Draft Alternative Methods Reports

Walker South Landfill Phase 2 Environmental Assessment

Walker Environmental Group

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1. Introduction

1.1 Background

Walker's Resource Management Campus (Campus) is located at 2800 Thorold Townline Road in the City of Niagara Falls. The Campus has existed since the 1880s and has provided safe, reliable and affordable waste disposal services for over 40 years.

The South Landfill is a central component of Walker's fully integrated Campus (Figure 1.1) and has been operating since 2009 under Environmental Compliance Approval (ECA) No. 0084-78RKAM, as amended. It has a total approved site capacity of 17.7 million cubic metres (m^3). The South Landfill provides safe, reliable, and affordable disposal capacity for solid, non-hazardous waste from residential and industrial, commercial, and institutional (IC&I) sources. It serves customers from the City of Niagara Falls, the Regional Municipality of Niagara, and the Province of Ontario.

In 2023, Walker Environmental Group (Walker) initiated a Comprehensive Environmental Assessment (EA) under the Ontario *EA Act* seeking approval to expand the capacity of its existing South Landfill as it is expected to reach its current maximum capacity by 2029 to 2031. The South Landfill provides essential resource recovery, renewable energy, and residual waste management infrastructure to the Niagara Region, surrounding communities and Ontario as a whole.

The proposed Phase 2 of the South Landfill would extend its approved capacity by approximately 18 million m^3 over a 20-year period, ensuring Walker can continue to provide essential residual waste disposal services to its existing customer base. Walker is proposing to locate the additional disposal capacity (Phase 2) to the east of the existing South Landfill within the area currently occupied by Walker's Southeast Quarry. The proposal would maintain the existing landfill service area, as well as the annual volume of solid, non-hazardous waste from the sources currently accepted.

The Minister-approved Terms of Reference (ToR) committed to providing details on the proposed Alternative Methods of Carrying Out the Undertaking (Alternative Methods) during the EA. This report presents the evaluation of alternative landfill configuration options and leachate management options.

1.2 Objectives of the Document

The purpose of this report is as follows:

– to present further details on the Landfill Configuration Options and Leachate Management Options, collectively referred to as the Alternative Methods;
– to present the assessment and evaluation of Alternative Landfill Configuration Options and Leachate Management Options; and,
– provide the rationale for the selection of the Preferred Landfill Configuration method and of Leachate Management method.

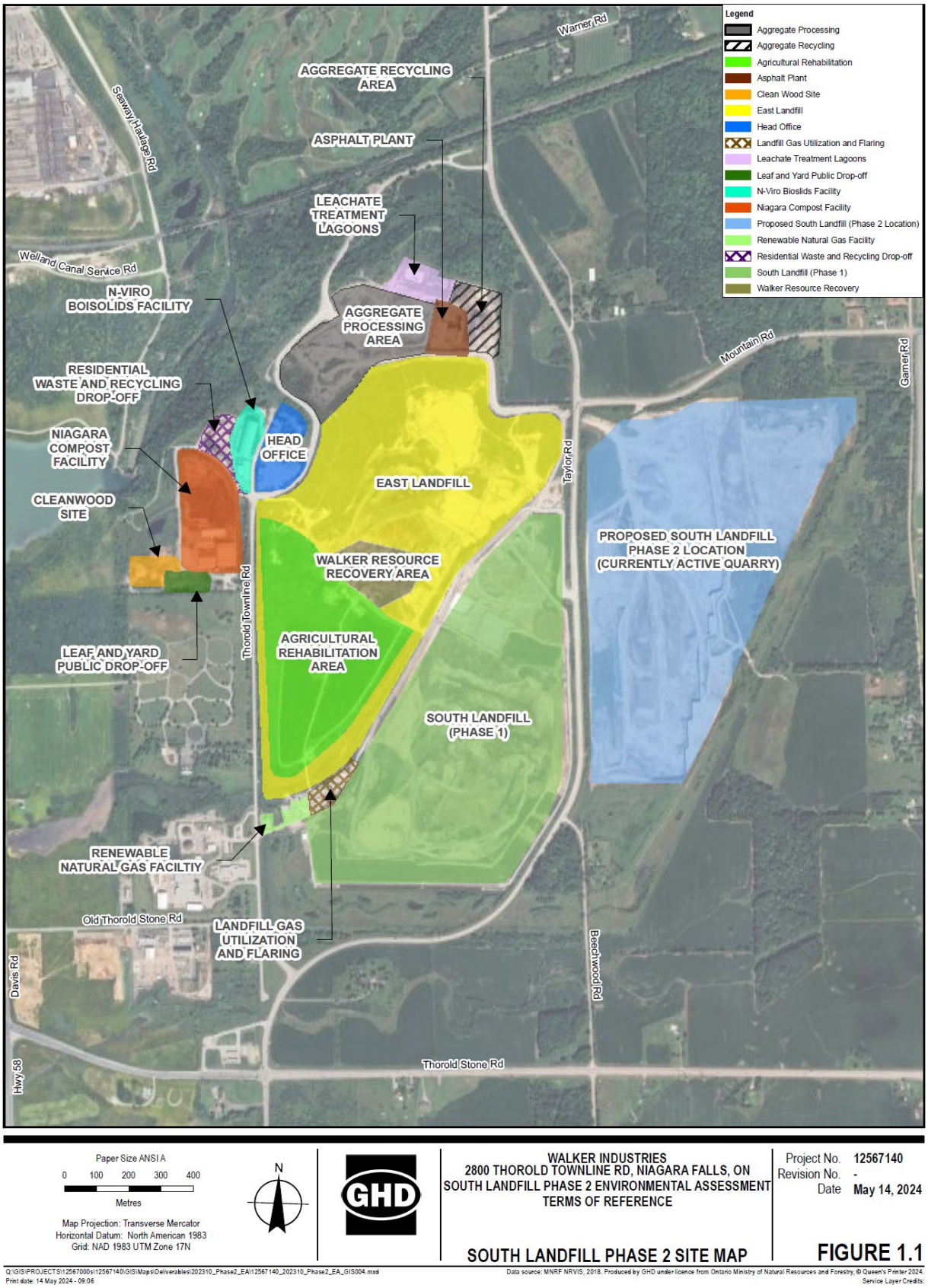

Figure 1.1 South Landfill Phase 2 Proposed Expansion Area

2. Conceptual Design Basis for the Alternative Methods

As committed to in the Minister-approved Terms of Reference (ToR) for the South Landfill Phase 2 Environmental Assessment (EA), the detailed description of each of the preceding Alternative Methods was based on a conceptual level of design reflecting existing regulatory requirements and the operational aspects of the South Landfill. In addition to the Minister-approved ToR for the South Landfill Phase 2 EA, the following documents were considered as part of developing the detailed descriptions:

– Ontario Regulation [O. Reg.] 243/23 – Waste Management Projects under the EA Act
– O. Reg. 50/24: Part II.3 Projects – Designations and Exemptions (the Comprehensive EA Projects Regulation) under the EA Act
– O. Reg. 232/98 – Landfilling Sites, under the Environmental Protection Act (Last amendment: O. Reg. 268/11, October 31, 2011)
– Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfilling Sites, Ontario Ministry of the Environment, Conservation and Parks (MECP) (Last revision: January 2012)
– ECA No. 0084-78RKAM
– Aggregate Resources Act (ARA) licence No. 11175
– ARA licence No. 4437

Each of the conceptual designs incorporated the following elements as fully documented in the South Landfill Phase 2 EA Conceptual Design Report (CDR; **Appendix A**):

– Site capacity and fill rate
– Footprint size
– Final contours and slopes
– Peak elevation and height relative to the surrounding landscape
– Buffer zones between the proposed South Landfill Phase 2 footprint and the property boundary
– Setbacks to surrounding developments
– Infrastructure requirements
– Leachate management
– Stormwater management
– Landfill gas management
– Site entrance and weight stations
– Operations

For context purposes, an overview of each of the preceding elements common to the Alternative Methods is provided first in the following subsections, followed by a detailed description of each Alternative Method in Sections 3.1 and 3.2.

