade. However, no major civil or structural upgrades would be required to facilitate a capacity upgrade.

It is of note that there would be a 50% loss of emergency storage capacity if the peak flow rated capacity was doubled from 150 L/s to 300 L/s.

5.2.4 Wastewater Flows from Study Area

Future wastewater flows generated from the Study Area were calculated using the net developable areas and equivalent populations noted in **Table 3-2**, along with the wastewater design criteria applicable to each component of the wastewater system. As identified in **Table 2-2**, there are differing design criteria applicable to the capacities of the treatment system (Caledonia WWTP), pumping system (Gateway SPS & forcemain), and conveyance (trunk sewers). The wastewater flows associated with each wastewater system component are identified below:

Treatment Capacity: As noted in **Table 2-2**, the sewage generation rate associated with treatment capacity is 338 L/capita/day with a daily peaking factor of 3.0. The sewage flows associated with these design criteria are outlined in **Table 5-4**.

Table 5-4: Caledonia WWTP - Wastewater Flows from Study Area

Phase	Equivalent Population (persons)	Average Daily Flow (ADF) (L/s)	Peaking Factor	Maximum Daily Flow (MDF) (L/s)
1	1,040	4.1	3.0	12.2
2	732	2.9	3.0	8.6
1 & 2	1,772	6.9	3.0	20.8

As noted in **Table 5-4**, the Study Area will require a wastewater treatment allocation of 0.6 MLD (or 6.9 L/s) for ADF and 1.8 MLD (or 20.8 L/s) for MDF from the Caledonia WWTP or a new WWTP.

Conveyance Capacity: As noted in **Table 2-2**, the peaking factor when sizing the collection system is based on a modified Harmon formula, a sanitary flow rate of 365 L/capita/day, and an infiltration allowance of 0.23 L/s/ha. The sewage flows associated with these design criteria are outlined in **Table 5-5**.

Table 5-5: Gateway SPS & Forcemain - Wastewater Flows from Study Area

Phase	Equivalent Population (persons)	Sewershed Area (ha)	ADWF (L/s)	Peaking Factor	I&I Allowance (L/s)	Peak Flow (L/s)
1	1,040	69.3	4.4	3.0	15.9	29.3
2	732	48.8	3.1	3.1	11.2	20.8
1 & 2	1,772	118.1	7.5	2.9	27.2	48.9

As noted in **Table 5-5**, the Study Area will require a conveyance system capable of conveying peak flows of 48.9 L/s. This requirement applies to the pumping capacity of the Gateway SPS and forcemain system. As identified in **Table 5-3**, the station's design report included approximately 25.0 L/s of pumping capacity for a portion of the Study Area, therefore a further allocation or expansion of **23.9 L/s** at the Gateway SPS is required to accommodate the Study Area.

5.3 External Infrastructure Upgrades

5.3.1 Recommendations per 2020 MSP

The 2020 MSP developed a steady state pipe-by-pipe model of Caledonia's wastewater conveyance system in PCSWMM to assess the existing and future demand in the system. As part of the 2020 MSP, existing system deficiencies were identified; those specific to the Study Area are listed below:

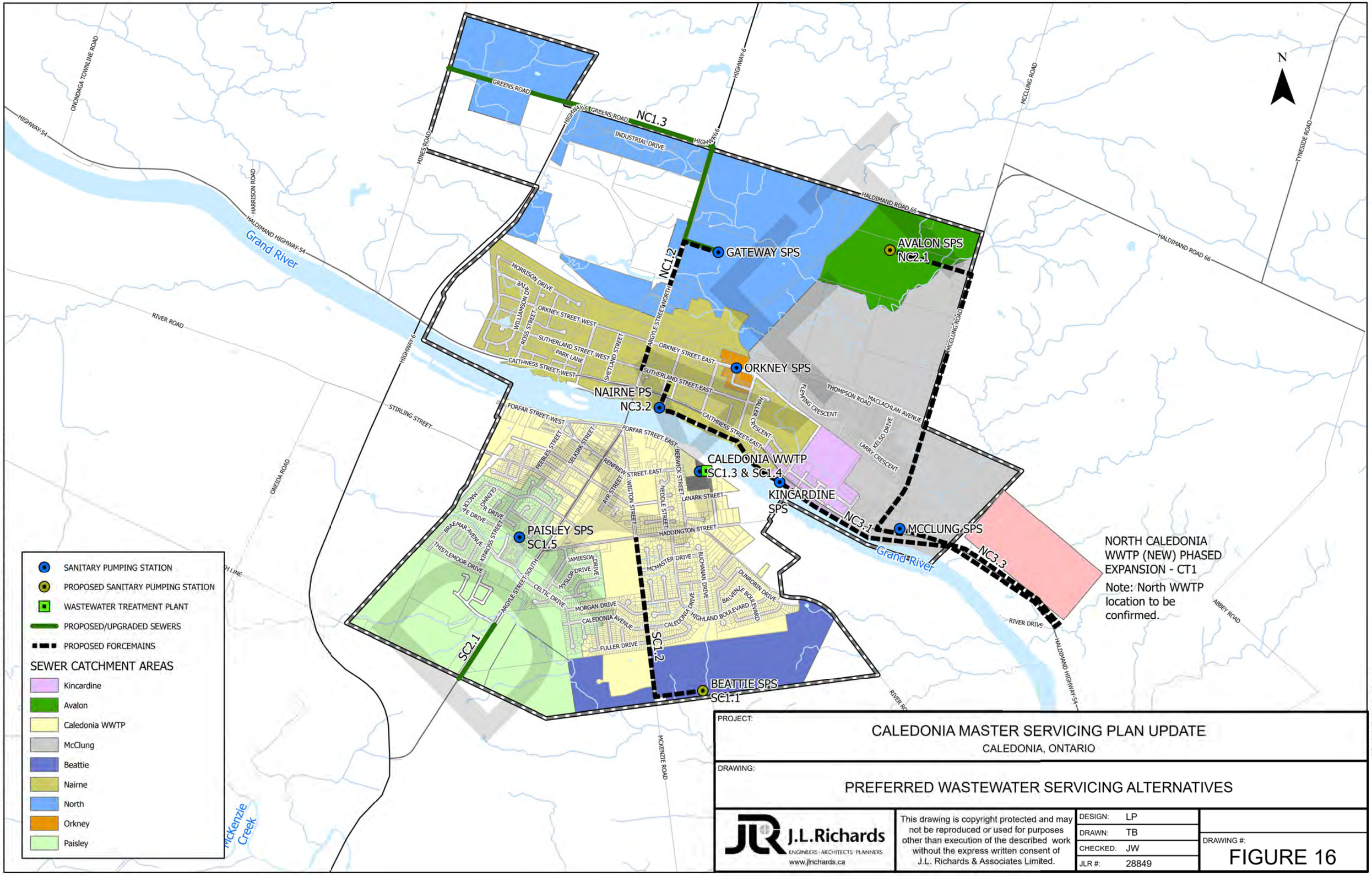
- Wastewater treatment capacity: the existing WWTP will reach 85% of its rated capacity by 2031.
- Nairne SPS: the existing SPS will reach its capacity by 2028.
- Sewers on Argyle Street North, Sutherland St. E., W. Edinburgh Square, and Caithness St. E. will require upsizing to accept additional flows from the Gateway SPS. As of the date of this report, these upgrades are currently being constructed.

Future servicing strategies were evaluated and a recommended servicing strategy was presented which included infrastructure upgrades to achieve the 2046 population growth projects. The upgrades relevant to the Study Area are outlined in **Table 5-6** and identified on **Figure 5-4**.

Table 5-6: Summary of Infrastructure Upgrades per Recommended Servicing Strategy in 2020 MSP

Project Identifier	Project Description	Cost Estimate (2020$)	Estimated Completion Timing
NC1.1	Gateway SPS	Complete	-
NC1.2	Forcemain from Gateway SPS to downstream sewer and upgrades to downstream gravity sewer to Nairne SPS. Currently being constructed.	$2.8M	2023
NC1.3	Collector sewer from Gateway SPS to Study Area (Greens Road and Highway 6) (250mmø – 3.1 km in length)	$3.5M	2023
CT1.1	New WWTP (including land acquisition & cost for Class EA)	$54.7M	2028
NC3.1	Forcemain extension from Nairne SPS to new WWTP (only required if the new WWTP is located on the north side of the Grand River).	$1.6M	2028
NC3.2	Upgrade Nairne SPS (inc. pump and pipe upgrades, and labour costs)	$0.7M	2028

Note: Cost estimates include 30% contingency and 12% engineering costs.



PROJECT:

CALEDONIA MASTER SERVICING PLAN UPDATE

CALEDONIA, ONTARIO

DRAWING:

PREFERRED WASTEWATER SERVICING ALTERNATIVES

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

DESIGN:	LP
DRAWN:	TB
CHECKED:	JW
JLR #:	28849

DRAWING #: FIGURE 16

GMBP Figure 5-4

File Location: P:\28000\28849-000 - Caledonia Master Plan\3-Production\1-Civil\28849-003 FIGURE 16.aprx

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5.3.2 Recommendations per 2020 CUBE study

As identified in the 2020 MSP, the baseline 2021 Maximum Daily Flow (MDF) for Caledonia is 11.0 MLD which is projected to increase to 29.0 MLD by 2046, excluding the urban expansion areas identified in the 2020 CUBE study. The 2020 CUBE study estimated a total MDF of 16.3 MLD for the new expansion areas which would increase the system's MDF to 45.3 MLD by 2046. In order to provide the additional capacity required within Caledonia's wastewater system for the expansion areas, the CUBE study recommended the following additional infrastructure upgrades in addition to the recommended servicing strategy put forth in the 2020 MSP.

