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St. Marys Future Solid Waste Disposal Needs Environmental Assessment Report

Volume I – Executive Summary

Town of St. Marys

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Town of St. Marys

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Executive Summary

ES1. Introduction

This document is the Environmental Assessment Report (EA Report) for the environmental assessment (EA) of the proposed expansion of the St. Mary's Landfill (also referred to as the Project herein) by the Town of St. Mary's (Town). This is an Individual EA completed under the *Environmental Assessment Act* (*EAA*), *1990*.

The existing St. Marys landfill site (herein referred to as St. Marys Landfill); located at 1221 Water Street South, St. Marys, Ontario, operates under Environmental Compliance Approval (ECA) No. A150203 dated June 24, 2010, issued by the Ministry of the Environment and Climate Change (MOECC)[1]. It has an approved capacity of 380,000 m^3 and receives post-diversion waste from within the Town. The St. Marys Landfill is a 37 ha site and was part of a former clay pit that was used by St. Marys Cement in cement manufacturing. The St. Marys Landfill contains an approved fill area of 8 ha. Site capacity (waste and daily cover) is currently consumed at a rate of approximately 13,500 m^3/year. The site reached its approved capacity in January 2016. To maintain operations during preparation of this EA, the Town applied for and received ECA Notices (amendments) allowing continued use. The current Notice allows operation through September 30, 2020. As required by the ECA, the Town will apply to the Ministry for further operation by July 31, 2020.

ES2. Terms of Reference

To respond to this need, the Town has prepared the Terms of Reference (TOR) for EA which is the first step in Ontario's EA process. The TOR was submitted to the MOECC (now Ontario Ministry of the Environment, Conservation and Parks (MECP)) and approved by the Minister on December 29, 2014. This EA Report has been prepared in accordance with the approved TOR.

ES3. Purpose

The problem which will be addressed through this EA is as follows:

The Town of St. Marys must identify a solution that addresses the Town's post-diversion municipal solid waste disposal needs over a 40-year planning period in a technically and economically feasible manner while minimizing impacts to the environment.

It was calculated that the 40-year planning period would require 708,000 m^3 of waste and operational cover disposal capacity.

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[1] The Ministry of the Environment and Climate Change was renamed the Ministry of the Environment, Conservation and Parks in 2018. In this document, MOECC is referenced as the author on materials published prior to 2018. MOECC is also referenced as the name of the ministry consulted throughout the TOR and much of the EA process. MOECC and MECP are considered synonymous.

ES4. Environmental Assessment Process

In Ontario, waste management projects are governed by O. Reg. 101/07, known as the Waste Management Projects Regulation. According to Part II of the regulation, any new landfill site with a capacity over 100,000 m^3 or any changes to an existing landfill site that result in additional volume over 100,000 m^3 is subject to Part II of the *Ontario Environmental Assessment Act* (EA Act), and, as such, is required to undergo an Individual EA.

In this case, the Town undertook some initial planning work prior to commencement of the EA. Work included a pre-screening of the *Alternatives to the Undertaking*. This work was refined during the TOR process. In accordance with Section 6.1(3) of the EA Act, and since some studies had occurred prior to initiating the EA process and the Town had proceeded through some of the initial stages of the project planning process, the Town has completed a focused EA.

ES5. Alternatives to the Undertaking and Screening Process

Section 6.1(3) of the Environmental Assessment Act (EA Act) allows for an EA with a narrow scope, commonly referred to as a "focused EA". The TOR outlined why this was deemed appropriate. In summary, the Town of St. Marys undertook some initial planning work prior to commencement of the EA. Work included a pre-screening of the *Alternatives to the Undertaking*.

The EA is scoped to focus on the *Alternatives to the Undertaking* which were remaining after the pre-screening exercise. These Alternatives include:

- Do Nothing (required by EA Act);
- Landfilling at an Expansion of the Existing Landfill Site in St. Marys; and
- Exporting Waste to Another Jurisdiction.

ES6. Evaluation of Alternatives to the Undertaking

ES6.1. Exporting Waste to Another Jurisdiction

In order to collect data to support the evaluation of the *Waste Export Alternatives*, the Study Team developed two surveys, one for municipalities and one for private waste haulers, transfer station and landfill operators. The survey asked whether the municipality would be interested in accepting St. Marys' waste. A follow-up question asked how the Respondent's response had been determined.

Of the 14 municipalities who received a survey, 10 responded indicating that they would not be interested in receiving St. Marys' waste. Four municipalities did not respond to the survey. Based on this information it was determined that export to another municipal landfill is not a feasible option. This municipal option was not considered any further in the study.

Of the six private landfill and transfer station operators contacted, five completed the survey. Of the nine waste haulers contacted, five provided responses. Based on the information provided, costs and ability to receive waste from St. Marys, the Twin Creeks Landfill in Watford and Carleton Farms Landfill in Michigan were identified to be the highest rated opportunities.

The Twin Creeks Landfill has at least 25 years of capacity remaining at the site; they have the willingness to negotiate a 25-year contract and it is relatively close distance from St. Marys. The Carleton Farms Landfill in Michigan has 75 years of capacity remaining at the site (this is the only landfill with sufficient capacity to fully address the 40-year needs of St. Marys) and has a low tipping fee (cost). However, for this option to be feasible, the Town would need to use a private hauler or deliver waste to a private transfer station with the necessary permissions/approval to transport waste across the border into Michigan.

Therefore, delivery to the Twin Creeks Landfill was determined to be the Preferred Alternative for waste export. This *Alternative* was carried as *Alternative 1* in the evaluation of the *Alternatives to the Undertaking*.

ES6.2. Description of the Existing Environment

Built Environment

Existing St. Marys Landfill

Prior to the development of the landfill, the property was licensed by the Ministry of Natural Resources as part of the St. Marys Cement Co. (SMC) quarry. The Site was approved in 1983, and landfilling began in December 1984 in the area known as Phase I. Phase I was completed and finished with final cover in the summer of 1993 (CRA, 2012). Phase II/III was approved in 1992.

The Site is now a 37-ha waste disposal Site with an 8-ha landfill area. Waste for disposal is accepted from the Town of St. Marys only. Phase I had a volume of 104,000 m^3 and Phase II/III has an approved volume of 330,050 m^3, giving the Site a total approved capacity of 434,050 m^3. The ECA has been amended several times to allow continued operation during the preparation of this EA. Fill placed since December 31, 2016 is considered part of the 40-year planning period of this EA.

The northeast portion of the landfill property was purchased by the Town from St. Marys Cement in 2009. The land in this area contains a Cement Kiln Dust (CKD) stockpile from historic St. Marys Cement operations. The CKD stockpile has been in place for approximately 30 years.

The existing landfill access operates under stop control at its intersection with Perth Road 123.