2.1 Site Capacity and Fill Rate

The South Landfill has a total approved site capacity of 17.7 million m^3 consisting of non-hazardous waste from residential and Industrial, Commercial, and Institutional (IC&I) sources. It has an annual fill of 1.1 million tonnes (a maximum of 850,000 tonnes of residual waste plus an additional 250,000 tonnes of soil used for daily and interim cover per year). The current approved capacity at the South Landfill (Phase 1) is estimated to be reached between 2029 and 2031. The expansion proposed under this EA is to increase the site capacity by approximately 18 million m^3

over a 20-year period and the current annual maximum fill rate of 1.1 million tonnes is proposed to be maintained for South Landfill (Phase 2).

2.2 Footprint Size

To accommodate the capacity expansion, the proposed footprint, or Fill Area, for all Landfill Configuration Options is 62.6 hectares (ha), and is contained within the Extraction Limit of the existing Southeast Quarry. The Waste Disposal Site Boundary Limits, which encompass the Fill Area, a 30 m buffer, and ancillary infrastructures area, is 82.9 ha (see Figure 2.1, and Section 2.6). The Waste Disposal Site Boundary Limits are fully within the Walker property.

2.3 Final Contours and Slopes

The regulatory requirements specify a maximum slope of four units horizontal to one unit vertical (4H to 1V, or 25%) and a minimum slope of 20H to 1V (5%), but allow variance where it can be shown to be appropriate with respect to slope stability, erosion potential, end uses, and infiltration requirements for groundwater protection.

2.4 Peak Elevation and Height

The peak elevation of the South Landfill Phase 2 refers to the highest point of the landfill measured in metres above mean sea level (mAMSL), while the height of the South Landfill Phase 2 is measured relative to the surrounding landscape and is measured in metres above grade. The peak elevation and maximum top of waste (TOW) height for the Alternative Methods was identified based on the goal of minimizing visual impacts to the landscape and will be limited to 212 mAMSL and 31 metres above grade. The height of the landfill is minimized as the proposed designs include an existing excavation of approximately 18 metres below existing grade (i.e., the mined-out quarry footprint).

2.5 Buffer Areas

Regulatory requirements specify a minimum buffer width of 100 metres (m) between the limit of the residual footprint and the Site boundary, but allow this to be reduced to 30 m if it is shown to be appropriate based on a Site-specific assessment (e.g., if the buffer provides adequate space for vehicle movements, ancillary facilities, and ensures that potential effects from the Site operations do not have unacceptable impacts outside of the Site).

For the South Landfill Phase 2, the proposed buffer zones and setbacks include a 30 m buffer around the entire perimeter of the Site (Figure 2.1). Additionally, there is extra buffer space at the south end of the proposed Fill Area to accommodate infrastructure such as office facilities, staff parking, and stormwater management (SWM) systems.

While there is potential that the entire proposed Buffer Area may be disturbed, the extent of this disturbance will be determined as the design is refined. It is possible that not all of the Buffer Area will need to be disturbed to accommodate the necessary infrastructure and monitoring/maintenance access.

2.6 Setbacks to Surrounding Developments

In addition to the on-Site buffers noted above that will be maintained in relation to the South Landfill Phase 2, additional buffer separation is achieved through road allowances and setbacks for other developments required in accordance with local planning by-laws. The setback between the South Landfill Phase 2 Perimeter of Fill Area and the nearest privately owned land is approximately 235 m (Figure 2.1).

2.7 Infrastructure Requirements

The South Landfill Phase 2 will require various infrastructure components in order to operate the Site. The components shall consist of preexisting infrastructure as well as new installations and are as follows:

– 3-phase electrical power access

– Leachate management system
– Landfill gas collection system and utilization facility
– Taylor Road main entrance
– Scale Facility
– Taylor Road underpass/tunnel
– Access roads
– Equipment maintenance facility
– Staff Site office facilities
– Stormwater management facilities

The groundwater management system, leachate management system, and stormwater management system will be reconfigured as required to accommodate the Alternative Methods. Further details are provided in the sections that follow.

2.8 Groundwater Management

The East and South Landfills, Closed West Landfill, as well as the proposed location of Phase 2 of the South Landfill, are developed in completed Lockport dolostone quarries. The floors of the quarries are situated on the DeCew and Rochester Formations. A trench was constructed along the north-south axis of the former East Quarry to provide gravity drainage of water away from the operations. Upon completion of the Quarry, the trench was re-engineered with a perforated collection pipe installed in granular backfill to facilitate continued groundwater collection, referred to as the Groundwater Collection Trench (GWCS). A solid drainage pipe was also installed in the trench to facilitate drainage of surface water from the South and Southeast Quarries.

Under baseline (pre-developed) conditions, bedrock groundwater flows in the vicinity of the Site were generally north towards the Niagara Escarpment. Development at the Campus has altered the potentiometric surfaces for the dolostone and shale bedrock units such that a drawdown cone exists around the former and current quarries, which influences groundwater flows up to a radius of about 500 m from the extraction area and creates a continuous inward gradient surrounding the East and South Landfills and the Southeast Quarry (the proposed Phase 2 of the South Landfill).

The South Landfill is a modern and highly engineered site consisting of a double composite liner system designed in accordance with O. Reg. 232/98: Landfilling Sites. Additionally, the hydrogeologic setting at the Site provides an inward groundwater gradient (i.e., hydraulic trap design) that offers a robust groundwater protection contingency measure.

The South Landfill Phase 2 will feature a double composite Compact Clay Liner (CCL) and Geosynthetic Clay Liner (GCL) liner system that meets or exceeds O. Reg. 232/98 with a maximum slope of 3H to 1V as per O. Reg. 232/98. The hydrogeologic setting of Phase 2 is similar to Phase 1, with an inward groundwater gradient for contingency purposes, supported by groundwater monitoring wells to ensure compliance.

2.9 Leachate Management

Within the South Landfill, leachate is currently primarily produced by the percolation of precipitation through the refuse and moisture present in the refuse upon arrival at the landfills also contributes to the production of leachate. An engineered clay liner system was constructed within the East and South Landfills to contain and isolate the leachate from the natural environment. A leachate collection system (LCS) constructed on the clay liner collects the leachate and discharges it to on-Site lagoons where it is aerated and eventually discharged to the sanitary sewer for treatment at the Port Weller, Wastewater Treatment plant in St. Catharines.