Wastewater Treatment: The baseline 2021 Average Daily Flow (ADF) for Caledonia is 3.7 MLD. It was projected to increase to 9.7 MLD by 2046 per the 2020 MSP with the 2020 CUBE study identifying an additional ADF of 5.5 MLD for the expansion areas, thereby requiring an ADF of 15.2 MLD to 2046 for wastewater treatment design purposes.

Pumping and Collection System: As outlined in the 2020 MSP, the Nairne SPS was identified to reach its capacity by 2028 and the trunk sewers on Argyle Street North, Sutherland St. E., W. Edinburgh Square, and Caithness St. E. will require upsizing to accept additional flows from the Gateway SPS. As of the date of this report, these trunk sewer upgrades are currently being constructed. The 2020 CUBE study re-ran Caledonia's PCSWMM model, including the expansion areas, to determine peak flows within existing and future pumping stations, forcemains, and gravity sewers. The following upgrades were identified to meet the demand of the expansion areas:

- Nairne SPS: Increase of build-out peak flows from 160 L/s (2020 MSP) to 260 L/s (2020 CUBE study) & increase in forcemain diameter from 2020 MSP.
- Gateway SPS: Increase of build-out peak flows from 103 L/s (2020 MSP) to 204 L/s (2020 CUBE study)
- Trunk sewers on Argyle Street North, Sutherland Street East, West Edinburgh Square, and Caithness Street East: Increased upsizing of sewers from requiring a 450 mm diameter sewer (2020 MSP) to a 525 mm diameter sewer (2020 CUBE study). Currently being constructed with anticipated completion of Fall 2023.
- Trunk sewer from Gateway SPS to Study Area: Increase sewer diameter from 250 mm to 450 mm.

5.3.3 External Infrastructure Upgrades Required for Study Area

Upon completion of the updated population growth estimates for the Study Area, the following external infrastructure upgrades were identified to meet the wastewater flow projections of the Study Area.

Wastewater Treatment: As identified in Section 5.3.2, the 2020 MSP identified that the ADF for Caledonia is anticipated to increase from 3.7 MLD in 2021 to 9.7 MLD by 2046. The 2020 CUBE study identified an additional ADF of 5.5 MLD for the expansion areas, thereby increasing the ADF to 15.2 MLD by 2046. This study updated the growth projections for the Study Area which involved updated wastewater treatment flow projections for the Study Area and Caledonia as a whole. Refer to **Table 5-7** for a summary of the wastewater treatment flow projections calculated for the Study Area, and Caledonia, based on the growth projections identified in the 2020 MSP, the 2020 CUBE, and this study.

Table 5-7: Summary of Wastewater Treatment Flow Projections

Study	Flow Projection	Areas	2021	2031[1]	2046
2020 MSP (Assumed population of 2,889 persons for portion of Study Area. Estimated 70% of North West Employment Area in Study Area, therefore a population of 2,022 was assumed)	Average Daily Flow (MLD)	Entire Area	3.7	8.0	9.7
		Study Area	0.0	0.5	**0.7**
	Maximum Daily Flow (MLD)	Entire Area	11.0	24.0	29.0
		Study Area	0.0	1.5	**2.1**
2020 CUBE study (Assumed population of 6,232 persons for Study Area)	Average Daily Flow (MLD)	Entire Area	3.7	11.9	15.2
		Study Area	0.0	1.5	**2.1**
	Maximum Daily Flow (MLD)	Entire Area	11.0	35.8	45.3
		Study Area	0.0	4.6	**6.3**
North Caledonia Employment Lands Feasibility Study (Assumed population of 1,772 persons for Study Area)	Average Daily Flow (MLD)	Entire Area	3.7	10.4	13.1
		Study Area	0.0	0.4	**0.6**
	Maximum Daily Flow (MLD)	Entire Area	11.0	31.0	38.7
		Study Area	0.0	1.3	**1.8**

Note 1: 2031 values were interpolated based on growth rates identified in 2020 MSP.

As shown in **Table 5-7**, the 2020 MSP assumed an estimated population of 2,022 persons for a 46.0 ha portion of the Study Area while the 2020 CUBE study assumed a population of 6,232 persons for a separate 126.2 ha portion of the Study Area. This study identifies a total population of 1,772 persons for the entire Study Area, which is a reduction of 6,482 persons [(2,022 + 6,232) – 1,772] from the estimates for the Study Area provided in the 2020 MSP & CUBE studies. Therefore, the ADF & MDF for wastewater treatment flows in Caledonia to 2046 is reduced to 13.1 MLD and 38.7 MLD, respectively. This update should be considered in the required sizing of the new WWTP.

Conveyance: As identified in **Figure 5-4** and summarized in **Table 5-6**, conveyance of sewage flows from the Study Area was recommended by the 2020 MSP to be accomplished through the following infrastructure projects or upgrades:

- Forcemain extension from new WWTP to Nairne SPS (this requirement will be influenced by whether the new WWTP is located north or south of the Grand River)
- Nairne SPS upgrades (pumps, etc.)
- Sewer upgrades upstream of Nairne SPS & forcemain extension to Gateway SPS (currently under construction)
- Gateway SPS
- Trunk sewer from Gateway SPS to Study Area

The 2020 MSP infrastructure projects identified in **Table 5-6** were updated through the 2020 CUBE study to include the expansion areas. The required upgrades are summarized in Section 5.3.2, however these upgrades are based on the population growth estimates assumed in the 2020 MSP and 2020 CUBE studies which as previously noted are overestimated by 6,482 persons for the Study Area. Refer to **Table**

5-8 for a summary of the wastewater collection system flow projections calculated for the Study Area based on the growth projections identified in the 2020 MSP, the 2020 CUBE study, and this study.

Table 5-8: Summary of Wastewater Collection System Flow Projections from the Study Area

Study	Equivalent Population (persons)	Sewershed Area (ha)	ADWF (L/s)	Peaking Factor	I&I Allowance (L/s)	PWWF (L/s)
2020 MSP	2,022	46.0	8.5	3.6	10.6	41.2
2020 CUBE Study	6,232	126.2	26.3	3.2	29.0	112.1
2019 Gateway SPS TM	1,089	33.0	4.6	3.8	7.6	25.0
North Caledonia Employment Lands Feasibility Study	**1,772**	**118.1**	**7.5**	**2.9**	**27.2**	**48.9**

Based on the updated flow projections for the wastewater collection system, refer to **Table 5-9** for the recommended external upgrades to accommodate the wastewater flows from the Study Area.

Table 5-9: Summary of Wastewater Collection System Upgrades

Project Identifier	Project Description	Project Status	2020 MSP Recommendation	2020 CUBE Study Recommendation	North Caledonia Employment Lands Feasibility Study
NC1.1	Gateway SPS	Complete; station currently has 150 L/s firm capacity; expandable to 300	Expected peak flow of 103 L/s.	Expected peak flow of 204 L/s; expand SPS to accommodate.	Expected peak flow of 141 L/s; does not require expansion.
NC1.2	Gateway SPS Forcemain and Undersized Sewer to Nairne SPS (currently under construction)	Gateway SPS forcemain is constructed as a 300mmø twinned forcemain system. Undersized sewers are currently a 250mmø sewer but are currently being upgraded.	Gateway SPS forcemain is sufficient size. 250mmø sewer to be upsized to 450mmø sewer. Currently under construction.	Carry forward 2020 MSP recommendation.	Carry forward 2020 MSP recommendation.
NC1.3	Collector sewer from Study Area to Gateway SPS	Not constructed.	Recommended as a 250mmø sewer with an approximate length of 3.1 km.	Increase pipe diameter to 450mm.	Reduce pipe diameter to 375mm. Revise length to 620 m within Argyle St. N. prior to routing onto Industrial Drive.

Project Identifier	Project Description	Project Status	2020 MSP Recommendation	2020 CUBE Study Recommendation	North Caledonia Employment Lands Feasibility Study
NC3.1	Forcemain extension from Nairne SPS to new WWTP	Not constructed. This project will be influenced by whether the new WWTP is constructed on the north or south side of the Grand River.	Capacity constraints at Nairne SPS anticipated by 2028; implement prior to 2028.	Carry forward 2020 MSP recommendation.	Carry forward 2020 MSP recommendation.
NC3.2	Upgrade Nairne SPS (including pump and pipe upgrades, and labour costs)	Not constructed.	Capacity constraints at Nairne SPS anticipated by 2028; implement	Carry forward 2020 MSP recommendation.	Carry forward 2020 MSP recommendation.
CT1.1	New North WWTP (including land acquisition)	Not constructed.	Build-out design flow of 9.7 MLD.	Build-out design flow increases from 9.7 MLD to 15.2 MLD.	Build-out design flow decreases to 13.1 MLD.