Leachate Collection

The Phase I leachate collection system is a perimeter system consisting of perforated collector pipes connected between manholes. It was installed as a contingency system to control mounding within the waste. The Phase II/III collection system incorporates perimeter collectors as well as lateral collectors passing beneath the waste. Leachate is directed to the Town's wastewater treatment plan (WWTP). The actual amount of leachate directed to the WWTP is small relative to the capacity of the plant. It is estimated that Phase I and Phase II/III produce an average of 24.5 m^3/day of leachate. By comparison, the St. Marys Wastewater Treatment Plant (WWTP) has a Rated Capacity of 5,560 m^3/day. This means the landfill leachate is approximately 0.4% of the WWTP's rated capacity.

There is current no landfill gas collection system in place.

Topography and Drainage

The highest elevation on the Site today is the cement kiln dust (CKD) stockpile at around 334 m amsl at its highest point. The elevations of the fill areas are approximately 327 m for Phase I and 326 m amsl in Phase II/III. The lowest elevations on the Site occur along the watercourse. This channel enters the east side of the Site at an elevation of approximately 310 m amsl and exits at the northwest end below 309 m amsl.

Surface water from the complete landfill areas is directed through a series of perimeter ditches and swales around the landfills and along the interior roadways. The ditches and swales convey the runoff to two stormwater retention basins. These stormwater basins attenuate the peak flows during storm events and allow sedimentation. The stormwater basins outlet to the watercourse via control features. The watercourse leaves the Site by a culvert under Perth Road 123. It eventually discharges into the Thames River, approximately 500 m downstream of the Site.

Social and Cultural Environment

Population, Land Use and Socio-economic Conditions

The Town of St. Marys has a population of a 7,265 according to the 2016 Census. Between 2011 and 2016, the Town population changed from 6,655 to 7,265 (Statistics Canada, 2016).

The landfill property is identified as an Environmental Constraint area, in accordance with the Town's Official Plan. The site is surrounded by the St. Marys Cement plant to the northeast and northwest, agricultural fields to the south and a number of rural residences (there are 16 rural residences within 120 m of the landfill) and farms to the west.

The landfill currently employs one full-time staff position, one part-time staff position and six staff who work occasionally, as required. Economic drivers in the Study Area primarily include the St. Marys Cement operation and agricultural uses to the south and west of the landfill site. The Town's economic stability is strengthened by the presence of this industry as well as a strong agricultural sector.

Archaeological and Cultural Heritage Features

There are no known archaeological sites on, or in the vicinity of, the landfill property. One Built Heritage Resource, a residence, located at 481 Water Street South is present approximately 1 km north of the landfill site. The residence is designated under Part IV of the *Ontario Heritage Act*.

Treaties and Traditional Territory

The St. Marys Landfill is within the lands covered by Treaty 29 (1827). The modern signatories to this treaty, as well as The Haudenosaunee Development Institute (representing the Haudenosaunee Confederacy) and Six Nations of the Grand River Territory, were also contacted as they expressed interest due to the site's location within the area covered by the Nanfan Treaty.

Natural Environment

The Thames River is located approximately 250 m to the northwest of the site. An unnamed watercourse runs through the centre of the site and discharges to the Thames River. There is a large perched culvert along the drain at Water Steet, limiting fish migration from the Thames River into the drain. The Thames River provides habitat for a Species Concern mussel species, several kilometers downstream of the unnamed watercourse outlet. Farther downstream, additional critical habitat for an Endangered mussel species is also present.

The unnamed watercourse wraps around the south and west sides of the CKD stockpile. Water quality samples from the watercourse since 1985 (as part of the landfill monitoring) have not detected an impact from the landfill or the CKD stockpile.

Other natural features on, and around, the site are limited due to the nature of the existing landfill and the surrounding extraction operations.

Source Water Protection

The St. Marys Landfill is located in the Thames-Sydenham & Region Source Protection Area. Mapping supplied by the Upper Thames River Valley Conservation Authority showed that the landfill is not within any Wellhead Protection Areas or Intake Protection Zones for municipal water supplies. There are no Significant Groundwater Recharge Areas mapped on the site. An area in the northeast corner of the landfill site is mapped as Highly Vulnerable Aquifer.

Air Quality

The air quality around the facility is typical of a small landfill. There are residential receptors across the road on the west side of Water Street with more receptors further away to the north and south. The residents around the landfill infrequently complain about odours. Road dust is easily controlled and dust from the working face does not impact the neighbours. All contaminants meet their regulated criteria at the property line.

Twin Creeks Landfill

This site is operated under Environmental Compliance Approval (ECA) No. A032203.

Built Environment

The Twin Creek landfill is located outside of the community of Watford. The landfill began operation in 1972. The landfill property is 301 ha with an approved landfilling area of 101.8 ha with an approved disposal capacity of 26,508,000 m^3.

Land Use and Socio-economic Conditions

Surrounding lands are primarily agricultural with a small number of commercial properties located to the south, along Nauvoo Road. Employment levels at the landfill are unknown.

Archaeological and Cultural Heritage Resources

With the exception of the two cemeteries adjacent to the landfill, the presence of archaeological or cultural heritage resources is unknown. It is assumed that because the landfill has been approved any concerns with archaeological and cultural resources have been addressed.

Treaties and Traditional Territory

There are several Indigenous communities that may have constitutionally protected Indigenous or Treaty Rights associated with the Study Area, or a portion of it. These are the same communities which may have rights associated with the St. Marys Landfill property.

Traffic Conditions

The landfill is accessed through an entrance off County Road 79. The landfill currently results in 19 landfill-related vehicles per hour travelling along various haul routes.

Natural Environment

A watercourse, known as the Vankessel Drain runs from the landfill to the west, where it discharges to the Bear Creek system. Current water quality conditions in the Vankessel Drain are not known. Bear Creek is known to provide critical habitat for a number of endangered mussel species.

Source Water Protection

The landfill is not within any Wellhead Protection Areas (WHPA) or Intake Protection Zones (IPZ) for municipal water supplies. There is a large Significant Groundwater Recharge Area (SGRA) with a vulnerability score of 2 mapped east of the site and covers the southeastern part of the landfill property.

Air Quality

Ground level concentrations for the contaminants emitted at the Twin Creeks landfill do not exceed 50% of the MECP criteria and majority are well below 10% (2017). There were no odour complaints from the surrounding residents according to a 2017 report. However, there were several odour related complaints in 2018 and 2019. An addition of the waste from St. Marys Landfill will have little impact on the emissions considering the size of the Twin Creeks Landfill.

ES7. Phase 1: Evaluation of the Alternatives to the Undertaking

Evaluation Criteria

The evaluation criteria used to evaluate the Alternative to the undertaking, as defined in the TOR (with minor changes), are:

- Natural Environment:
  - Atmosphere (air quality, odour, noise, etc.);
  - Geology and hydrogeology;
  - Surface water (quality and quantity); and
  - Biology (terrestrial, aquatic).
- Cultural Environment:
  - Built Heritage Resources;
  - Cultural Heritage Landscapes; and
  - Archaeological Resources.
- Socio-Economic Environment:
  - Land Use;
  - Transportation Routes;
  - Employment Effects;
  - Economic Conditions; and
  - Aesthetics/Enjoyment of Life.