The estimated maximum leachate generation rate for the South Landfill Phase 2 is approximately 104,500 m^3 per year (supporting calculations are presented in the CDR, found in **Appendix A**). It should be noted that the leachate generation rate will vary over the operational and post-closure period of the landfill, and is influenced by factors including precipitation, degree of landfill development (e.g., area of landfill that is actively undergoing development versus areas where interim/final cover has been placed), final cover design, and other factors. Detailed modeling of the leachate generation will be carried out using the Hydrologic Evaluation of Landfill Performance (HELP) model following the selection of a preferred alternative.

The alternative methods of leachate management being considered for the South Landfill Phase 2 are continued use and expansion of the existing leachate management system (Section 3.3.1), and development of an on-Site wastewater treatment system (Section 3.3.2). A new pump station and forcemain would be common to both options. It is assumed the forcemain would be installed in open cut.

2.10 Stormwater Management

Drainage for the Campus operations is managed such that surface water that has the potential to contact waste materials is isolated and directed to the LCS, prior to treatment and discharge to the Municipal Sanitary Sewer under an existing agreement with the Town of Niagara on the Lake. Non-contact runoff within the Campus is collected in the Southeast Quarry sump, East Quarry stormwater management structure, and in a series of stormwater management ponds (SWMPs) around the South and East Landfills. These ponds are operated with the discharge valve normally closed and are batch discharged if they meet their applicable discharge criteria. If the accumulated runoff in the SWMPs does not meet discharge criteria, the water can be pumped to the LCS as a contingency.

During the extraction phase in the former East Quarry (now East Landfill), a trench was constructed along the north-south axis of the former East Quarry floor to provide gravity drainage of water away from the operations. Prior to constructing the landfill, a solid drainage pipe (1200-millimetre [mm] solid pipe) was installed in the trench along with a perforated groundwater collection pipe, to facilitate drainage of surface water from the South and Southeast Quarries, underneath the East Landfill, to the Old Welland Canal. Collectively, these drainage pipes are known as the WEG Drainage System (WDS).

Accumulated stormwater runoff from the East Quarry Operations Area collects in the stormwater management structure with the discharge valve operated in the normally closed position. The accumulated runoff settles and typically infiltrates through voids in the underlying fractured bedrock. If required, the accumulated runoff is batch discharged to a roadside ditch along Thorold Townline Road, which ultimately flows to the Old Welland Canal. Non-contact runoff from the South Landfill flows to the South Landfill SWMP. The SWMP is batch discharged into the aforementioned 1200 mm solid pipe, from where it flows north under the East Landfill and to the Old Welland Canal.

Non-contact runoff from the capped southern and northern parts of the East Landfill flow to Pond S5 and the North Pond (S2N), respectively. Pond S5 is batch discharged to Ten Mile Creek at Thorold Townline Road, from where it flows west to the Welland Canal. The North Pond is batch discharged to the WBQ Service Pond, which is used as a water source for quarry operations and dust suppression.

The South Landfill Phase 2 landfill will include additional SWMPs surrounding the development and the associated conveyance infrastructure (Figure 2.1). The design of the cap will include 600 mm of low permeability final cover soil and 150 mm of topsoil meeting the requirements of O. Reg. 232/98.

2.11 Landfill Gas Management

Walker has pioneered the successful utilization of landfill gas from the landfill to provide reliable, low cost and renewable sources of energy within the local community. In 2020, Walker and General Motors (GM) developed a cogeneration project using landfill gas to power and heat GM's St. Catharines Propulsion Plant helping reduce its greenhouse gas (GHG) emissions by 70 percent and protecting it from rising electricity and carbon costs. Most recently, in 2023, Walker and Enbridge built Ontario's largest renewable natural gas (RNG) project, where landfill gas

is cleaned and transformed into RNG which is used interchangeably with natural gas. In total, the landfill gas from the Walker Campus can power the equivalent of 16,000 homes.

The landfill gas collection and control system for South Landfill Phase 2 will follow or exceed the applicable regulations.

2.12 Traffic

Vehicle traffic associated with the development of the Site is important in assessing the potential impacts of the Site on various receptors. The total vehicle traffic volumes were calculated based on assumed vehicle types and average capacities and are estimated at an average of approximately 250 trucks per day with a potential peak of approximately 425 trucks per day (supporting data is presented in the CDR). The traffic associated with staff vehicles or other Site operations is assumed to be negligible. It is noted that operation of the Southeast Quarry is expected to cease in five to seven years and would result in a decrease in background traffic.

The vehicle traffic to the Site during the operations phase of the development will remain the same as current landfill operations:

– Current haul routes and Site entrance for South Landfill (Phase 1) will remain unchanged for Phase 2.
– A maximum daily receipt limit of 10,000 tonnes per day will continue.
– Phase 2 will have the same operational hours as Phase 1:
    - Waste will only be accepted between 7:00 am to 7:00 pm – Monday to Friday (except statutory holidays), and 7:00 am to 1:00 pm on Saturdays.
    - Site preparation activities (road maintenance, snow removal, etc.) will permit on-Site equipment operation between:
        – 6:00 am to 9:00 pm – Monday to Friday (except statutory holidays);
        – 6:00 am to 3:00 pm on Saturdays; and
        – 24 hours a day and on Sundays during emergency events such as large snow events, large melt events, large rain events and fire emergencies.

The longest possible haul distance for internal traffic within the Site is estimated at 3,100 m.

2.13 Construction

The development and construction of the project will include two main components. The first component is the construction of key infrastructure required to operate the landfill. This includes the construction of new and/or upgrade of existing infrastructure such as scales and weigh station, primary internal haul roads, Taylor Road underpass/tunnel, electrical servicing, leachate pump station, force mains, Site offices and general civil works. This infrastructure will be developed prior to, or during the development of the first stage (Stage 1) of the landfill.

The second component is the development of the landfill fill area which primarily includes the liner system. The landfill fill area will be developed in four main stages (Figure 2.1). Each stage will accommodate approximately four cells. It is generally anticipated that cells will be developed on an annual basis. Stage and cell development is expected to occur as follows and will be the same for all Landfill Configuration Options being considered. Construction of the Stages and cells generally consists of earthmoving, placement of granular materials and construction of the liner and LCS.

– Stage 1 will begin in the southern end of the Site and will progress in a northerly direction. The capacity of Stage 1 is approximately 4,500,000 m^3 and will last about five years at maximum filling rates.
– Stage 2 is in the middle of the Site and will progress in a northerly direction. The capacity of Stage 2 is approximately 4,500,000 m^3 and will last about five years at maximum filling rates.

– Stage 3 is in the northeastern corner of the Site. It will begin at the northeastern limit of Stage 2 and progress in a northerly direction. The capacity of Stage 3 is approximately 4,500,000 m^3 and will last about five years at maximum filling rates.
– Stage 4 is in the northwestern corner of the Site. It will begin at the western limit of Stage 3 and progress in a westerly direction. The capacity of Stage 4 is approximately 4,500,000 m^3 and will last about five years at maximum filling rates.
– Note that footprints for the stages, although not equal in area, are approximately equal in volume due to the effect of temporary waste side slopes required during the operation of the landfill.
– Within each of these stages, new landfill liner (referred to as a cell) will be constructed yearly, or as needed, to provide sufficient space for waste placement and landfill operations. All aspects of each new cell are connected to existing cells, and new stages to existing stages to form one continuous landfill liner system.