5.4 Proposed Internal Infrastructure

As identified on **Figure 5-5,** the internal wastewater system will consist of a network of local 375mmø sewers (sizing to be confirmed at detailed design) located within future road right-of-ways or easements. The local system will discharge flows to the trunk sewer extension on Glendale Drive, Industrial Drive, and Argyle Street North, ultimately discharging to the Gateway SPS. As identified on **Figure 5-5**, the wastewater conveyance system has been laid out to allow the connection of future sewers to convey sewage flows from the existing properties south of the Study Area, on Industrial Drive. Confirmation of sewer sizing should be completed at detailed design to ensure adequate conveyance upon determination of inclusion or exclusion of the sewage flows from properties on Industrial Drive.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Seneca Creek

Greens Rd

Mines Rd

Phase 1

Phase 2

T/G = 210.0 ±

T/G = 208.0 ±

T/G = 205.0 ±

T/G = 205.0±
Inv. = 200.00

T/G = 209.0±
Inv. = 203.25

Local sanitary main located in 12m width servicing easement

T/G = 211.3±
Inv. = 200.45

10m width drainage easement

T/G = 212.0±
Inv. = 197.75

T/G = 208.0±
Inv. = 203.05

10m width servicing easement

12m width servicing easement

T/G = 209.0 ±

Greens Rd

T/G = 210.0 ±

T/G = 210.0±
Inv. = 196.45

Greendale Dr

6

T/G = 207.0±
Inv. = 196.05

Haldimand Road 66

T/G = 202.0±
Inv. = 195.10

Industrial Dr

T/G = 208.0±
Inv. = 196.54

T/G = 202.0±
Inv. = 193.95

T/G = 199.0±
Inv. = 194.50

T/G = 199.40
Inlet Sewer Inv. = 187.00
Pr. Incoming Sewer Invert = 192.00

Argyle St N

Gateway SPS

Domtar PS
(Decommissioned)

Twinned 300m diameter forcemains

0 250 500 m

General Features
- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Existing Infrastructure
- Sanitary Pumping Station (SPS)
- Sanitary Forcemain
- Sanitary Mains

Proposed Conditions
- 375mm Sanitary Main (Average 0.3% Slope)
- Optional Future Sanitary Main (Average 0.3% Slope)
- Sanitary Servicing Junction
- Optional Future Sanitary Servicing Junction
- Servicing Easements
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Proposed Stormwater Pond
- Development Block
- Conceptual Primary Gateway
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback

Figure 5-5

Proposed Wastewater Infrastructure

BluePlan Engineering

August 2023
722015-003
Projection EPSG:26917

6. STORMWATER INFRASTRUCTURE

6.1 Existing Infrastructure

As the Study Area is primarily agricultural, there is limited stormwater infrastructure (ponds, sewers, etc.) within the Study Area with surface drainage conveyed overland and through creeks or swales to existing outlets at the limits of the Study Area. Refer to **Figure 6-1** for the existing stormwater infrastructure within Caledonia.

There is a stormwater management (SWM) pond located north of Greens Road, approximately 250 metres east of Mines Road, which collects drainage from a portion of the Study Area. There are eight (8) culverts and one (1) bridge on the perimeter roads which facilitate drainage from and through the Study Area; which are identified on **Figure 3-1**. The existing perimeter roads (Mines Road, Greens Road, Highway 6) all have rural cross-sections including roadside ditches and driveway culverts to facilitate drainage.

6.2 Existing Drainage Areas

The Study Area is located in the Seneca Creek watershed and contains six sub-catchments which drain to tributaries of Seneca Creek, which subsequently drain to the Grand River.

The pre-development drainage catchments, along with the relevant hydraulic structures (bridges, culverts, etc.), are identified on **Figure 1-2** with additional details provided in **Table 6-1**.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

- Conceptual Highway 6 Extension
- Conceptual Highway 6 Right-of-Way (90m)
- North Caledonia Employment Lands

Existing Infrastructure

- Storm Mains
- Stormwater Pond
- Pre-Development Drainage Catchment

General Features

- Railways
- Parcels
- Urban Boundary
- Parks
- Woodlot
- Grand River Conservation Authority Regional Floodline
- Grand River Conservation Authority Regulation Limit
- Significant Natural Heritage Features
- Wetland
- Core Natural Environment Areas
- Waterbody and Watercourse
- Municipal Boundary

Figure 6-1

Existing Stormwater Infrastructure

BluePlan Engineering

May, 2023
722015-002
Projection EPSG:26917

0 1 2 km

Table 6-1: Pre-development Drainage Areas

Catchment ID	Catchment Area (ha)	Catchment Outlet	Additional Notes:
101	69.4	Tributary to Seneca Creek via Culvert 2 (C2)	C1 & C3 convey external drainage from west of Mines Road into the Study Area, which is conveyed through the Study Area via existing creeks to C2 which outlets to the Seneca Creek tributary
102	10.6	Tributary to Seneca Creek via Culvert 4 (C4)	
103	53.0	Seneca Creek	Several hydrologic features within this catchment including wetlands. Bridge 1 (B1) conveys Seneca Creek under Hwy 6.
104	29.8	Tributary to Seneca Creek via Culvert 7 (C7)	Several hydrologic features within this catchment including wetlands and creeks. C7 conveys drainage from the Study Area via a creek east of the Study Area which then crosses Highway 6 via C6 and ultimately drains to Seneca Creek via C5.
105	7.3	Seneca Creek via Culvert (C5)	Drainage flows overland through Study Area to C5.
106	14.0	Tributary to Seneca Creek via Culvert 8 (C8)	Several hydrologic features within this catchment including wetlands and a creek.
TOTAL:	**184**	-	-

As noted, the majority of the Study Area is agricultural with several residential and commercial properties fronting the perimeter roads. There are also several wooded areas and wetlands throughout the Study Area. Based on a review of the topographic shapefile provided by the County, the Study Area has a generally flat terrain with typical slopes of approximately 2%. There are localized areas with steeper terrain exceeding a 5% slope.

6.3 Proposed Drainage Areas

Existing drainage patterns will be preserved as much as possible under the proposed development condition. Impacts to the quantity and quality of runoff resulting from the implementation of the proposed concept plan will be mitigated by SWM controls, specifically wet ponds for quantity and quality control. Source controls (pipe storage, oil-grit separators, etc.) may be employed in localized portions of the local road right-of-way if access to a wet pond is not available. The minor system conveyance of drainage throughout the Study Area will be via conventional storm sewers with the major system conveyed overland through municipal corridors. The post-development drainage catchments are identified on **Figure 6-2** with additional details provided in **Table 6-2**.

Table 6-2: Post-development Drainage Areas

Existing Outlet	Catchment ID	Catchment Description	Catchment Area (ha)
Culvert 2 (C2)	201	Private lots and local road extension in Phase 1	66.0
	203B	Portion of MTO corridor (Hwy 6 Extension)	3.4
		TOTAL:	69.4
Culvert 4 (C4)	203A	Portion of MTO corridor (Hwy 6 Extension)	1.8
	204	Private lots, local road extension, and natural area in Phase 2	8.8
		TOTAL:	10.6
Seneca Creek	202	Private lots & natural areas in Phase 1	18.8
	203C	Portion of MTO corridor (Hwy 6 Extension)	2.9
	208	Private lots and natural areas in Phase 2	31.3
		TOTAL:	53.0
Culvert 7 (C7)	206	Private lots, local road extension, and natural areas in Phase 2	29.8
		TOTAL:	29.8
Culvert 5 (C5)	205	Private lots in Phase 2	7.3
		TOTAL:	7.3
Culvert 8 (C8)	207	Private lots, local road extension, and natural area in Phase 2	14.0
		TOTAL:	14.0
		TOTAL:	**184**

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Seneca Creek

Greens Rd

Mines Rd

Phase 1

Phase 2

Catchment 201 (66.0 Ha)

Catchment 202 (18.8 Ha)

Catchment 203A (1.8 Ha)

Catchment 203B (3.4 Ha)

Catchment 203C (2.9 Ha)

Catchment 204 (8.8 Ha)

Catchment 205 (7.3 Ha)

Catchment 206 (29.8 Ha)

Catchment 207 (14.0 Ha)

Catchment 208 (31.3 Ha)

SWM-1

SWM-2

SWM-3

SWM-4

SWM-5

SWM-6

SWM-7

SWM-8

SWM-9

10m width drainage easement

C1

C2

C3

C4

C5

C6

C7

C8

B1

T/G = 209.0 ±

T/G = 210.0 ±

T/G = 210.0 ±

T/G = 208.0 ±

T/G = 205.0 ±

T/G = 203.0 ±

Greens Rd

Greendale Dr

Industrial Dr

Haldimand Road 66

6

Argyle St N

0 250 500 m

General Features

- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Culverts
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Proposed Conditions

- Post-Development Drainage Areas
- Servicing Easement
- Booster Pumping Station Area
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Pond Outlet
- Proposed Stormwater Pond
- Development Block
- Conceptual Primary Gateway
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback

Figure 6-2

Post-Development Drainage Plan

BluePlan Engineering

February 2023
722015-003
Projection EPSG:26917

6.4 Stormwater Quality

Based on the existing and future catchment areas, and imperviousness, a total of nine (9) stormwater management (SWM) facilities are proposed within the Study Area to accommodate the change in land use. Each of these facilities is proposed as an end-of-pipe wet pond facility to provide quantity control and quality treatment of stormwater prior to discharging to the respective tributaries of Seneca Creek.

Per Table 3.2 of the MECP SWM Planning and Design Manual (2003), an Enhanced Level of Protection (80% removal of suspended solids on an annual loading basis) was chosen for the SWM ponds. The impervious level of each post-development catchment area dictated the required water quality storage volume as presented in **Table 6-3**.