- Indigenous Connections to the Land:
  - Traditional and Historic Uses; and
  - Land Claims/Treaty Rights/Indigenous Rights.
- Financial Factors:
  - Capital Costs; and
  - Operational and Maintenance Costs.
- Technical Factors:
  - Technical Ability to Carry Out Each Alternative.

Using these criteria, a comparative evaluation was completed. With consideration to potential mitigation measures, the magnitude, frequency, duration, and reversibility of potential net impacts were identified.

Potential Net Effects of the Alternatives to the Undertaking

The evaluation of Alternatives to the Undertaking applied the criteria to the proposed Undertaking and Alternative 1. The potential impacts to each environmental component are identified, followed by measures which could be used to minimize effects. Net effects are then identified and described according to their magnitude, duration, frequency, and reversibility. The evaluation of net effects relative to Doing Nothing is presented in Table ES1.

Table ES1: Evaluation of Alternatives to the Undertaking

Criteria	Comparison to the Do Nothing Alternative	
	Alternative 1: Expand the St. Marys Landfill	**Alternative 2: Export Waste to the Twin Creeks Landfill**
Natural Environment		
Potential Impacts to Atmosphere	Equally Preferred	Preferred
Potential Impacts to Geology and Hydrogeology	Equally Preferred	Equally Preferred
Potential Impacts to Surface Water	Equally Preferred	Equally Preferred
Potential Impacts to Biology	Somewhat Less Preferred	Preferred
Cultural Environment		
Potential Impacts to Archaeological Resources	Equally Preferred	Equally Preferred
Potential Impacts to Built Heritage	Equally Preferred	Equally Preferred

Criteria	Comparison to the Do Nothing Alternative	
	Alternative 1: Expand the St. Marys Landfill	**Alternative 2: Export Waste to the Twin Creeks Landfill**
Potential Impacts to Cultural Heritage	Equally Preferred	Equally Preferred
Socio-economic Environment		
Potential Impacts to Transportation Routes	Equally Preferred	Less Preferred
Land Use	Preferred	Less Preferred
Employment Effects	Somewhat Preferred	Less Preferred
Economic Conditions	Equally Preferred	Less Preferred
Aesthetics/Enjoyment of Life	Somewhat Preferred	Preferred
Indigenous Connections to the Land		
Traditional and Historic Uses/Land Claims/ Indigenous and Treaty Rights	Equally Preferred	Somewhat Preferred
Financial Factors		
Capital and Operational Costs	Somewhat Less Preferred	Less Preferred
Technical Factors		
Technical Ability to Carry Out Each Alternative	Equally Preferred	Less Preferred
Overall Preference	**Somewhat Preferred**	**Less Preferred**

ES8. Preferred Undertaking

Based on this scoring and the advantages and disadvantages of each Alternative, it was determined that:

- Doing Nothing does not address the Town's waste management needs and obligations and is not a feasible solution to the Problem Statement.
- Exporting waste to the Twin Creeks Landfill is preferred to expanding the St. Marys Landfill based on Natural Environment and Indigenous Connections to the Land criteria.
- Expanding the St. Marys Landfill is preferred based on Socio-economic criteria, Financial Factors, and Technical criteria.
- Both options were equally preferred based on Cultural Heritage criteria.

As such, based on cumulative scoring, the alternative to expand the St. Marys Landfill was found to be preferred.

ES9. Phase 2: Review of the Environmental Assessment Requirements

Under Ontario Regulation 101/07, the Waste Management Projects Regulation, landfill expansions in exceedance of 100,000 m^3 are subject to the Individual EA process under the EA Act. As the Town's waste disposal needs exceed this volume, this EA has continued using the scoped process identified in the Terms of Reference including the Evaluation of Alternatives Methods, the impacts and mitigation associated with the preferred Undertaking, consultation measures and commitments to additional actions to be taken during the design, operations, and final decommissioning of the landfill.

ES10. Phase 3: Redefine the Purpose and Rationale for the Undertaking

As it has been determined that expanding the St. Marys Landfill is the preferred solution, the Undertaking can be redefined to:

The expansion of the St. Marys landfill in order to provide the necessary capacity to fulfill the Town's post-diversion solid waste disposal needs for the next 40 years.

ES11. Phase 4: Define the Parameters of the Study

This Phase of the EA frames the parameters for the evaluation of Alternative Methods for Carrying out the Undertaking. The parameters of the study include:

- The *Alternative Methods* to be assessed;
- The Study Area;
- The timeframe to be considered;
- The evaluation criteria;
- The methodology for characterizing the existing environment; and
- The existing environment within which the Undertaking will be implemented.

ES11.1. Alternative Methods

Based on the consideration of a variety of design factors, the Study Team developed and identified five conceptual Alternative Methods summarized in Table ES.2.

Table ES.2: Summary of Alternative Methods

Alternative Methods		Description
	Do Nothing	As a requirement of the EA Act, the 'Do Nothing' Alternative must be considered. Do Nothing represent the result of no action being taken to address the Problem Statement and serves as a baseline against which other Alternatives can be compared.

Alternative Methods		Description
1	Vertical expansion of the existing landfill	This Alternative Method involves an expansion in the vertical direction within the existing footprint of the landfill.
2	Horizontal expansion of the existing landfill	This Alternative Method involves an expansion outside of the existing landfill footprint.
3	A combination of vertical and horizontal expansion	This Alternative Method would involve partial vertical expansion along with some horizontal expansion of the landfill footprint, basically a mixture of Methods 1 and 2.
4	Development of a new landfill footprint	This Alternative Method involves closure of the existing 8 ha footprint and development of a new landfill footprint elsewhere on the 37 ha Site.
5	Vertical expansion plus a new footprint	This Alternative Method is a combination of Alternative Methods 1 and 4.

Although each Alternative is technically feasible, Alternatives 1 and 4 do not provide sufficient volume to address the Town's landfill capacity needs. To meet the Town's waste disposal needs for the next 40 years, 708,000 m^3 of landfill capacity is required. Alternatives 1 and 4 provide only 500,000 m^3 and 397,000 m^3, respectively. Therefore, Alternatives 1 and 4 were discarded as feasible Alternatives as they do not fully address the Problem Statement.

ES12. Description of the Environment

ES12.1. Natural Environment

Air Quality

Following the MECP guidance documents, the emission rates of each contaminant were estimated and modelled using the current version of AERMOD as specified by the MECP. The results of that modeling show that the impact of each contaminant is below its respective criteria at every location along the property line and off-property. The contaminant with the highest off-property impact was particulate matter at 80% of the 24-hour criterion of 120 µg/m^3.

Noise

The existing impacts at sensitive receptors showed that the worst-case impact is well below the MECP's criteria during the day. The landfill does not operate at night.