2.14 Operations

The following operating practices, based on current operation of the South Landfill (Phase 1), will be common to all Alternative Methods. While these would not significantly influence the comparative analysis, they should nevertheless be considered in reviewing the Alternative Methods. Any modifications to the design and operations will be outlined during the detailed impact assessment of the Preferred Method.

Receiving and Placement of Waste

– All materials received at the Site are verified, recorded and weighed to ensure compliance with regulatory conditions.
– Waste trucks will be directed to offload in the designated working area (active face).
– Daily working areas (active face) will generally be limited to no more than 2,000 m^2 in size.
– Waste will be placed, graded with a bulldozer and compactor in lifts ranging from 1 m to 5 m thickness.
– Burning or scavenging will not be permitted.

Daily and Intermediate Cover

– Daily cover will be applied following each day's landfilling operations to control potential nuisance effects, to facilitate vehicle access on the Site, and to ensure an acceptable Site appearance is maintained.
– Suitable solid, non-hazardous wastes (e.g., wood chips, soil, sand, fill materials) will be segregated from the incoming waste streams for use as daily cover. Alternative daily cover may also be used.
– Intermediate cover will be applied to landfill areas that are not yet brought up to final grade, but will be inactive for more than several months, consistent with O. Reg. 232/98.
– Soil suitable for the establishment of temporary vegetation in order to control water and wind erosion will be used for intermediate cover (or other equivalent surface treatments that achieve the same purpose), obtained from suitable solid, non-hazardous waste soils that are segregated from the incoming waste streams, or an alternative source.

Nuisance Controls

O. Reg. 232/98 requires that landfills be designed and operated to ensure that nuisance impacts are minimized, and the regulation requires that the proponent prepare a report describing all aspects of the operation, as well as maintenance procedures that will be followed.

A key objective in planning operations is to ensure the facility is operated in accordance with relevant permits and approvals while minimizing nuisance impacts including noise, litter, vectors, dust, and odour. Typical operating practices relating to these issues include:

– Approximately 750 m of paved internal roads allow mud to dislodge from truck wheels before exiting the Site, minimizing mud and dust on public roads.
– Road sweepers will be used regularly on internal paved roads, parking areas, and adjacent external roadways to remove dirt and dust.
– Dust control such as watering will be used to minimize dust on unpaved traffic surfaces.
– Traffic speeds will be limited to control dust and noise.
– Trucks with open tops will require tarping while moving. Once inside the Site, tarps will be removed prior to unloading.
– Permanent and temporary/mobile litter fencing will be erected at key locations around the working areas to catch blowing litter.
– Litter collection will be regularly carried out on-Site and in the vicinity of the Site to remove any fugitive blowing litter.
– Birds of prey, noisemakers and other industry standard bird control methodologies will be used daily during operating hours to discourage birds from gathering and scavenging at the landfill.
– Pest control measures will be employed if vermin are found at the Site.
– Odour control measures will include, but are not limited to, the adaptive application of a small working face, daily cover, and ongoing refinements to the operation of the gas collection and leachate treatment systems.
– A formal public hotline, reporting and response procedure will be in place to identify and correct any nuisance issues (currently in place for Walker's Campus operations).

Monitoring

Routine monitoring programs and reporting systems will be established through the EA and subsequent approvals process. These may could include the following:

– Functional and operational equipment (pumps, flares, etc.)
– Leachate quantity and quality
– Groundwater levels and quality
– Surface water flows and quality
– Treated leachate quantity and quality
– Air emissions
– Landfill gas collection and perimeter monitoring
– Noise levels
– Particulates (dust)

Personnel Requirements

The Site is generally anticipated to require the following full-time personnel for the landfill operations:

– 1 operator for each piece of heavy equipment (see Sec. 3.10 below)
– 2 scale operator
– 1 landfill traffic coordinator
– 1 waste inspector
– 1 sweeper operator
– 2 litter control technicians
– 1 landfill superintendent
– 1 landfill gas control/utilization plant operator

– 1 landfill gas wellfield technician
– 1 wildlife control technician
– 1 leachate treatment plant operator (if on-Site leachate treatment plant is required)
– Various subcontracted personnel as required for construction, operation, daily / intermediate cover supply and application, closure, and maintenance activities

Equipment Requirements

The Site is anticipated to require the following landfilling equipment:

– 5 compactors for waste spreading/compaction
– 2 tippers for truck unloading
– 1 water truck for dust control
– 1 fuel truck for refueling
– 1 sweeper truck for dust control
– 1 loader for miscellaneous operations
– 1 skidsteer for miscellaneous operations
– 10 Site pick-up trucks for Site staff
– 2 excavators for loading of soils and miscellaneous operations
– 6 haul trucks for transport of soils
– 1 grader
– 1 bulldozer for miscellaneous operations
– 1 bulldozer for maintaining inbound cover material (25% utility)

Additional equipment will be required during construction and closure phases which are expected to occur up to eight months per year.

2.15 End Use

Closure and post closure (or decommissioning) of the South Landfill Phase 2 will take place in accordance with O. Reg. 232/98, which includes the future requirement to develop a closure plan. Walker is required to prepare a closure plan when the South Landfill Phase 2 has reached 90 percent of its approved capacity or two years of remaining capacity (whichever comes first).

In concert with developing conceptual designs for the Alternative Methods, per the Minister-approved ToR, broad closure and post closure frameworks relating to infrastructure, monitoring, and end use have been generated for assessment and comparative evaluation purposes.

Infrastructure

Table 2.1indicates the potential outcome for South Landfill Phase 2 infrastructure at closure.

Table 2.1 Potential Outcome of Infrastructure at Closure

Retain/Modify for continued operation post-closure	Repurpose, or remove and rehabilitate	Remove and rehabilitate
Leachate management system	Entrance, tunnel, and internal access roads	Scale facility
Landfill gas collection system and utilization facility	Maintenance and Site office facilities	

Retain/Modify for continued operation post-closure	Repurpose, or remove and rehabilitate	Remove and rehabilitate
Stormwater management facilities	Site security fencing as determined	
Groundwater management system		
Water Monitoring Program		
Site security fencing as determined		

Post-closure Monitoring Requirements

Post-closure monitoring is expected to include the following:

– Monitoring of the final cover system
– Landfill gas and landfill gas collection system monitoring
– Leachate and LCS monitoring
– Groundwater and surface water monitoring

An annual Post-Closure Care Report will be prepared, which will summarize results from monitoring programs.

Post-closure Use

The proposed end use associated with the existing quarry is progressive rehabilitation to agricultural land usage. With consideration given to pre-development land use and ecological conditions, Walker is currently considering the following as possible end-uses for the proposed South Landfill Phase 2:

– Agricultural use (e.g., similar to the rehabilitated portion of the East Landfill)
– Naturalization (e.g., planting with regionally native species, and improving wildlife corridors/connectivity)
– Recreational (e.g., trails for hiking or mountain biking, and sports fields)
– A combination of the above.

With the preceding context in mind, Section 3 describes the three proposed Landfill Configuration Options and provides details on the two proposed Leachate Management Options.