Table 6-3: Stormwater Quality Storage Volumes

SWM Facility	Total Contributing Drainage Area (ha)	Percent Imperviousness of Drainage Area (%)	Required Water Quality Storage Volume (m^3/ha)	Required Water Quality Storage Volume (m^3)
SWM-1	66.0	71	227	14,982
SWM-2	18.8	60	202	3,798
SWM-3	8.8	70	225	1,980
SWM-4	7.3	85	250	1,825
SWM-5	5.2	85	250	1,300
SWM-6	10.0	66	216	2,160
SWM-7	3.4	85	250	850
SWM-8	9.4	74	232	2,181
SWM-9	21.7	35	140	3,038

As further discussed in Section 6.7 and identified in **Figure 6-3**, a portion of the local road in Phase 2 of the Study Area requires source controls for the treatment of water quality. Source controls involve treating water at the location where it is collected and can include oil-grit separators, bioswales, or vegetated swales. The specific method of providing the source controls is to be confirmed in a subsequent study but it should be designed to provide the same level of protection provided by the SWM wet ponds.

6.5 Stormwater Quantity

Stormwater quantity criteria was derived from Table 6-36 of the Draft Final Storm Drainage Report (Wood, October 2019) which was completed in support of the 2020 MSP. As detailed in the 2019 report, an assessment of the SWM requirements for quantity control was performed for the urban business park and employment land areas in the Seneca Creek watershed. Unitary criteria were derived at significant crossings and confluences within Seneca Creek with the unitary criteria for the crossing at Greens Road applied to all SWM ponds within the Study Area. The unitary volume criteria at the Greens Road crossing are as follows:

- 700 m^3 per impervious hectare for the 25-year event
- 850 m^3 per impervious hectare for the 100-year event

A summary of the quantity control volumes for the SWM ponds in the Study Area is provided in **Table 6-4**.

Table 6-4: Stormwater Quantity Storage Volumes

SWM Facility	Total Contributing Impervious Drainage Area (ha)	25-year Unitary Volume (m^3/imp. ha)	25-year Required Volume (m^3)	100-year Unitary Volume (m^3/imp. ha)	100-year Required Volume (m^3)
SWM-1	46.9	700	32,802	850	39,831
SWM-2	11.3		7,896		9,588
SWM-3	6.2		4,312		5,236
SWM-4	6.2		4,344		5,274
SWM-5	4.4		3,094		3,757
SWM-6	6.6		4,620		5,610
SWM-7	2.9		2,023		2,457
SWM-8	7.0		4,869		5,913
SWM-9	7.6		5,317		6,456

As noted in Section 6.4 and further detailed in Section 6.7, a portion of the local road in Phase 2 of the Study Area requires source controls for water quantity which can include subsurface storage such as oversized pipe or storage tanks. The specific method of providing the source controls is to be confirmed in a subsequent study.

6.6 Summary of SWM Facility Sizing

Based on a wet pond configuration, conceptual sizing of the SWM ponds and associated land requirements were completed and are presented in **Table 6-5**.

Table 6-5: Summary of SWM Pond Storage Volumes and Footprints

SWM Facility	Storage Volume (m^3)				SWM Block Size (ha)
	Water Quality	25-year	100-year	Total	
SWM-1	14,982	32,802	39,831	87,677	3.8
SWM-2[1]	3,798	7,896	9,588	21,313	1.5
SWM-3	1,980	4,312	5,236	11,590	1.1
SWM-4[1]	1,825	4,344	5,274	11,435	1.1
SWM-5[1]	1,300	3,094	3,757	8,120	1.0
SWM-6[1]	2,160	4,620	5,610	12,390	1.1
SWM-7[1]	850	2,023	2,457	5,345	0.9
SWM-8[1]	2,181	4,869	5,913	13,031	1.2
SWM-9[1]	3,038	5,317	6,456	14,818	1.2

***Note 1**: These SWM facilities are not planned to accept drainage from municipal corridors therefore these ponds will be privately-owned. The method through which SWM quantity and quality controls are provided for private development blocks will be subject to change based on future studies.*

Confirmation of the discharge rates to downstream receiving watercourses and volumetric sizing of the SWM facilities must be completed at the design stage. The pond sizing may change due to increased use of on-site controls or low impact development (LID) techniques.

6.7 Proposed Internal Infrastructure

As identified on **Figure 6-3**, the internal storm sewer system will consist of a network of local sewers (sizing to be confirmed at detailed design) located within future road right-of-ways or easements. The SWM design criteria identified in Section 2.1.3 is applicable to the development blocks with the local roads designed to convey the minor and major storm systems to the applicable SWM facility for treatment. As previously noted, the drainage collected within a portion of the local road in Phase 2 will require source controls as it does not have access to an end-of-pipe facility. The source controls will provide the necessary water quality and quantity treatment prior to discharge to the receiving watercourse(s) at the locations noted on **Figure 6-3**. Drainage discharging from retained naturalized areas within the Study Area will be either conveyed overland via its existing drainage pattern or via the storm sewer system to an appropriate outlet. Drainage collected within the MTO corridor (Highway 6 extension) will be directed towards the outlets identified in **Table 6-2** with the required SWM infrastructure required to meet the necessary SWM criteria being the responsibility of the MTO.

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

Seneca Creek

Greens Rd

Mines Rd

Phase 1

Phase 2

SWM-1

SWM-2

SWM-3

SWM-4

SWM-5

SWM-6

SWM-7

SWM-8

SWM-9

T/G = 210.0 ±

T/G = 208.0 ±

T/G = 205.0 ±

T/G = 203.0 ±

T/G = 209.0 ±

T/G = 210.0 ±

B1

C1

C2

C3

C4

C5

C6

C7

C8

12m width servicing easement

10m width drainage easement

Stormwater Sewer located in 10m width servicing easement

12m width servicing easement

Greendale Dr

Industrial Dr

Haldimand Road 66

Argyle St N

0 250 500 m

General Features

- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Culverts
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Proposed Conditions

- Stormwater Sewer
- Stormwater Sewer Requiring Source Controls
- Post-Development Drainage Areas
- Servicing Easement
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Pond Outlet
- Proposed Stormwater Pond
- Development Block
- Conceptual Primary Gateway
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback

Figure 6-3

Proposed Stormwater Infrastructure

BluePlan Engineering

February 2023
722015-003
Projection EPSG:26917

7. ROAD & RAIL NETWORK

7.1 Existing Infrastructure

As shown in **Figure 1-3**, the Study Area is bounded by Mines Road to the west, Greens Road to the south, and Highway 6 to the south and east. North of the Study Area are agricultural fields and naturalized areas without direct road access. Mines Road and Green Road both have rural cross-sections with a single lane eastbound & westbound. Highway 6 also has a rural cross-section with two lanes westbound and a single lane eastbound along the south limits of the Study Area. Highway 6 changes to two lanes northbound and southbound along the east limits of the Study Area. Highway 6 continues north and connects Caledonia to Highway 403 in Hamilton. Driveway accesses onto Mines Road, Greens Road, and Highway 6 provide access to the existing properties in the Study Area.

The Study Area does not have direct access to the existing rail network through Caledonia, however it is located approximately 1 km south of the Study Area on Mines Road.

7.2 Highway 6 Extension

The future extension of Highway 6 through the Study Area is detailed in Section 1.1.6 and reflected on **Figure 1-3**. Through correspondence completed with MTO for this study, timing of commencing the Highway 6 extension has not been confirmed. As noted in Section 1.1.6, the following was considered during the development of the concept plan:

- Road access connections to future Highway 6 will not be allowed.
- Road access connections to existing Highway 6 must exceed 800 metres in distance from existing intersections.
- It is understood that once the MTO extends Highway 6 through the Study Area, the portion of existing Highway 6 that follows the south & east limits of the Study Area will be transferred to the County. Upon transfer of Highway 6 to the County, the feasibility of additional driveway accesses onto this length of roadway will need to be further reviewed.

7.3 Proposed Internal Infrastructure

As identified on **Figure 7-1**, road access to future development blocks within the Study Area will be from local road extensions through the Study Area. The local road extensions are shown as 20 metre width urban cross-sections and are to be designed to Haldimand County standards, including curb and gutter, sidewalk, boulevard, and associated utilities.

The road extension through Phase 1 includes two intersections with Mines Road, approximately 340 metres apart, and will provide driveway access to private development blocks within Phase 1. The approval of any additional accesses onto Mines Road or Greens Road should be minimized and will be at the discretion of the municipality at the time of application.

The road extension through Phase 2 connects to Highway 6, approximately 850 metres north of the intersection of Haldimand Road 66 and Highway 6, which is in line with the request by MTO for a minimum of 800 metres in distance from existing intersections. The local road extension through Phase

2 is proposed to terminate at a cul-de-sac immediately adjacent to existing Highway 6. The feasibility of constructing a road connection from the Phase 2 cul-de-sac to existing Highway 6 in the future, after the new Highway 6 extension has been constructed and this section of Highway 6 has been turned over to the County, was discussed with the MTO. The MTO indicated they would not support an intersection in this location as it does not meet the necessary separation distance from the new interchange planned for Highway 6 and Greens Road. Access from the cul-de-sac to existing Highway 6 will be required for emergency services (fire vehicles, etc.). This requirement was discussed with the MTO and it was discussed that the MTO will review the specifics of this emergency access through subsequent design stages.

Driveway accesses to private development blocks will be off of the Phase 2 local road extension with any additional accesses onto the boundary roads fronting Phase 2 to be minimized and at the discretion of the municipality and/or MTO at the time of application.