Hydrogeology

The highest elevation on the Site today is the cement kiln dust stockpile (CKD) at 334 m amsl. The elevations of the fill areas are approximately 326 to 327 m. The lowest elevations on the Site occur along the watercourse. This channel enters the east

side of the Site at an elevation of approximately 310.0 m amsl and exits at the north end under Water Street South at 306.8 m amsl. Perth County Road 123 is a topographic ridge on the west side of the Site and acts as a drainage divide. West of the ridge, runoff flows to the Thames River. East of the road, runoff is eastward toward the landfill stormwater retention basins and the watercourse.

The regional overburden is the result of successive glacial till and inter-till deposits. The overburden is primarily silt till. The regional water table slopes downward from the east toward the west. However, flow along major rivers are toward those rivers. Therefore, in the St. Marys area, flow in the overburden is toward Trout Creek and the North Thames River. On the bedrock surface there is a general downward slope from east to west with local variations. The bedrock surface in the St. Marys area is approximately 300 m amsl. Regional flow in the bedrock is generally east to west. Groundwater flow in the bedrock below the Landfill Site is from the east toward the west and northwest. The North Thames River is above the surface of the bedrock and above the water level in the bedrock. Therefore, there is no groundwater discharge to the river at this point in the river. On the Landfill Site, the water level in the bedrock is 10 to 15 m below the top of the bedrock. Therefore, the bedrock is not fully saturated and is not a confined aquifer.

On the west side of the Landfill Site, groundwater in the shallow soils moves east toward the watercourse. On the east side of the watercourse, groundwater is mounded below the cement kiln dust stockpile, creating radial flow out from the stockpile, toward the watercourse and the exposed edge of the quarry. Based on the report compiled by Golder Associates on the Cement Kiln Dust (CKD) stockpile (from historic SMC operations) and ground water monitoring in June 2019, it was concluded that the groundwater quality is not homogeneous throughout the stockpile. The groundwater quality at the southeast corner of the stockpile is considerably better than the quality in the centre. The groundwater quality data shows an overall improvement with concentrations of many parameters in 2019 compared to 2005.

Groundwater movement through the overburden is minimal at the Site. Therefore, groundwater is not a pathway for significant landfill leachate movement. The groundwater contributes little to the streamflow even when there is discharge to the watercourse. Water quality samples upstream and downstream are similar with little change to water quality through the Site.

Annual monitoring at the Site is conducted in accordance with the ECA. Samples of leachate, groundwater and surface water are collected in the spring and fall and analyzed for general chemistry, metals and volatile organic compounds (VOC). There is little indication of landfill impacts at the Site. This is due to the combination of the low permeable till and the leachate collection systems.

Source Water Protection

The Site is more than 1,000 m from the Wellhead Protection Areas (WHP-A to WHPA-C). Two of the supply wells are GUDI with an additional WHPA-E. The landfill is outside and downstream of the WHPA-E. There are no SGRA mapped on the Landfill Site. A small area in the northeast corner of the Landfill Site is within an HVA.

St. Marys Cement (SMC) has historically dewatered both the plant north of the landfill and the Thomas Street Quarry west of Perth Road 123. They have also used water supply wells on the plant site to provide processing water. Dewatering at the plant site quarry is expected to continue for the life of the landfill since the cement plant is located on the quarry floor. There are no plans for future dewatering locations. The well closest to the landfill is not currently in use.

Surface Water

The Site is within the Upper (North) Thames River Drainage Basin. The North Thames River lies northwest of the Site limits. Locally, the river flows in a southwesterly direction from St. Marys. The primary surface water features of the Landfill Site are the watercourse and the two stormwater management basins. The unnamed watercourse flows through the Site from the southeast corner to the northwest corner.

Clean surface water from the west side of the Site is directed through a series of perimeter ditches and swales around the landfill footprints and along the interior roadways. The ditches and swales convey runoff to two stormwater retention basins.

These stormwater basins attenuate the peak flows during storm events and allow sedimentation. Surface water collected from the cover of the completed Phase I is directed Basin A (north basin). Surface water collected from the completed stages and perimeter of Phase II/III is directed to Basin B (south basin). The stormwater basins outlet to the watercourse via control features.

Semi-annual surface water monitoring is conducted as part of the landfill monitoring program. Water samples are collected in spring and fall from the watercourse and the two stormwater management basins. The main water quality indicators have been chloride, total phosphorus, iron and TSS.

The chloride concentrations at the Basin A outlet range from 30 to 130 mg/L. Iron and total phosphorus concentrations at the outlet are sporadically above the PWQO. TSS levels have had a historical range of less than 10 mg/L. Chloride concentrations at the inlet are typically higher than the outlet and exceeded the Aquatic Protection Value (APV) of 180 mg/L on two occasions (August 2012 and November 2014). Iron and phosphorous have been elevated levels typically exceeding the PWQO at both sampling stations. TSS at the outlet has generally been below 50 mg/L with occasional spikes to 60 to 80 mg/L. The quality at the Basin A outlet is better than the quality from Basin B. The water quality of on-site watercourse is similar between upstream and downstream.

Biology

Both the On-site Study Area and Study Area Vicinity are significantly disturbed and include a high number of human-influenced features and landscapes.

All the vegetation communities identified are considered to be relatively common in Ontario, including both upland and wetland, and natural and cultural vegetation habitats.

- Dry-Fresh Graminoid Meadow (MEGM3): represents the majority of the Site. Cool season grasses, including Smooth Brome (*Bromus inermis*), Quack Grass (*Elymus repens*) and Fescue species (*Festuca sp*.) are the dominant vegetation type found throughout this community.
- Graminoid Mineral Shallow Marsh (MASM1)/Willow Mineral Deciduous Thicket Swamp (SWTM3): This mixed wetland represents the watercourse that extends from the northwest corner of the Site to the central east property limit, at the base of the slopes.
- Cultural Woodland: This community is located on the east side of the Site, growing on the south facing portion of the slope. The dominant trees, Eastern Cottonwood and Manitoba Maple (*Acer negundo*), represent early successional species.
- Cultural Hedgerows: There are three Cultural Hedgerows identified within the On-site Study Area: one at the west limit and the other along the south property limit. The hedgerow at the west limit is predominantly White Spruce that has been planted to screen the landfill from Water Street South and the adjacent residences. Large deciduous species of Eastern Cottonwood and Green Ash are also found in the hedgerow, as well as groupings of Common Buckthorn. The hedgerow at the south property limit is dominated by Manitoba Maple with meadow groundcover in the base in the western portion of the community. The third hedgerow is located at the northwest corner of the site, adjacent to the rural residence. It is comprised of a mix of mid-aged Eastern White Cedar, Black Walnut (*Juglans nigra*), Norway Spruce (*Picea abies*).
- Fresh-Moist Lowland Deciduous Forest (FODM7) (Study Area Vicinity): This forest is located on the east side of the Thames River and is dominated by Willow with associates of White Elm (*Ulmus americana*) and Manitoba Maple.