Figure 2.1 South Landfill Phase 2 Conceptual Design Basis

3. Description of Alternative Methods of Carrying Out the Undertaking

The Alternative Methods consist of three proposed landfill configuration options and two proposed leachate management options.

The landfill configuration options have been developed each with the same proposed Perimeter of Fill area and Waste Disposal Site Boundary Limits. All three options also share identical infrastructure requirements; groundwater management, stormwater management, and gas management design elements; annual and daily maximum fill rate, Site development staging, and operations. The landfill configuration options differ in capacity, maximum height, and final contour slopes.

Additionally, in accordance with the Minister-approved ToR, an assessment of the existing leachate treatment system relative to the Alternative Methods will be carried out as part of the Environmental Assessment (EA) to determine if any modifications or additions are required to support the continuation of disposal capacity at Walker's Resource Management Campus. Any modifications or additions to the existing leachate treatment system that are required for the preferred Alternative Method will be identified and assessed as part of the EA. The development of an on-Site wastewater treatment plant is also being evaluated as an alternative method for leachate management.

A "Do Nothing" alternative will be included as part of this EA to represent what is expected to happen if none of the Alternative Methods being considered is carried out. Although the "Do Nothing" alternative does not address the Purpose of the Undertaking and is therefore not a viable option, it is included in EAs as a matter of best practice to represent the benchmark against which the advantages and disadvantages of the Alternative Methods being considered can be measured and compared.

3.1 "Do Nothing" Alternative

Under the "Do Nothing" Alternative, once extraction activities end, the quarry would be rehabilitated into agricultural land in accordance with its approved rehabilitation plan. As South Landfill Phase 1 reaches capacity, it would begin its closure process, and the Walker Niagara Campus would stop accepting waste. Existing landfill infrastructure would then be either maintained, repurposed, or decommissioned, in accordance with the requirements set out in the South Landfill Phase 1 closure plan.

3.2 Landfill Configuration Options

3.2.1 Landfill Configuration Option A

Landfill Configuration Option A is shown in Figure 3.1 and has the following general attributes:

– Option A has the highest peak elevation of the three options of 212 mAMSL (TOW).
– An approximate height above grade of 31 m
– The slope from existing grade to 202 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 202 mAMSL to 212 mAMSL will be twenty units horizontal to one unit vertical (20H to 1V, or 5%).
– A landfill capacity of 20,205,000 m^3
– The area available for agricultural end use will be 36.7 ha.

3.2.2 Landfill Configuration Option B

Landfill Configuration Option B is shown in Figure 3.2 and has the following general attributes:

– Option B has a slightly lower peak elevation than Option A of 211 mAMSL (TOW).
– An approximate height above grade of 30 m
– The slope from existing grade to 194 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 194 mAMSL to 211 mAMSL will be fifteen units horizontal to one unit vertical (15H to 1V, or 6.7%).
– A landfill capacity of 18,277,400 m^3
– The area available for agricultural end use will be 51.4 ha.

3.2.3 Landfill Configuration Option C

Landfill Configuration Option C is shown Figure 3.3 and has the following general attributes:

– Option C has the lowest peak elevation of the three options of 205 mAMSL (TOW).
– An approximate height above grade of 24 m
– The slope from existing grade to 195 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 195 mAMSL to 205 mAMSL will be 20 units horizontal to one unit vertical (20H to 1V, or 5%).
– A landfill capacity of 17,893,000 m^3
– The area available for agricultural end use will be 45.0 ha.

Table 3.1 summarizes the specific details associated with each of the Landfill Configuration Options.

Table 3.1 Summary Description of Landfill Configuration Options

Option	Figure No.	Description	Location	Volume (m^3)	Footprint area (ha)	Approx. elevation (mAMSL; Top of Waste)	Approx. height above grade (m; Tope of Waste)	Slope	Area available for agricultural end use (ha)	Minimum Distance to Privately Owned Lands (m)	Longest Internal Haul Distance (m)	Leachate Generation Rate (max, m^3/yr)
A	Figure 3.1	Same Height & Slope as Current South Landfill Phase A	Quarry footprint	20,205,000	62.6	212	31	E.G. to 202 @ 4:1 202 to 212 @ 20:1	36.7	~235	~3,100	~104,500
B	Figure 3.2	Maximized Agricultural End Use	Quarry footprint	18,277,400	62.6	211	30	E.G. to 194 @ 4:1 194 to 211 @15:1	51.4	~235	~3,100	~104,500
C	Figure 3.3	Average Agricultural End Use	Quarry footprint	17,893,000	62.6	205	24	E.G. to 195 @ 4:1 195 to 205 @ 20:1	45.0	~235	~3,100	~104,500