7.4 External Infrastructure Upgrades

As previously noted, the boundary roads for the Study Area are as follows:

- Mines Road: North limit of Study Area to Greens Road (2-lane rural cross-section)
- Greens Road: Mines Road to Highway 6 (2-lane rural cross-section)
- Highway 6/Greens Road: Highway 6 to Haldimand Road 66 (3-lane rural cross-section)
- Highway 6: Haldimand Road 66 to north limit of Study Area (4-lane rural cross-section)

Due to the anticipated increase in traffic stemming from the change in land use, the following boundary road improvements are recommended to facilitate access from the Study Area to major transportation routes (Highway 6, etc.):

- Upgrade Mines Road to 4-lane urban cross-section from north intersection with Phase 1 local road to Greens Road (approximate distance of 550 metres).
- Upgrade Greens Road to 4-lane urban cross-section from intersection with Mines Road to Highway 6 (approximate distance of 890 metres)

Restrictions on trucks turning right (north) from the northern local road connection for Phase 1 onto Mines Road should be investigated during the design stage as this section of Mines Road will remain a rural road and not a truck route.

In order to facilitate the proposed Phase 1 local road, two (2) new 3-leg signalized intersections are recommended at the connections of the Phase 1 local road to Mines Road. One (1) new signalized 3-leg intersection is recommended at the connection of the Phase 2 local road to Highway 6, approximately 850 metres north of Haldimand Road 66.

It is also recommended that the existing 3-leg stop-control intersection of Mines Road and Greens Road be upgraded to a 3-leg signalized intersection. Confirmation of these recommended external road improvements are contingent on a future transportation impact study (TIS) to be completed at a subsequent design stage.

	Phase 1		Phase 2	
	Existing Area	Proposed Area	Existing Area	Proposed Area
MTO Dedication	8.4 Ha			
Total Natural Features[1]	15.7 Ha	16.4 Ha	39.0 Ha	38.6 Ha
Agriculture	70.0 Ha	-	51.3 Ha	-
Stormwater Ponds	-	5.4 Ha	-	7.7 Ha
Proposed Roads	-	3.5 Ha	-	2.4 Ha
Temporary Cul-de-Sac	-	-	-	0.4 Ha
Reconstructed Woodlot[2]	-	-	-	1.8 Ha
Natural Environment Setback (15m)	-	-	-	0.5 Ha
Development Blocks	-	60.4 Ha	-	38.9 Ha
Total Areas	85.7 Ha	85.7 Ha	90.3 Ha	90.3 Ha

Phase 1

Phase 2

SWM-1

SWM-2

SWM-3

SWM-4

SWM-5

SWM-6

SWM-7

SWM-8

SWM-9

B1

C1

C2

C3

C4

C5

C6

C7

C8

12m width servicing easement

10m width drainage easement

12m width servicing easement

10m width servicing easement

12m width servicing easement

Permanent cul-de-sac with emergency access to Highway 6

Mines Rd

Greens Rd

Greendale Dr

Industrial Dr

Haldimand Road 66

Argyle St N

6

N

0 250 500 m

Notes:

1) 'Total Natural Environment' includes regulation limits, significant natural features with 30m setback, core natural areas, woodlots with 10m setback, wetlands, and watercourses/waterbodies. Total Natural Environment does not include the MTO dedication area.

2) Assumed 4:1 compensation ratio based on 'Young' classification (0.405 ha removed for Phase 2 local road extension; 1.62 ha required compensation)

Haldimand County

North Caledonia Employment Lands Feasibility and Servicing Study

General Features
- Study Area
- Parcels
- Urban Boundary
- Grand River Conservation Authority Floodplain Limits
- Grand River Conservation Authority Regulation Limits
- Existing Culverts
- Existing Stormwater Pond
- Wetland
- Waterbody, Watercourse
- Natural Environment Areas
- Woodlot
- 10m Woodlot Setback
- Significant Natural Heritage Features
- 30m Significant Natural Heritage Features

Proposed Conditions
- Servicing Easement
- Booster Pumping Station Area
- Local Road (20m Width)
- Woodlands Compensation Area
- Natural Features Buffer (15m Width)
- Pond Outlet
- Proposed Stormwater Pond
- Development Block
- Conceptual Primary Gateway
- Conceptual Hwy 6 Extension
- Conceptual Hwy 6 R.O.W. (90m Width)
- 14m MTO Setback
- 3-Leg Signalized Intersection
- Rural to Urban Road Reconstruction

Figure 7-1

Proposed Road Infrastructure and Improvements

BluePlan Engineering

February 2023
722015-003
Projection EPSG:26917

8. UTILITIES AVAILABLE TO STUDY AREA

In order to determine the availability of utilities for service extension into the Study Area, the project team contacted the existing utility companies within Caledonia. The responses received from the various utilities are outlined in the sub-sections below.

8.1 Electrical Capacity

Hydro One confirmed that electrical infrastructure (3 phase overhead) is installed along the west, south, and east borders of the Study Area, on Mines Road, Greens Road, and Highway 6, respectively. An extension of this infrastructure could provide electrical servicing to the Study Area however available capacity would need to be confirmed at the development stage based on the anticipated loading.

8.2 Natural Gas Availability

As identified on **Figure 8-1**, Enbridge Gas confirmed that natural gas infrastructure is installed adjacent to the Study Area. A 4" gas pipeline capable of 420 kPa Maximum Operating Pressure (MOP) is installed along the south border of the Study Area on Greens Road. A 10" gas pipeline capable of 3450 kPA MOP is installed along the east border of the Study Area on Highway 6. Enbridge Gas confirmed that the Study

Figure 8-1: Enbridge Infrastructure Adjacent to Study Area

Area could be serviced by an extension of their infrastructure into the Study Area; however, could not confirm available capacity within their system until the development timing of the Study Area was better understood.

As noted by Enbridge Gas, the volume of natural gas available to service each site is dependent upon the capacity of their natural gas system at the time of the client's request, the client's specific natural gas requirements, and the expected in-service date of the facility. Enridge Gas will require the following information to complete an up-to-date analysis on their system's capacity upon submission of a development application:

- Total connected load of all gas-fired appliances (max BTU/hour)
- Peak hour requirements (m^3/hour)
- Requested delivery pressure at the outlet of the meter (kPa or psig)
- Estimated peak daily consumption (m^3/day)

- Natural gas requirements ramp up schedule including any construction gas requirements
- Service requirements (Firm and/or Interruptible service)

Upon receipt of the client's specific natural gas requirements, Enbridge Gas would conduct the up-to-date analysis and confirm the natural gas service parameters for the property, which would include the following:

- Delivery service options
- Natural gas facility requirements to service the client
- Cost estimate to attach to the system
- Lead time for first delivery of natural gas

A high-level capacity assessment was conducted at the time of this study's completion which identified that the upstream gas network could support approximately 3,000 m^3/hr when factoring in system upgrades driven by another project that is expected to be in service by 2024. There would be several distribution station upgrades required to accommodate the load on the local network, however the size and scope of these upgrades would depend on the actual timing and confirmed load requirements. Typical of any new attachment to Enbridge's system, new service lines to each property and customer station (pressure regulation and measurement) would also be required. A larger than expected load requirement could trigger required upgrades to the upstream system, however that would need to be confirmed at the time of the Study Area's development.

8.3 Telecommunications / Cellular

8.3.1 Bell Canada

GMBP contacted Bell Canada in order to confirm the availability of Bell infrastructure in proximity to the Study Area. Bell Canada circulated drawing files showing their facilities in proximity to the Study Area which are summarized in **Figure 8-2**. As shown, Bell Canada has buried cable and conduit in the east boulevard of the north-south portion of existing Highway 6. There is also conduit and buried cable along the north and south boulevards of Greens Road. Buried cable is also located on the west and east boulevards of Mines Road, fronting the Study Area. Bell Canada cautioned that in circumstances where Bell Canada infrastructure needs to be extended across an MTO corridor (in this case, Highway 6), the approval process can be time-consuming which should be factored into the project timeline. In addition, from a review of Bell Canada's online coverage map, coverage for 4G, LTE, and 5G cellular devices are also available for the Study Area.

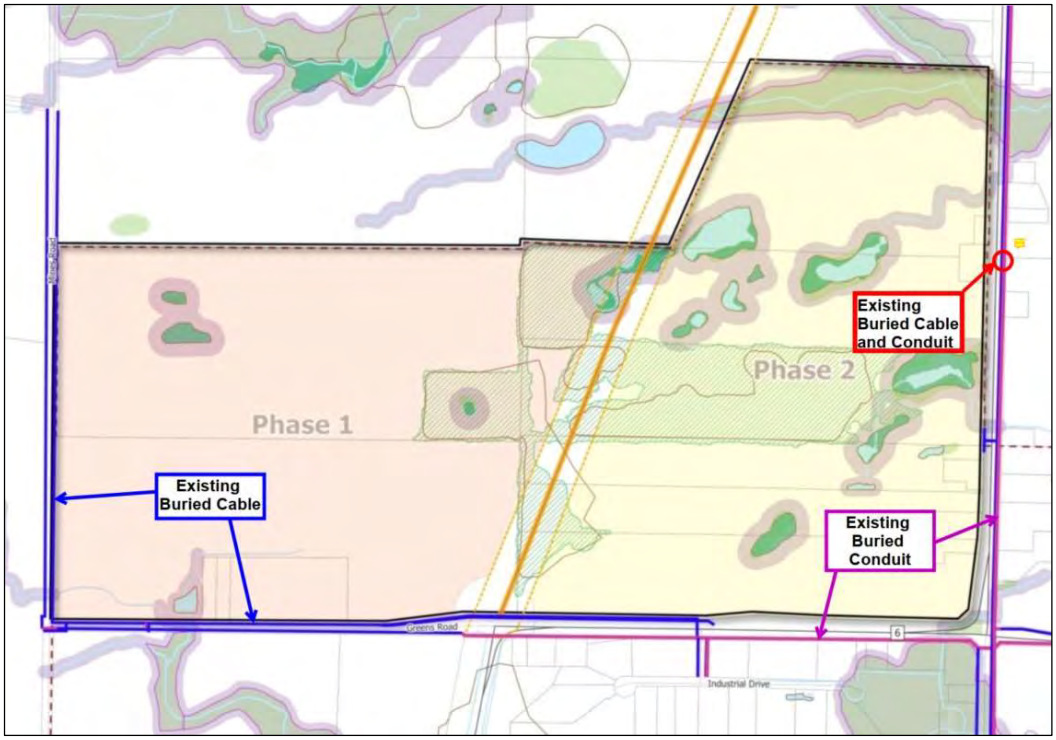

Figure 8-2: Bell Canada Infrastructure in Proximity to Study Area

In summary, it is anticipated that the Study Area could be serviced by Bell Canada through an extension of their infrastructure into the Study Area.