There are no Significant Wetlands, Woodlands, Valleylands or ANSIs in the On-site Study Area; however, some of these features are present in the Study Area Vicinity. Significant Woodlands and Valleylands are associated with the Thames River and the treed areas along its banks. The St. Marys Cement Company Provincially Significant Earth Science ANSI is located west of the Thames River within the Study Area Vicinity. No other ANSIs were identified within the Study Area Vicinity.

Four bird species listed as either provincially and/or federally significant were observed within the On-site Study Area during the breeding bird surveys: Bald Eagle, Bank Swallow, Barn Swallow, and Eastern Meadowlark. Bald Eagle was a flyover observation

only; no key habitat features required by this species are present at the Site. Nesting and foraging habitat for Eastern Meadowlark was confirmed in the Study Area with the suitable nesting habitat at the two capped areas of the landfill (not currently active areas of the landfill operations).

Potential hibernation habitat for Midland Painted Turtle may be present within the existing watercourse. Three species of snakes were observed under cover board materials or materials adjacent to cover boards: Dekay's Brownsnake (*Storeria dekayi*), Eastern Gartersnake (*Thamnophis sirtalis sirtalis*) and Eastern Milksnake. Based on these observations, it is highly likely that reptile hibernaculum is present within the landfill limits.

Eight terrestrial crayfish burrows were incidentally observed during breeding bird surveys/snake cover board surveys. The burrows were observed at the edges of damp Common Reed pockets that have established in the area northwest of the capped cement kiln dust pile.

Two Monarch butterflies (*Danaus plexippus*) were recorded in the cultural meadow of the On-site Study Area during the site visit. The presence of Common Milkweed (*Asclepias syriaca*), which serves as both host (caterpillar) and nectar (food source) plant, indicates that suitable habitat for this species is present within the On-site Study Area. Other wildflower nectar sources also support the species. Monarch is listed as Special Concern under the ESA, 2007.

Several incidental observations of mammals were documented during the field investigations. None of these species are listed as provincially and/or federally significant; all are considered to be common, widespread, and abundant in the province.

Based on the species observed and ecosystems present, several types of Significant Wildlife Habitat (SWH) have been confirmed present or are potentially present and identified as "Candidate Habitat". Candidate and confirmed SWH present in the On-site Study Area and Study Area Vicinity are identified in Table ES.3.

Table ES.3: Candidate and Confirmed SWH present in the On-site Study Area and Vicinity

On-Site Study Area	Study Area Vicinity*
Seasonal Concentration Areas of Animals	
Candidate Reptile Hibernaculum	• Candidate Raptor Wintering Area • Candidate Bat Maternity Colonies • Candidate Turtle Wintering Areas • Candidate Reptile Hibernaculum
Specialized Wildlife Habitat	
None present	• Candidate Bald Eagle and Osprey Nesting, Foraging and Perching Habitat • Candidate Turtle Nesting Areas

On-Site Study Area	Study Area Vicinity*
	• Candidate Amphibian Breeding Habitat (Woodland)
Habitat of Species of Conservation Concern	
Confirmed Terrestrial Crayfish	Candidate Terrestrial Crayfish
Confirmed Special Concern and Rare Wildlife Species: • Monarch (SC) Other: • Eastern Milksnake (formerly listed as SC under SARO; listed as SC under COSEWIC and SARA)	Candidate Special Concern and Rare Wildlife Species: • Bald Eagle • Common Nighthawk • Eastern Wood-pewee • Red-headed Woodpecker • Wood Thrush • Monarch • West Virginia White • Eastern Milksnake • Eastern Ribbonsnake • Northern Map Turtle • Snapping Turtle • Northern Brook Lamprey
Animal Movement Corridors	
None present	Candidate Amphibian Movement Corridors

With the exception of one “Common” Crayfish, no fish were visually observed or captured during the aquatic assessment and fish presence survey. The watercourse on-site does not contain or provide habitat for any fish SAR. However, because the subject watercourse is connected upstream to the Sgariglia Drain, and downstream to the Thames River, it is considered to be indirect fish habitat and contributes to the water quality and quantity of the Thames River. Since the Thames River is known to provide fish habitat and habitat for several aquatic SAR, the proposed works must avoid causing a HADD (as described in the Fisheries Act) to the downstream habitat in the Thames River.

ES12.2. Cultural Environment

Built Heritage Resources and Cultural Heritage Landscapes

12 cultural heritage resources were identified within the Study Area Vicinity. Of these, 11 are Cultural Heritage Landscapes and one is a Built Heritage Resource. No cultural heritage resources were identified within the On-site Study Area. The closest resources to the Landfill Site are the St. Marys Cement Plant. A resource identified (farm property) on Water Street is directly adjacent to the landfill and surrounded by the landfill property on it northern, eastern, and southern borders.

Archaeological Resources

A Stage 1 Archaeological Assessment determined that no previously registered archaeological sites are located within 1 km of the Study Area. A property inspection conducted by a registered archaeologist determined that the entire On-site Study Area has been subject to deep and extensive land disturbance and, as such, is considered to not retain archaeological potential.

ES12.3. Socio-Economic Environment

Population – The Town of St. Marys has a population of a 7,265 according to the 2016 Census. Between 2011 and 2016, the Town population changed from 6,655 to 7,265 (Statistics Canada, 2016).

Land Use – The Town of St. Marys, located on the banks of the Thames River in southwestern Ontario, has a thriving tourism sector and places significant importance on its natural and cultural heritage sites. The landfill property is located along the southwestern edge of the Town, bordering the Township of Perth South in the County of Perth. Adjacent lands therefore span multiple jurisdictions. According to the Town of St. Marys Official Plan, the landfill property is identified as an Environmental Constraint area. Surrounding land uses within the Town include Extractive Industrial uses to the north, northeast and west that encompass the operations of St. Marys Cement. The small residential property immediately to the west of the landfill is zoned as Development. Currently, no properties have been assigned this zone as no future developments are proposed in close proximity to the landfill[3].

Land use related conflicts, including odour, noise and dust concerns, between residents and landfills are not unusual. Town complaint summaries indicate that odour issues are influenced by wind direction (from the east or northeast) following wet site conditions. Annual Monitoring Reports (AMRs) have been prepared since landfill operations began in 1984 and monitoring events are completed twice a year; in the Spring and in the Fall, in compliance with the Site's Environmental Compliance Approval (ECA). No monitoring results in the last five years have indicated that operations at the facility have impacted on recreation, enjoyment of private property or neighboring businesses, including agricultural and quarrying industries. However, correspondence received during the development of the TOR revealed that odours from current landfill operations were deterring customers and negatively impacting sales at a neighbouring farm.