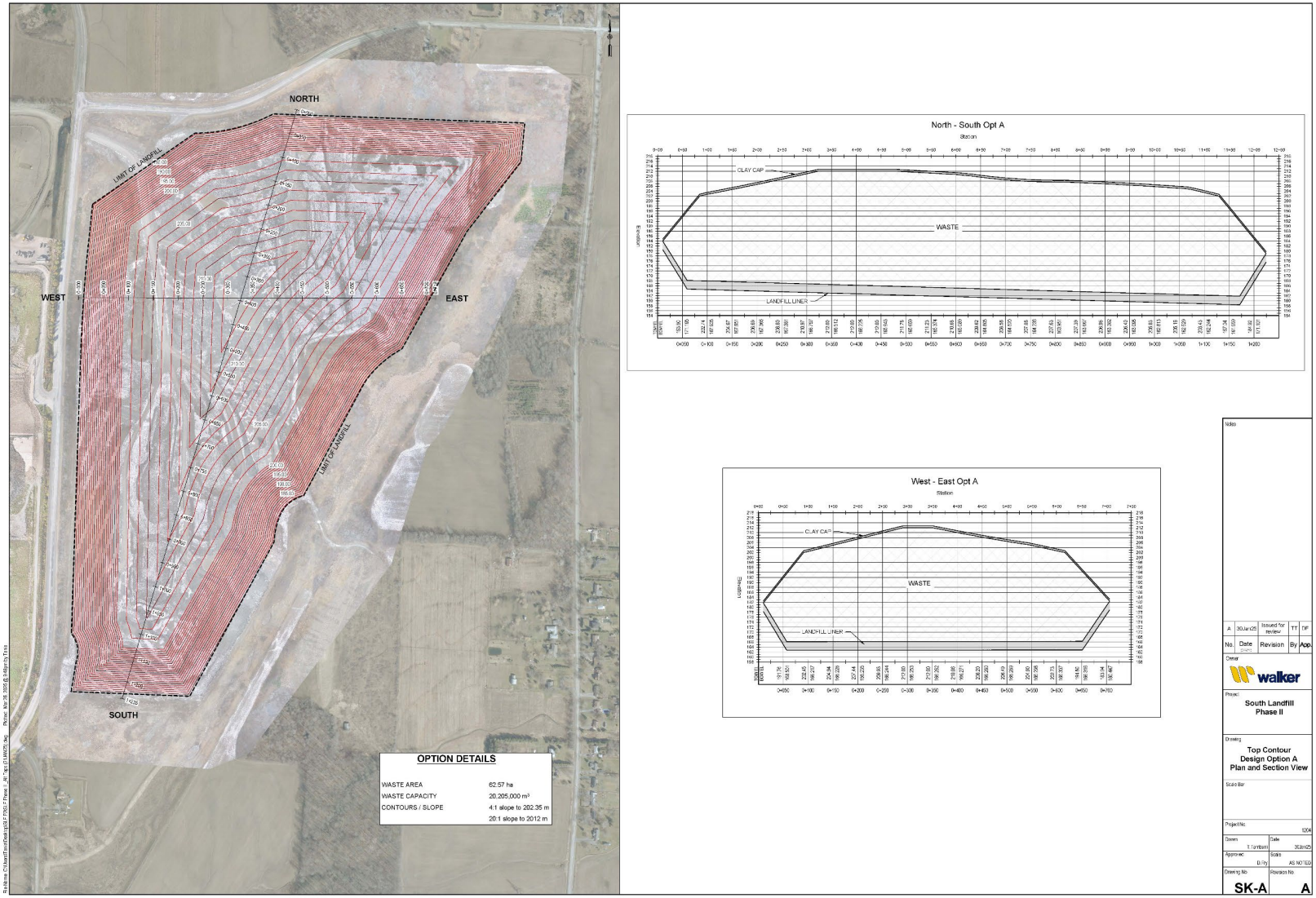

Figure 3.1 Landfill Configuration Option A

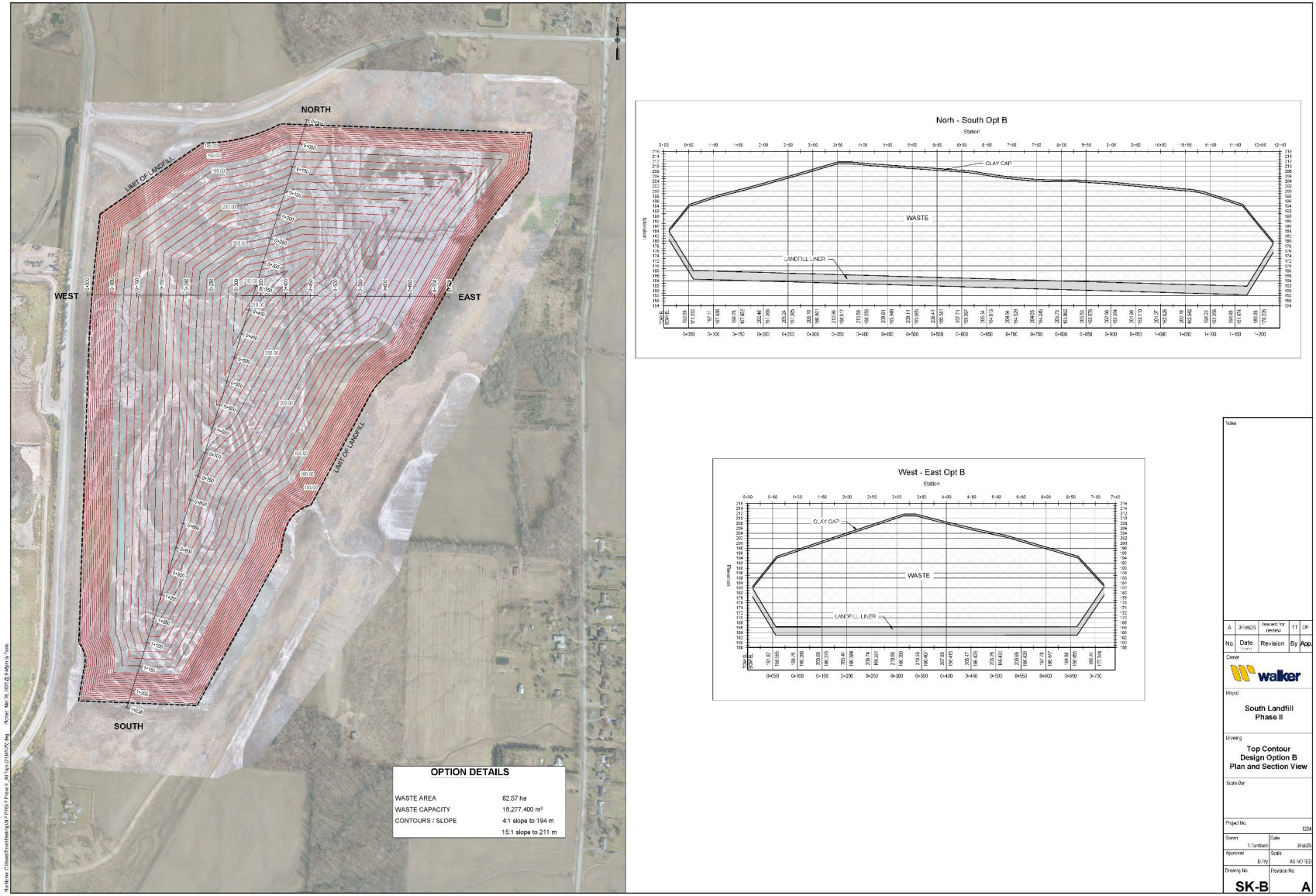

Figure 3.2 Landfill Configuration Option B

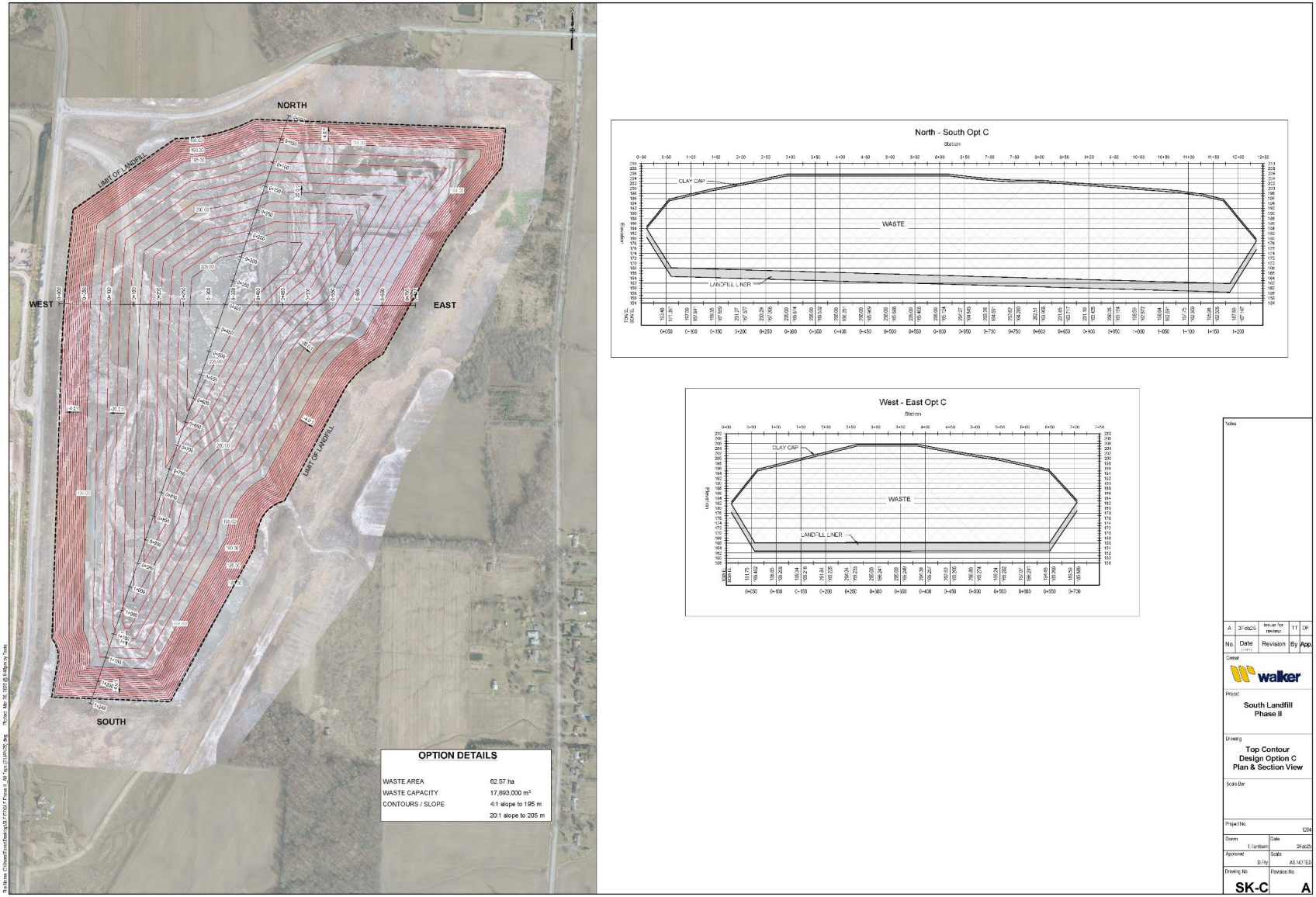

Figure 3.3 Landfill Configuration Option C

3.3 Leachate Management Options

Table 3.2 summarizes specific details of the two Leachate Management Options, while following subsections describe their general attributes.

Table 3.2 Summary Description of Leachate Management Options

Option	Figure No.	Description	Location	Approximate footprint area (ha)	Potential discharge location	Associated infrastructure requirements
A	Figure 3.4	Municipal Wastewater Treatment System	Northwest portion of Campus, adjacent existing lagoons	0.3	Welland Canal via municipal wastewater treatment plant	Leachate pump station; new forcemain
B	Figure 3.6	On-Site Wastewater Treatment Plant	Northwest portion of Campus, adjacent existing lagoons	6.5	Old Welland Canal	Leachate pump station; new forcemain

3.3.1 Option A – Continued Use of the Municipal Wastewater Treatment System

Leachate Management Option A would build upon the pre-existing leachate management system and approach but would include the necessary expansion of the system capacity as the new development is expected to generate a maximum of 104,500 m^3 per year. The expansion would include a leachate sump, including a pump station equipped with the needed metering equipment and controls for monitoring and contingency purposes, a forcemain to transport the leachate from the pump station to the lagoon area, and a third on-Site lagoon (located adjacent the existing two lagoons) for aeration and eventual discharge (Figure 3.4).