8.3.2 Rogers Communications

GMBP contacted Rogers Communications (Rogers) in order to confirm the availability of their infrastructure in proximity to the Study Area. Rogers circulated a screen capture of their existing infrastructure as shown in **Figure 8-3** which confirms that their infrastructure (fiber and coaxial) is located on Highway 6 and Greens Road, fronting the Study Area. An extension of Rogers infrastructure

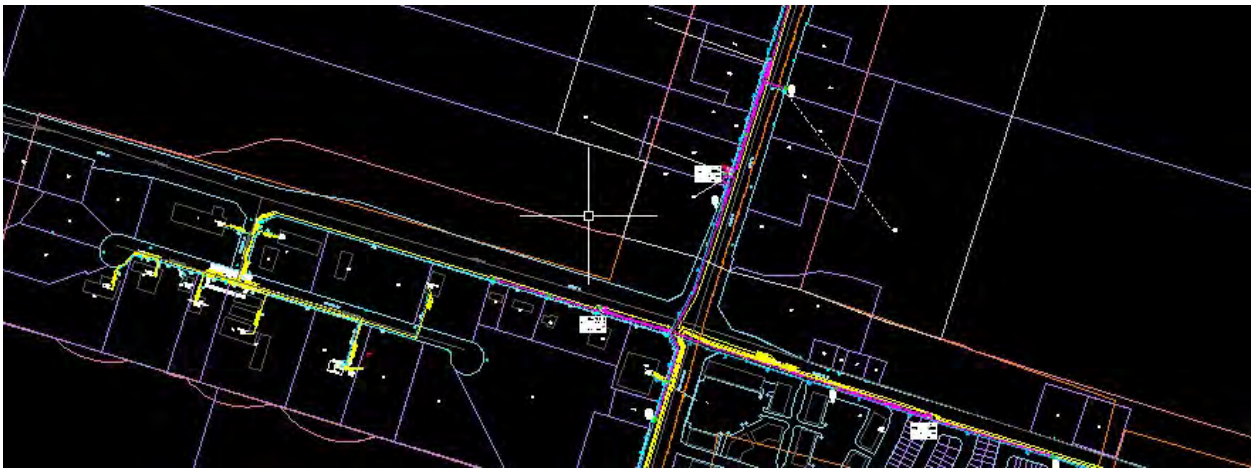

Figure 8-3: Rogers Communications Infrastructure in Proximity to Study Area

from the boundary road network into the Study Area could provide telecom servicing for the Study Area. In addition, from a review of Rogers' online coverage map, coverage for 4G, LTE, and 5G cellular devices are also available for the Study Area.

8.4 Broadband

8.4.1 Metro Loop/Xplore Internet

Metro Loop/Xplore Internet confirmed that fiber optic infrastructure is installed along the south border of the Study Area, on Greens Road from Highway 6 to Mines Road. Metro Loop/Xplore confirmed that the entire Study Area could be serviced by an extension of their infrastructure into the Study Area.

8.4.2 KWIC Internet

KWIC Internet confirmed that they do not have any broadband infrastructure in proximity to the Study Area.

9. CONCEPTUAL SUBDIVISION LAYOUT

The conceptual subdivision layout of the Study Area is outlined on **Figure 3-1**. As previously noted, the existing environmental areas are retained wherever possible within the Study Area with buffers applied to development blocks. Water, wastewater, and storm servicing has been extended throughout the Study Area via proposed local road extensions and/or municipal servicing easements. SWM facilities have been identified to control and treat the additional storm flows anticipated from the change in land use. Road and servicing access for each development block will be provided via the local road extensions in Phases 1 and 2. Section 3.3 identifies the range in development block sizing anticipated within the Study Area based on the anticipated land use; however, the location, size, and orientation of each development block will be refined at subsequent development stages.

10. COST ESTIMATES

10.1 Water

A summary of the external water infrastructure projects and costs associated with developing the Study Area is provided in **Table 10-1**. These external projects were identified in the 2020 MSP and 2020 CUBE studies; a summary of which is provided in **Table 10-1** for comparison.

A summary of the internal water infrastructure projects necessary for development of Phases 1 and 2 of the Study Area and associated high level cost estimates provided in **Table 10-2.**

All of the identified external and internal water infrastructure projects benefit multiple landowners within the Study Area and are therefore development charge (DC) applicable.

Table 10-1: Cost Estimate for External Water Infrastructure Projects

2020 MSP			2020 CUBE study		2023 North Caledonia Employment Land Feasibility and Servicing Study	
Project Label	*Project Description*	*Cost Estimate (2020$)*	*Revision per Boundary Expansion*	*Updated Cost Estimate (2020$)*	*Updated Boundary Expansion*	*Updated Cost Estimate (2020$)*
W-WM-1	Twinning of 450mmø WM along Highway 6	$1,500,000	Increase WM to 600mmø	$2,900,000	Maintain 600mmø WM	$2,900,000
W-WM-3	Extension of 350mmø WM along Greens Road	$2,000,000	Not included	-	Maintain 350mmø WM	$2,000,000
W-S-2	Increase In-Ground Reservoir at Caledonia WTP by 5,000 m^3	$5,900,000	Increase In-Ground Reservoir by 7,000 m^3 (Additional 2,000 m^3)	$8,200,000	Increase In-Ground Reservoir by 6,502 m^3 (Additional 1,502 m^3)	$7,600,000
W-P-3	Booster Pumping Station (BPS) for Caledonia 1 & 2	-	Additional pumping to higher elevation areas	$4,000,000	Include BPS for Study Area	- (Accounted for in **Table 10-2**).
Various	Remaining recommendations from the 2020 MSP	$13,800,000	Remaining recommendations from 2020 MSP & other unimpacted recommendations from the 2020 CUBE study	$22,100,000	Remaining recommendations from 2020 MSP & other unimpacted recommendations from the 2020 CUBE study	$20,100,000
	2020 MSP Total:	**$23.2M**	**Revised Total:**	**$37.2M**	**Updated Total:**	**$32.7M**

Table 10-2: Cost Estimate for Internal Water Infrastructure Projects

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
W-1	300mmø PVC WM Class 150 DR18 (Greenfield installation within Phases 1 & 2)	4,180	m	$873 per metre	$5,180,000
W-2	300mmø PVC WM Class 150 DR18 (Tunnelled crossing of retained environmental area adjacent to and within the future Hwy 6 extension, approx. 345 metres north of Haldimand Road 66)	165	m	$2,000 per metre	$470,000
W-3	600mmø steel casing for crossing of future Hwy 6 extension	110	m	$1,000 per metre	$155,000
W-4	300mmø PVC WM Class 150 DR18 (Tunnelled crossing of Hwy 6 & Haldimand Road 66 intersection)	60	m	$2,117 per metre	$180,000
W-5	300mmø PVC WM Class 150 DR18 (Within existing right-of-way of Mines Road)	600	m	$1,222 per metre	$1,040,000
W-6	1500mmø valve chambers	16	units	$20,000 per unit	$450,000
W-7	1800mm x 2400mm rectangular valve chambers	6	units	$100,000 per unit	$850,000
W-8	1800mm x 2400mm rectangular valve chambers (c/w bleeder valves)	2	units	$100,000 per unit	$285,000
W-9	Air release or drain valve chambers	7	units	$100,000 per unit	$995,000
W-10	Booster Pumping Station (BPS) for Study Area (~107 L/s firm capacity)	107	L/s	$35,000 per L/s	$5,320,000
				TOTAL (PHASES 1 & 2):	**$14.9M**

Note: Cost estimate includes 12% engineering and 30% contingencies

10.2 Wastewater

A summary of the external wastewater infrastructure projects and costs associated with developing the Study Area is provided in **Table 10-3**. These external projects were identified in the 2020 MSP and 2020 CUBE studies; a summary of which is provided in **Table 10-3** for comparison.

A summary of the internal wastewater infrastructure projects necessary for development of Phases 1 and 2 of the Study Area and associated high level costs is provided in **Table 10-5**.

All of the identified external and internal wastewater infrastructure projects benefit multiple landowners within the Study Area and are therefore development charge (DC) applicable.