Traffic – The St. Marys Landfill access is a semi-paved tar and chip driveway, located on the east side of Perth Road 123. The landfill site access is stop-sign controlled and forms a T-intersection with Perth Road 123. All traffic into and out of the site uses this

[3] Since the beginning of this EA study, a number of new residential units have been built mostly concentrated near the entrance to the landfill site, filling in some of the gaps between existing residences.

entrance. Perth Road 123 is a two-lane arterial road under the jurisdiction of the County of Perth. It has a posted speed of 80 km/h in the area of the landfill access. Perth Road 123 becomes Water Street South, a road under the jurisdiction of the Town of St. Marys, at a location about 470 m to the north of the landfill access. Water Street South has a posted speed of 50 km/h. There are no new developments or planned road improvements in the Study Area that may impact traffic on Perth Road 123 or Water Street South near the landfill. There are no existing traffic concerns associated with the entrance or major access routes to the landfill.

Economic Conditions

Economic drivers in the Study Area primarily include the St. Marys Cement operation and agricultural uses to the south and west of the Landfill Site. St. Marys Cement is a key industry for the Town.

In 2016, the employment rate for St. Marys was at 64.8% and the unemployment rate was at 2.5% this is much better than Ontario as a whole. In 2016, 25.6% of St. Marys labour force was employed in management occupations, educational and social services, business and finance, or as health care practitioners. Statistics obtained from the Town's Community Based Strategic Plan (2010), suggests that the Town has a higher percentage of income earners between $30,000 and $99,999 when compared to other regions (Perth, Stratford and the GTA) but lags in the percentage of households earning $100,000 or over.

There are currently eight persons employed at the existing landfill ('as occasionally needed' positions). The Town of St. Marys 2016 budget attributed total staff salary for these employees as approximately $106,000. Continued employment of these individuals provides stability for local employment and the economy.

Social Conditions

In total, there are 16 residences within 120 m of the landfill and 44 residences within the 1 km Study Area Vicinity. The Study Area Vicinity is characterized by industrial uses and a small number of houses and businesses. Several commercial and light industrial businesses are present along James Street South, east of St. Marys Cement. There are no community spaces, public parks or other social services provided in the Study Area Vicinity.

ES12.4. Indigenous Connections to the Land

Indigenous peoples made use of the lands in the Study Area for thousands of years before the European contact. The Thames River was of particular importance as a travel and trade route and source of fish. There are several Indigenous communities that are believed to have constitutionally protected Indigenous or Treaty Rights (or both) associated with the Study Area, or a portion of it.

Phase 5: Assess Alternative Methods for Carrying Out the Undertaking

ES12.5. Evaluation Criteria

The criteria used in this evaluation are similar to those used in the Evaluation of Alternatives to the Undertaking.

ES12.6. Natural Environment

Air Quality and Odour – The maximum Point of Impingement (POI) concentrations were calculated based on the operating conditions where all significant sources are operating simultaneously at their individual maximum rates of production. All the predicted POI concentrations for contaminants were predicted to be below the acceptable levels according to the Air Contaminants Benchmarks (ACB) List, 2018. Odour impacts are at levels generally considered acceptable. The model indicates that the receptors generally do not exceed 6 Odour Units (OU) which is the level at which odour complaints are received. The frequency of this is less than 0.5% at all receptors. The preferred alternative, Alternative Method 3, shows the highest impact but the impact is still at acceptable levels.

Noise – The existing operation, assuming the worst noise emissions possible, shows compliance with the MECP criteria of 55 dBA during the day. Under all five *Alternative Methods*, the noise impact at all receptors is also less than the MECP criterion of 55 dBA. No net effects associated with noise are expected. General mitigation measures will be followed during construction and operation.

Hydrogeology – Each Alternative Method was evaluated according the how it would alter the Site. The alterations included, for example, height of the waste mound, waste footprints, topography and slopes, and stormwater and leachate controls.

The effect of each alteration was then considered on Leachate Generation, Groundwater Quality and Groundwater quantity. It was noted that some impacts could be positive such as increasing the buffer distance between waste and property boundary. A detailed comparison was done for the Hydrogeology Study Volume III, Appendix C.

Mitigation measures were assigned to each negative effect. It is possible to mitigate the effects by monitoring, changing operations, extending current engineering controls (LCS) or adding new engineering controls (full liner). Therefore, while none of the alternatives would have a net effect, each had varying magnitudes of mitigation measures.

Therefore, to differentiate Alternatives, each effect and the associated mitigation measure was ranked according to the perceived magnitude. The magnitude was based on both the potential severity of the effect and the scale of the mitigation measures needed to address it. The Alternative Methods were then ranked according to number of effects (positive and negative) and severity of impact and mitigation.

Surface Water – Each Alternative Method was evaluated according to how it would alter the Site. The alterations included, for example, height of the waste mound, waste footprints, topography and slopes, and stormwater and leachate controls.

The effect of each alteration was then considered on Surface Water Quality and Quantity. It was noted that some impacts could be positive such as increasing the buffer distance between waste and surface water features. A detailed comparison was done for the Hydrogeology Study Volume III, Appendix C.

The Alternative Methods were then ranked according to number of effects (positive and negative) and severity of impact and mitigation.

Biology – In the On-Site Study Area, the only natural features present are:

- Candidate Reptile Hibernacula;
- Habitat for Terrestrial Crayfish, Monarch and Eastern Milksnake, all of which are Considered to be rare species;
- Nesting habitat for Eastern Meadowlark, a Threatened species;
- Foraging habitat for barn swallow and bank swallow, both Threatened species; and
- Fish habitat.

Several other natural features are present in the Study Area Vicinity. Only a small number have the potential to be affected by the Undertaking as they are downstream of the site along the Thames River. These include:

- Turtle Wintering Areas;
- Turtle Nesting Areas;
- Amphibian Breeding Habitat (Woodland);
- Habitat for Terrestrial Crayfish; and
- Fish Habitat.

Under baseline conditions (i.e., the Do Nothing Alternative), there are a small number of natural features present, all of which have been disturbed to varying extents by the existing landfill and surrounding land uses. After mitigation has been applied, the net effects of all of the Alternatives are expected to be limited.

Any habitats lost will be recreated through additional plantings either on the Site or another nearby location. Thus, no net effects are anticipated with the exception of habitat for terrestrial crayfish. This habitat is difficult to recreate and thus some alternatives will result in a net loss of this habitat.

In the long-term it is expected that aquatic habitat will improve with Alternatives in which the watercourse is relocated.

All impacts to downstream fish and wildlife habitat can be appropriately mitigated with sediment and erosion control measures and measure to minimize the impacts of in-water works.

ES12.7. Cultural Environment

Potential Impacts to Built Heritage Resources – There is one Built Heritage Resource present in the Study Area Vicinity, located at 481 Water Street South. No impacts are anticipated. No visual connection and no impacts are anticipated with respect to any of the Alternative Methods. No mitigation is required, and no net effects are anticipated.

Cultural Heritage Landscapes – There are 11 cultural heritage landscapes located within the Study Area Vicinity. Of these, two are directly adjacent to the landfill. The St. Marys Cement Plant Industrial Complex is located to the west. Any impacts to the feature from any of the Alternative Methods are considered minimal, given the industrial nature of the resource.