Once treated at the on-Site lagoons, leachate would be conveyed via an existing force/gravity main to the Niagara-on-the-Lake sanitary sewer system for final treatment at the Region of Niagara's Port Weller Wastewater Treatment Plant.

Figure 3.4 Leachate Management Option A

3.3.2 Option B – Development of an On-Site Wastewater Treatment Plant

Leachate Management Option B consists of developing an on-Site wastewater treatment plant located within the Campus boundary. A facility design basis was developed and a preliminary siting exercise was undertaken to examine options for locating the facility. The following factors were considered in establishing the design basis for the on-Site wastewater treatment plant option:

– Estimated leachate volumes
– Potential discharge location
– Leachate quality

The proposed treatment configuration is illustrated in Figure 3.5. Approximately 6.5 ha would be required to accommodate the plant.

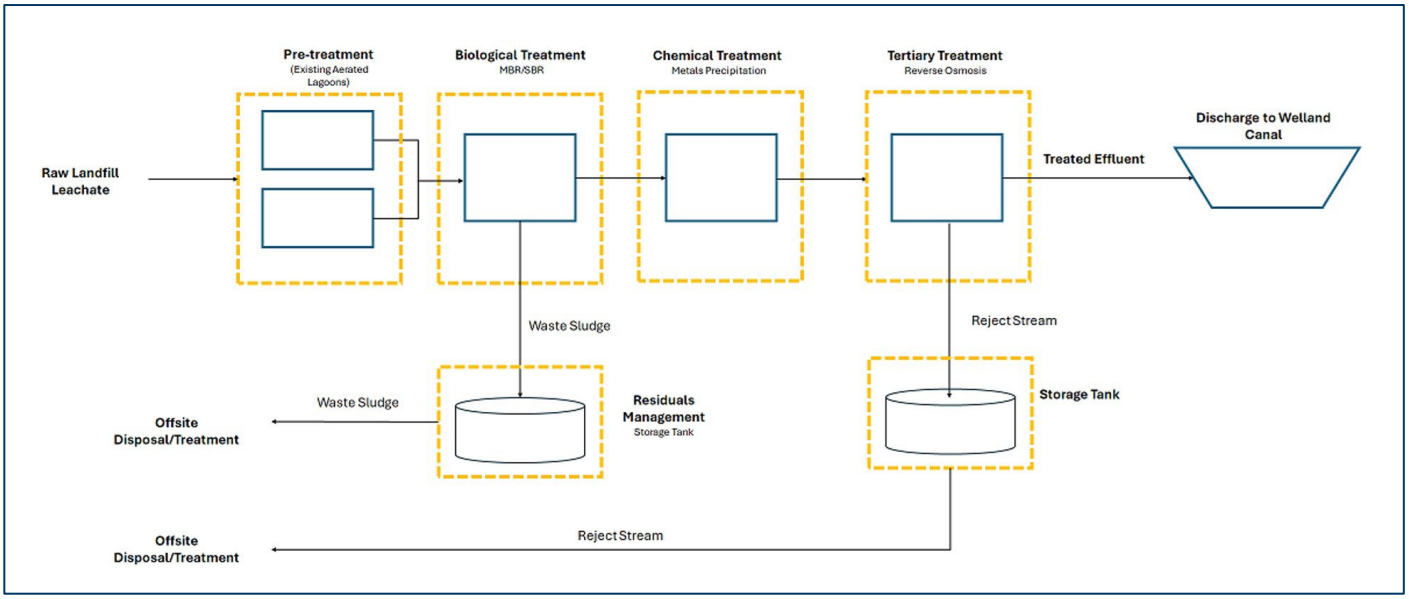

Figure 3.5 Proposed on-Site Wastewater Treatment Process Configuration

Subsequently, a high-level screening was undertaken to identify and evaluate potential locations for the on-Site wastewater treatment plant option. Criteria that were considered in the evaluation process included the following:

– Natural Environment
– Socio-Cultural Environment
– Financial
– Technical

Figure 3.6 shows the location and proposed footprint of the preferred location, adjacent the existing treatment lagoons.