Table 10-3: Cost Estimate for External Wastewater Infrastructure Projects

2020 MSP			2020 CUBE study		2023 North Caledonia Employment Land Feasibility and Servicing Study	
Project Label	Project Description	Cost Estimate (2020$)	Revision per Boundary Expansion	Updated Cost Estimate (2020$)	Updated Boundary Expansion	Updated Cost Estimate (2020$)
NC1.1	Gateway SPS (firm capacity of 150 L/s; expandable to 300 L/s)	-	Upgrade Gateway SPS (increase build-out peak flows from 103 L/s to 204 L/s)	$260,000	Estimated peak flow of 141 L/s; does not require expansion.	-
NC1.2	Gateway SPS Forcemain and Undersized Sewer to Nairne SPS. Maintain 300mmø Gateway forcemain and upsize 250mmø sewer to 450mmø	$2,786,040	Maintain 2020 MSP recommendations.	$2,825,090	Maintain 2020 MSP recommendations.	$2,825,090
NC1.3	250mmø sewer to Study Area (Greens Road & Highway 66; approximately 2,960 metres in length)	$3,521,600	Maintain length of sewer extension, increase sewer diameter to 450mm.	$3,741,700	Reduce pipe diameter to 375mm and revise alignment per **Figure 5-5**.	$17,100,000 (refer to **Table 10-4**)
NC3.1	Forcemain extension from Nairne SPS to new WWTP	$1,590,000	Increase in forcemain diameter per 2020 MSP.	$2,172,600	Carry forward 2020 MSP recommendation.	$2,172,600
NC3.2	Upgrade Nairne SPS	$710,000	Build-out peak flow increases from 160 L/s to 260 L/s triggers new SPS/major expansion.	$5,680,000	Carry forward 2020 CUBE recommendation.	$5,680,000

2020 MSP			2020 CUBE study		2023 North Caledonia Employment Land Feasibility and Servicing Study	
CT1.1	New North WWTP (including land acquisition)	$54,201,400	Build-out design flows increase from 9.7 MLD to 15.2 MLD	$113,841,400	Build-out design flows increase from 9.7 MLD to 13.1 MLD.	$91,071,000
Various	Remaining recommendations from the 2020 MSP	$9,591,000	Remaining recommendations from 2020 MSP & other unimpacted recommendations from the 2020 CUBE study.	$12,180,000	Remaining recommendations from 2020 MSP & other unimpacted recommendations from the 2020 CUBE study.	$12,206,000
	2020 MSP Total:	**$72.4M**	**Revised Total:**	**$140.7M**	**Updated Total:**	**$131.1M**

Note: Cost estimate includes 12% engineering and 30% contingencies

Table 10-4: Updated Cost Estimate for NC1.3

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
WM-1	375mmø PVC sewer (average depth of cover is 7.6 metres, trenchless assumed to be required)	1,427	m	$5,501 per metre	$7.85M
WM-2	Trenchless launch/receiving shafts (estimated shaft diameter is 7 metres, assumed 6 shafts; 5 launch shafts, 1 receiving	6	shafts	$640,000 per launch shaft $450,000 per receiving shaft	$3.6M
WM-3	600mmø steel casing for major road crossings of (crossing of Argyle Street North & Highway 6 @ 60 metre length for each)	120	m	$1,000 per metre	$120K
WM-	1200mmø deep manhole structures	22	units	$20,000 per unit	$440K
				Subtotal:	**$12.1M**
				Engineering and Contingencies (42%):	**$5.0M**
				TOTAL:	**$17.1M**

Table 10-5: Cost Estimate for Internal Wastewater Infrastructure Projects

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
WM-1	375mmø PVC sewer (Deep greenfield installation within Phases 1 & 2)	3,600	m	$2,328 per metre	$11,900,000
WM-2	375mmø PVC sewer (Tunnelled crossing of retained environmental area adjacent to and within the future Hwy 6 extension, approx. 345 metres north of Haldimand Road 66)	165	m	$8,300 per metre	$1,945,000
WM-3	600mmø steel casing for crossing of future Hwy 6 extension	110	m	$1,000 per metre	$155,000
WM-4	1200mmø deep manhole structures	50	units	$20,000 per unit	$1,420,000
				TOTAL (PHASES 1 & 2):	**$15.4M**

Note: Cost estimate includes 12% engineering and 30% contingencies

10.3 Stormwater

A summary of the internal stormwater infrastructure projects necessary for development of Phases 1 and 2 of the Study Area and associated costs is provided in **Table 10-6.** As noted in **Table 6-5**, seven (7) of the nine (9) wet ponds identified in **Table 10-6** do not accept drainage from municipal corridors and are therefore planned to be privately-owned ponds. Further efficiencies and refinements to the method through which SWM quantity and quality controls are provided for each development block will be determined through subsequent studies. As such, the cost and maintenance of privately-owned SWM facilities is the sole responsibility of the landowner. The remaining SWM infrastructure projects (SWM-1, SWM-3, SWM-10, SWM-11, SWM-12, SWM-13, and SWM-14) benefit multiple landowners within the Study Area and are therefore development charge (DC) applicable.

Table 10-6: Cost Estimate for Stormwater Infrastructure Projects

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
SWM-1	SWM block size of 3.8 ha.	87,677	m^3	$40/$m^3$	$5.0M
SWM-2	SWM block size of 1.5 ha.	21,313	m^3	$75/$m^3$	$2.3M
SWM-3	SWM block size of 1.1 ha.	11,590	m^3	$100/$m^3$	$1.6M
SWM-4	SWM block size of 1.1 ha.	11,435	m^3	$100/$m^3$	$1.6M
SWM-5	SWM block size of 1.0 ha.	8,120	m^3	$125/$m^3$	$1.4M
SWM-6	SWM block size of 1.1 ha.	12,390	m^3	$100/$m^3$	$1.8M
SWM-7	SWM block size of 0.9 ha.	5,345	m^3	$150/$m^3$	$1.1M
SWM-8	SWM block size of 1.2 ha.	13,031	m^3	$100/$m^3$	$1.9M
SWM-9	SWM block size of 1.2 ha.	14,818	m^3	$100/$m^3$	$2.1M
SWM-10	Re-aligned municipal drain c/w landscaping	260	m	$850/m	$315K
SWM-11	Storm sewers (various sizes)	2,250	m	$700/m	$2.2M
SWM-12	Manholes (various sizes)	28	units	$11,000 per unit	$440K
SWM-13	Catch basins	56	units	$5,000 per unit	$400K
SWM-14	Allowance for conveyance and source controls in Phase 2 local road	-	-	-	$1.0M
				TOTAL (PHASES 1 & 2):	**$23.2M**

Note: Cost estimate includes 12% engineering and 30% contingencies

10.4 Roads

A summary of the external road infrastructure projects and costs associated with developing the Study Area are provided in **Table 10-7.** A summary of the internal road infrastructure projects necessary for development of Phases 1 and 2 of the Study Area and associated costs are provided in **Table 10-8.** All of the identified external and internal road infrastructure projects benefit multiple landowners within the Study Area and are therefore development charge (DC) applicable.

Table 10-7: Cost Estimate for External Road Infrastructure Projects

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
T-1	New 3-leg signalized intersection (local road connections to boundary roads)	3	-	$550,000	$2.3M
T-2	Re-construction of 3-leg stop-control intersection (Mines Road & Greens Road) to 3-leg signalized intersection	1	-	$480,000	$680K
T-3	Re-construction of existing 2-lane Mines Road to 4-lane urban cross-section	550	m	$4,200 per metre	$3.3M
T-4	Re-construction of existing 2-lane Greens Road to 4-lane urban cross-section	890	m	$4,200 per metre	$5.3M
				TOTAL:	**$11.6M**

Note: Cost estimate includes 12% engineering and 30% contingencies

Table 10-8: Cost Estimate for Internal Road Infrastructure Projects

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price ($)
T-5	Local 20m width road extension in Phase 1 c/w surface works (granular base, asphalt, curb & gutter, sidewalk, utilities, landscaping, street lighting)	1,760	m	$2,500 per metre	$6.3M
T-6	Local 20m width road extension in Phase 2 c/w surface works (granular base, asphalt, curb & gutter, sidewalk, utilities, landscaping, street lighting)	1,120	m	$2,500 per metre	$4.0M
				TOTAL:	**$10.2M**

Note: Cost estimate includes 12% engineering and 30% contingencies

10.5 Summary of Cost Estimates

A summary of the external and internal infrastructure costs associated with developing the Study Area is provided in **Table 10-9**.

As previously noted, the external projects include the costing related to other projects that benefit Caledonia, as identified in the 2020 MSP and 2020 CUBE studies. As noted in Section 10.3, several of the wet ponds identified in **Table 10-6** do not accept drainage from municipal corridors and are therefore planned to be privately-owned ponds. As such, the cost and maintenance of privately-owned SWM facilities is the sole responsibility of the landowner. The remaining SWM infrastructure projects (SWM-1, SWM-3, SWM-10, SWM-11, SWM-12, SWM-13, and SWM-14) benefit multiple landowners within the Study Area and are therefore development charge (DC) applicable. However, the cost for SWM infrastructure identified in **Table 10-9** includes all of the identified SWM infrastructure, thereby providing a high-level estimate for SWM infrastructure needs for the Study Area as a whole.