The farmscape located at 1025 Water Street South is directly adjacent to the landfill. As cultural landscapes are designated based on the perception of scenes and landscape view, visual impacts from adjacent land uses can be detrimental. Other Cultural Heritage Landscapes are also present in the Study Area Vicinity, including farm and streetscapes which may have a view of the landfill. It was therefore assumed that any alternative with a higher elevation could potentially have a greater impact than alternatives at a lower elevation. Alternative 5 will have elevations that are higher than the existing peak height of the landfill. Alternative 3 is only slightly higher (2 m higher than existing peak) and Alternative 2 offer a design that is lower than existing landscape features and will thus have a more minimal effect on the overall landscape.

With appropriate visual screening, including boundary tree plantings, impacts to views can be minimized. During detailed design, a Cultural Heritage Impact Assessment will be required to further assess impacts and identify additional mitigation measures with all cultural heritage resources.

Archaeological Resources – There are no previously registered archaeological sites located within the Study Area Vicinity. The On-Site Study Area offers no archaeological potential, given its past and current disturbances. As such, no archaeological resources are present and no impacts to archaeological resources are anticipated with respect to any of the Alternative Methods. Mitigation to address the discovery of unexpected artifacts will be implemented. With this no net effects are anticipated.

ES12.8. Socio-Economic Environment

Land Use – None of the Alternatives changes the land use designation of the Site. Compatibility with surrounding land uses remains unchanged. A landfill is compatible with adjacent aggregate operations and rural landscapes. Some occasional conflicts with nearby residents can be expected. The Township of Perth zoning by-law does not

include appropriate restrictions for adjacent land uses. The need for restrictions applies to all Alternative Methods. With the application of appropriate zoning measures, no net effects associated with land use are expected.

Transportation Routes – None of the Alternatives is expected to increase the amount of waste generated or transported to the landfill, with the exception of small increases as the Town's population grows. All Alternatives will continue to be accessed through the existing entrance off Water Street which is sufficient to meet traffic demands through 2059 and beyond. No effects on traffic are expected and no mitigation is required. No net effects are expected.

Employment Effects – No changes to the staffing at the landfill are expected for any of the Alternatives. A small number of additional short-term temporary positions may be required during construction. No effects on employment are expected. No mitigation is required, and not net effects are anticipated.

Economic Conditions – It is expected that small businesses that are currently serviced by local curbside waste pick up will not have any service changes. Businesses that currently use a private waste collection service will likely continue to do so. As such, none of the Alternatives will have an effect on businesses. No mitigation is required, and no net effects are expected:

- *Aesthetics and Enjoyment of Life* – Under baseline conditions some complaints have been received in recent years due to odour and dust concerns. The number of complaints is not considered to be out of the ordinary with respect to landfill operations and are typically addressed quickly. No changes from baseline conditions are expected for lower elevation Alternatives (i.e., Alternatives 2 and 3). Net effects may be expected for Alternative 5 which can be improved through existing and additional visual blockages that can be erected as part of the new landfill design. Additional berms and tree plantings may not be sufficient to fully block Alternatives with a higher elevation. All noise, odour and air quality related net effects are expected to be low and below provincial emission limits.

ES12.9. Indigenous Connections to the Land

Under baseline conditions lands historically used by Indigenous communities have been subject to aggregate extraction and landfilling for nearly a century, removing any potential for traditional use.

Impacts to Traditional Uses, Land Claims and Treaty and Indigenous Rights are not quantified as these impacts are difficult to measure. However, it is noted that there will be no opportunity to return lands to a condition under which they could be used for traditional uses in the short-term.

ES12.10. Financial Factors

Capital Costs – The cost for capital works was estimated to be $7,360,000 based on the conceptual design of Alternative Method 3 – a combination of vertical and horizontal expansion. The expanded footprint is approximately 3.6 ha, meaning that much of the Site's existing base, with its leachate collection system, can be utilized for the expansion.

Compared to Alternative 3, the remaining Alternatives are assumed to have a higher or lower capital cost:

- Alternative Method 2 is a horizontal expansion. It is expected that this horizontal expansion will require a new base area of approximately 7.0 ha. The larger footprint still requires the relocation of the existing watercourse. It will also require additional ditching and a larger stormwater management pond to control the larger footprint.
- Method 5 eliminates the need for additional EA Planning Period capacity, but it is inefficient from a capital cost perspective for the same reasons mentioned for Methods 1 and 4. Verses the baseline cost estimate, the only savings is that the watercourse realignment is not required. Overall, Method 5 is expected to be costlier than Alternative 3.

Operational and Maintenance Costs

For most operational items during the Site's lifespan or following closure, there is essentially no difference between the Alternative Methods. Staffing and equipment requirements, and monitoring are expected to be the same. The differences are related to items like quantity of leachate requiring disposal and maintenance requirements. A smaller waste footprint generates less leachate than a larger footprint and a larger footprint will require more maintenance than a smaller footprint. The operation and maintenance cost was estimated to be $17,500,000 based on the conceptual design of Alternative Method 3 – a combination of vertical and horizontal expansion.

Compared to the Alternative 3 operations and maintenance costs:

1. Alternative Method 2 is a horizontal expansion. This expansion requires approximately 7.0 ha of new landfill footprint. There will therefore be more length of leachate and stormwater facilities as well as more leachate generated than would be anticipated by the baseline operational cost estimate.

2. Alternative Method 5 is a vertical expansion plus a new footprint that's up to 6.1 ha. Compared to the baseline operational costs, there is more leachate requiring disposal and the maintenance required for the leachate and stormwater systems will be higher as well. As a result, Method 5 is expected to cost more than the baseline for operations.

ES12.11. Technical Factors

Landfill expansion requires extensive permitting and approvals through a variety of agencies. All Alternatives will require completion of this EA followed by MEPC authorization with an Environmental Compliance Approval (ECA) related to landfill operations, stormwater controls and the leachate collection system. All Alternatives will also require completion of further studies with respect to Cultural Heritage Landscapes and acceptance of a Cultural Heritage Impact Assessment from MTCS. Differences lie in the permitting required in relation to natural features.

With respect to ease of engineering, all Alternatives are technically feasible. The infrastructure and engineering requirements differ for each Alternative, with Alternatives 3 and 5 requiring more extensive infrastructure upgrades.

ES12.12. Preferred Method for Landfill Expansion

A full evaluation of the alternative methods was undertaken. Scoring was based on quantitative measures where possible. For many criteria (e.g., technical factors), impacts were based on qualitative assessment and professional experience.

Based on this scoring and the advantages and disadvantages of each alternative it was determined that:

- Alternative 3, expanding the landfill using a combination of vertical and horizontal expansion was Preferred, Somewhat Preferred of Equally Preferred in all major categories (Natural Environment, Cultural Environment, Socio-economic Environment, Indigenous connections, Financial and Technical).

Overall, expanding the St. Marys Landfill both vertically and horizontally, per Alternative Method 3, is preferred. A summary of net effects is provided in Table ES.4.

Table ES.4: Evaluation of Alternative Methods

Criteria	Comparison to the Do Nothing Alternative		
	Alternative 2: Horizontal Expansion of the Existing Landfill	**Alternative 3: A Combination of Vertical and Horizontal Expansion**	**Alternative 5: Vertical Expansion plus a New Footprint**
Natural Environment			
Potential Impacts to Air Quality	Equally Preferred	Equally Preferred	Equally Preferred
Potential Effects due to Odour	Equally Preferred	Less Preferred	Somewhat Less Preferred
Potential Effects of Noise	Equally Preferred	Equally Preferred	Equally Preferred

Criteria	Comparison to the Do Nothing Alternative		
	Alternative 2: Horizontal Expansion of the Existing Landfill	**Alternative 3: A Combination of Vertical and Horizontal Expansion**	**Alternative 5: Vertical Expansion plus a New Footprint**
Potential Impacts to Groundwater	Equally Preferred	Equally Preferred	Less Preferred
Potential Impacts to Surface Water Quality	Somewhat Preferred	Somewhat Preferred	Equally Preferred
Potential Impacts to Surface Water Quantity	Equally Preferred	Equally Preferred	Equally Preferred
Potential Impacts to Biology	Somewhat Less Preferred	Preferred	Less Preferred
Cultural Environment			
Potential Impacts to Built Heritage Resources	Equally Preferred	Equally Preferred	Equally Preferred
Potential Impacts to Cultural Heritage Landscapes	Equally Preferred	Somewhat Less Preferred	Less Preferred
Potential Impacts to Archaeological Resources	Equally Preferred	Equally Preferred	Equally Preferred
Socio-economic Environment			
Potential Impacts to Transportation Routes	Equally Preferred	Equally Preferred	Equally Preferred
Land Use	Somewhat Preferred	Preferred	Somewhat Preferred
Employment Effects	Somewhat Preferred	Somewhat Preferred	Somewhat Preferred
Economic Conditions	Equally Preferred	Equally Preferred	Equally Preferred
Social Conditions	Equally Preferred	Equally Preferred	Equally Preferred
Indigenous Connections to the Land			
Traditional and Historic Uses/Land Claims/Indigenous and Treaty Rights/ Environmental Concerns	Equally Preferred	Equally Preferred	Equally Preferred

Criteria	Comparison to the Do Nothing Alternative		
	Alternative 2: Horizontal Expansion of the Existing Landfill	**Alternative 3: A Combination of Vertical and Horizontal Expansion**	**Alternative 5: Vertical Expansion plus a New Footprint**
Financial Factors			
Capital and Operational Costs	Less Preferred	Somewhat Less Preferred	Less Preferred
Technical Factors			
Technical Ability to Carry Out Each Alternative	Preferred	Somewhat Preferred	Preferred
Overall Preference	**Somewhat Preferred**	**Preferred**	**Less Preferred**

ES13. Climate Change

Effect of the Preferred Alternative on Climate Change

The landfill's impact on climate change is most directly linked to the fugitive emissions of landfill gas (LFG). This is created by the decomposition of the waste in the landfill. LFG is roughly half carbon dioxide (CO_2) and half methane (CH_4) with a small percentage of other gasses. Ontario Regulation 232/98 under the *Environmental Protection Act* states that landfill sites containing 1.5 million cubic meters (1.5 Mm^3) of landfill capacity or more are required to install an LFG capture and destruction system. Preferred Alternative for the facility expansion (over the 40-year EA Planning Period), averaged over the Site's life, would contribute approximately 0.24% of Ontario's annual solid waste related GHG emissions and approximately 0.001% of the total annual GHG emissions from Ontario. In the national context, expanded landfill will contribute approximately 0.004% of Canada's annual solid waste related GHG emissions, or approximately 0.0003% of the country's total annual GHG emissions.

Effect of Climate Change on the Preferred Alternative

Increased severity of storm events, more intense but less frequent rainfall events, and reduced snow cover over the long-term are the most likely and relevant results of climate change on the design of the Preferred Alternative. The potential impacts are largely limited to the design of the SWM infrastructure requiring an increased capture volume for ditches and ponds, as well as additional erosion protection as more intense storm events result in higher flow velocities across the landfill cover, in ditches and swales and at discharge points.

The design of the Preferred Alternative will address the MECP design criteria for approval for an ECA under the OWRA, in addition to the landfill-specific requirements in

O. Reg. 232/98. Additional storage areas will be added to the existing stormwater management system to satisfy quantity and quality requirements for the Preferred Alternative.

Climate Change should also be considered in the Site's design. Ensuring the maximum slope is no greater than 25% (4 m run for every 1 m rise, or 4:1), as required by O. Reg. 232/98, will help to mitigate this Climate Change effect.

There may be changes in the precipitation patterns that result in less frequent yet more intense rain. If this occurs as expected, leachate generation could be reduced. Intense rain events result in more runoff than infiltration.

Climate Change results in an increase in the amount of materials being received at landfills in the form of food waste (i.e., from power outages), clean-up debris, construction and demolition debris and reconstruction scrap. Based on an incorporated U.S. Army Corps of Engineers debris model for a single Category 1 hurricane, approximately five months or 1% of additional capacity could be utilized in dealing with the storm debris.

ES14. Consultation

Consultation with the public, Indigenous communities, review agencies and organizations were ongoing throughout the EA process in accordance with the consultation plan described in the approved TOR. A variety of consultation events and activities were used. The consultation events were designed to facilitate engagement of potentially interested persons in the progress of the EA.

The consultation activities carried out during the EA included:

- Circulation of Notices to property owners within the Study Area Vicinity.
- Circulation of Notices to seven Indigenous communities with potential interest in the Project including follow-up calls with Indigenous communities following circulation of Notices to confirm receipt and level of interest in the Project.
- Circulation of Notice to Applicable review agencies and organizations (federal, provincial, municipal governments, conservation authority and utilities).
- Circulation of Notices to individuals that signed in at project Public Information Centres (PICs).
- Notices published in local newspapers.
- Notices on the Town's website (https://www.townofstmarys.com/en/living-here/Landfill-Environmental-Assessment.aspx).
- Posting of EA documents on the Town's website.
- Hosting of two PICs.
- Four meetings and several telephone calls between Town and the MECP.

- One meeting with HDI.
- Letters sent to all Indigenous communities on the Project Contact List to inform them of planned field work assignments and invite representatives from their communities to observe field work.

The consultation activities are described in Section 9.0 of this EA Report with complete documentation provided in Record of Consultation.

ES15. Monitoring and Contingency

Construction, operation and decommissioning of the landfill expansion are expected to result in a number of impacts to the natural, cultural, social and built environments. Potential impact resulting from the *Undertaking*, mitigation measures and net effects are identified in Section 8.0 (Table 8-1). Monitoring requirements and contingency measures have also been identified to ensure that:

- Predicted net effects are not exceeded;
- Unexpected negative effects are addressed; and
- Predicted mitigation effects are realized.

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