Table 10-9: Summary of Cost Estimates

Infrastructure	External Projects	Internal Projects	Total[1]
Water	$32.7M	$14.9M	$47.6M
Wastewater	$131.1M	$15.4M	$146.5M
Stormwater	-	$23.2M	$23.2M
Roads	$11.6M	$10.2M	$21.8M
Total	**$175.4M**	**$63.7M**	**$239.1M**

***Note 1**: The concept plan presented in this report is theoretical and subject to change based on updates to the road network, lot sizing, and several other factors that will be refined through subsequent studies. The costing presented in **Table 10-9** represents a high-level estimate based on the concept plan; therefore, these cost estimates are also subject to change based on an updated concept plan and/or updates to the recommendations put forward in this report.*

11. CONCLUSIONS

As detailed in this report, the North Caledonia Employment Lands can be serviced by an extension and/or expansion of the existing water and wastewater systems in Caledonia, in line with the strategies put forth by the previous servicing studies for the area. These lands can provide valuable employment uses in Caledonia and assist in meeting the goals laid out in the County's 2021 Official Plan Update. The timing and specifics of implementation of this project's recommendations will be subject to funding and interest by applicable landowners.

APPENDIX A:
DESIGN CALCULATIONS – WATER INFRASTRUCTURE

Project: North Caledonia Employment Lands Feasibility and Servicing Study **Design:** BP **Date:** 20-Mar-23
Project No.: 722015 **Check:** MZ **Updated:** -

Water Demand

Proposed Site Conditions

A. **Proposed Land Use**

Area #	Density (jobs/hectare)	Area	Population
Phase 1	15	69.3	1,040
Phase 2	15	48.8	732
TOTAL	**-**	**118.1**	**1,772**

B. **Area's**

Site Area	118.1	ha
Site Area	1,181,000	m^2

C. **Design Criteria**

Average Consumption Rate[2] =	365.0	L/cap/d	Note: Average Consumption Rate taken from Gateway North SPS Tender Documents (Dry Weather Flow) (WSP, March 2020)
Max Day Factor[2] =	1.6		Note: Max Daily PF taken from Caledonia Master Servicing Plan Update (MSP 2020)
Max Hour Factor[2] =	2.0		Note: Max Hourly PF taken from Haldimand County Design Guidelines

D. **Water Demand - Phase 1 & 2**

Industrial - Phase 1

Average Daily Flow	365	x	1,040	=			379,418	L/day	=	4.39	L/s
Maximum Day Flow	365	x	1,040	x	1.6	=	599,480	L/day	=	6.94	L/s
Maximum Hourly Flow	365	x	1,040	x	2.0	=	758,835	L/day	=	8.78	L/s

Industrial - Phase 2

Average Daily Flow	365	x	732	=			267,180	L/day	=	3.09	L/s
Maximum Day Flow	365	x	732	x	1.6	=	422,144	L/day	=	4.89	L/s
Maximum Hourly Flow	365	x	732	x	2.0	=	534,360	L/day	=	6.18	L/s

E. **Total Water Demand - Phases 1 & 2**

Average Daily Flow	365	x	1,772	=			646,598	L/day	=	7.48	L/s
Maximum Day Flow	365	x	1,772	x	1.6	=	1,021,624	L/day	=	11.82	L/s
Maximum Hourly Flow	365	x	1,772	x	2.0	=	1,293,195	L/day	=	14.97	L/s

Project:	North Caledonia Employment Lands Feasibility and Servicing Study	Design:	BP	Date:	20-Mar-23
Project No:	722015	Check:	MZ	Updated:	-

POPULATION

			Notes
Existing:	10,781	persons	Per 2020 MSP
2046	28,558	persons	Per 2020 MSP
Build-out of Urban Expansion:	44,659	persons	Per 2020 CUBE study, which assumed 126.2 hectares of serviceable land for Caledonia Areas 1 & 2 (refer to Figure 4-2) with a population density of 49.4
Revised Build-out per North Caledonia Employment Lands Feasibility Study:	40,199	persons	Per this study, there are 118.1 gross hectares of employment land with a population density of 15 jobs/hectare for a total population of 1,772 jobs.

MAXIMUM DAILY WATER DEMAND

Study Area:	1.02	MLD	Phases 1 & 2
	11.82	L/s	
Caledonia:	20.31	MLD	Updated per the population projections for the Study Area.
	235.07	L/s	

A - FIRE STORAGE

MECP Fire Flow Guidelines value of 318 L/s for 5 hours was used, similar to the 2020 MSP Update and 2020 CUBE study.

Flow:	318	L/s
Duration:	5	hours
Volume:	5724	m^3

B - BALANCING

Maximum Daily Water Demand:	235.07	L/s
Balancing (25% of Max Day):	58.77	L/s
Volume:	5077.5	m^3

C - EMERGENCY

Emergency (25% of A + B):	2700.4	m^3

STORAGE = A + B + C

Storage:	13501.9	m^3

Table 8-1: Fire Flow Requirements

EQUIVALENT POPULATION[1]	SUGGESTED FIRE FLOW (L/s)	DURATION (HOURS)
500 – 1 000	38 (10 ft/s)	2
1 000	64 (17 ft/s)	2
1 500	79 (21 ft/s)	2
2 000	95 (25 ft/s)	2
3 000	110 (29 ft/s)	2
4 000	125 (33 ft/s)	2
5 000	144 (38 ft/s)	2
6 000	159 (42 ft/s)	3
10 000	189 (50 ft/s)	3
13 000	220 (58 ft/s)	3
17 000	250 (66 ft/s)	4
27 000	318 (84 ft/s)	5
33 000	348 (92 ft/s)	5
40 000	378 (100 ft/s)	6

Note [1]: When determining the fire flow allowance for commercial or industrial areas, it is recommended that the area occupied by the commercial/industrial complex be considered at an equivalent population density to the surrounding residential lands.

Estimated fire flow for the Study Area is 95 L/s for a duration of 2 hours based on a projected population of 1,772 people.

SUMMARY OF WATER STORAGE VOLUMES:

2020 MSP Update:	12,000	m^3
2020 CUBE Study:	14,000	m^3
2023 North Caledonia Employment Lands Feasibility and Servicing Study:	13,502	m^3

Therefore, an additional 1,500 m3 of water storage is required beyond the infrastructure recommendations made within the 2020 MSP Update report.

APPENDIX B:
DESIGN CALCULATIONS – WASTEWATER INFRASTRUCTURE

Project: North Caledonia Employment Lands Feasibility and Servicing Study | Design: BP | Date: 20-Mar-23
Project No.: 722015 | Check: MZ | Updated: -

Wastewater Flows

Proposed Site Conditions

A. Proposed Land Use

Area #	Density (jobs/hectare)	Area	Population
Phase 1	15	69.3	1,040
Phase 2	15	48.8	732
TOTAL	-	118.1	1,772

B. Area's

Site Area	118.1	ha
Site Area	1,181,000	m^2

C. Design Criteria

Sewage Generation Rate - Collection System:	365	L/capita/day	Note: TS Tender Documents (Dry Weather Flow)
Peaking Factor - Collection System:	Modified Harmon Formula	$Me = 0.8\left(1 + \frac{14}{4 + Pe^{0.5}}\right)$	Note: Where: M_e = ratio of peak flow to average flow; P_e = equivalent tributary population in thousands
Sewage Generation Rate - Treatment:	338	L/capita/day	Note: Based on 2016 actuals
Peaking Factor - Treatment:	3.0		Note: Per 2020 MSP
Infiltration Flow (Allowance):	0.23	L/s/ha	

D. Wastewater Flows - Collection System

Note: Using Modified Harmon Formula

	Area (ha)	Population (Persons)	Average Dry Weather Flow (ADWF) (L/s)	Peaking Factor (PF)	Peak Dry Weather Flow (PDWF) (L/s)	Inflow & Infiltration Allowance (L/s)	Peak Wet Weather Flow (PWWF) (L/s)
Phase 1	69.3	1,040	4.39	3.0	13.3	15.9	29.3
Phase 2	48.8	732	3.09	3.1	9.6	11.2	20.8
Phases 1 & 2	118.1	1,772	7.48	2.9	21.7	27.2	48.9

E. Wastewater Flows - Treatment

	Area (ha)	Population (Persons)	Average Daily Flow (ADF) (L/s)	Peaking Factor (PF)	Maximum Daily Flow (MDF) (L/s)
Phase 1	69.3	1,040	4.07	3.0	12.2
Phase 2	48.8	732	2.86	3.0	8.6
Phases 1 & 2	118.1	1,772	6.93	3.0	20.8

APPENDIX C:
DESIGN CALCULATIONS – STORMWATER INFRASTRUCTURE

	Contributing Drainage Area (ha)	Percent Imperviousness of Drainage Area (%)	Required Water Quality Storage Volume (m3/ha)	Required Water Quality Storage Volume (m3)	Total Contributing Impervious Drainage Area (ha)	25-year Unitary Volume (m3/imp. ha)	25-year Required Volume (m3)	100-year Unitary Volume (m3/imp. ha)	100-year Required Volume (m3)	Total Required Volume (m3)	Approximate Land Requirement (ha)
SWM 1	66	71	227	14,982	46.9	700	32,802	850	39,831	87,615	3.84
SWM 2	18.8	60	202	3,798	11.3	700	7,896	850	9,588	21,282	1.45
SWM 3	8.8	70	225	1,980	6.2	700	4,312	850	5,236	11,528	1.10
SWM 4	7.3	85	250	1,825	6.2	700	4,344	850	5,274	11,443	1.09
SWM 5	5.2	85	250	1,300	4.4	700	3,094	850	3,757	8,151	0.97
SWM 6	10	66	216	2,160	6.6	700	4,620	850	5,610	12,390	1.13
SWM 7	3.4	85	250	850	2.9	700	2,023	850	2,457	5,330	0.87
SWM 8	9.4	74	232	2,181	7.0	700	4,869	850	5,913	12,963	1.15
SWM 9	21.7	35	140	3,038	7.6	700	5,317	850	6,456	14,810	1.21