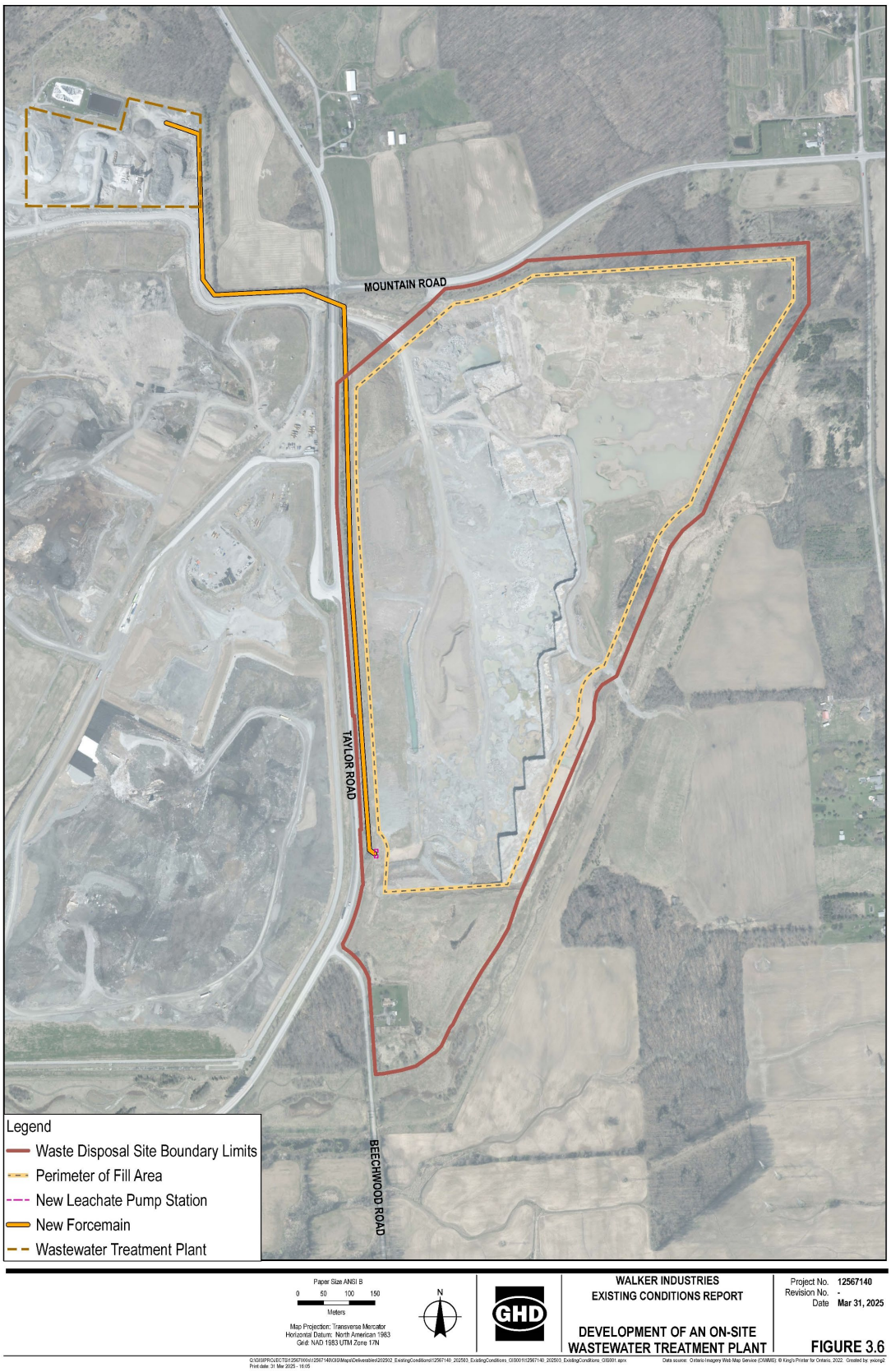

Figure 3.6 Leachate Management Option B

3.4 Landfill Gas Collection and Treatment Considerations

In accordance with the Minister-approved ToR, an assessment of the existing landfill gas collection and utilization system relative to the Alternative Methods will be carried out as part of the Environmental Assessment (EA) to determine if any modifications or additions are required to support the continuation of disposal capacity at Walker's Resource Management Campus.

The three landfill configuration options are equally able to accommodate a landfill gas extraction wellfield, developed in accordance with O. Reg. 232/98. All three landfill options would necessitate similar upgrades to the existing landfill gas management system. Generally, system upgrades will include a landfill gas control booster station to extract landfill gas from the landfill and convey it across Taylor Road to the existing Landfill Gas Utilization Facility where it will be used to generate renewable energy. The landfill gas management approach will seek to maximize the use of the existing facilities within the Walker Campus and may be utilized within Walker's existing landfill gas projects or additional venues for landfill gas utilization may potentially be explored.

As a result, it was deemed unnecessary to consider landfill gas collection and treatment further in the comparative evaluation of alternative methods. Any modifications or additions to the existing landfill gas collection and utilization system that are required for the Preferred Alternative Method will be identified at the detailed design stage and assessed as part of the detailed Impact Assessment.

4. Rationale for the Alternative Methods of Carrying Out the Undertaking

The preceding Alternative Methods of Carrying Out the Undertaking for the South Landfill Phase 2 Environmental Assessment (EA) were selected for consideration for the following reasons:

– All represent different ways of performing the same activity (i.e., continuing to provide disposal capacity for solid, non-hazardous waste at Walker's existing Resource Management Campus).
– All are situated within Walker's existing Resource Management Campus property boundary.
– All will reflect the regulatory design requirements under O. Reg. 232/98: Landfilling Sites (e.g., setbacks, slopes, etc.).
– All are within the ability of Walker to implement.

The area currently occupied by the Southeast Quarry is the only location within Walker's Campus that could feasibly accommodate the proposed expansion capacity of approximately 18 million m^3. Other Walker-owned property adjacent to its Resource Management Campus is not being considered for the Alternative Methods of Carrying Out the Undertaking due to limitations related to parcel dimensions and reduced footprint design flexibility; inability to maximize use of the existing waste management infrastructure (e.g., leachate treatment and landfill gas collection systems), environmental controls, regulatory restrictions and Campus synergies; and environmental constraints. Further, utilizing the adjacent existing disturbed, quarried area for the expansion of the South Landfill makes most sense from economic, resource, land (re-)use and environmental perspectives.

5. Description of Assessment and Evaluation Methodology

5.1 Description of the Assessment Methodology

The Alternative Methods were assessed through a "net effects analysis" consisting of the following activities:

1. Confirm evaluation criteria and indicators
2. Identify potential effects on the environment (both positive and negative)
3. Develop appropriate impact management measures
4. Apply the impact management measures to the identified potential environmental effects to identify net effects on the environment (both positive and negative)

The "net effects analysis" took into account the construction, operation, and closure/post-closure timeframes or stages of the Alternative Methods and, where possible, used highly conservative estimates. The estimates will be refined at the Impact Assessment stage of the South Landfill Phase 2 EA when more construction/operation and closure/post-closure details are provided on the Preferred Alternative.

5.1.1 Confirmation of Preliminary Evaluation Criteria and Indicators

To identify the potential environmental effects of the Alternative Methods in a traceable, logical, understandable, and reproducible manner, the preliminary list of evaluation criteria and indicators from the Minister-approved Terms of Reference (ToR) was finalized. This process incorporated feedback from review agencies, Indigenous communities, and the public through various consultation activities, including a virtual and in-person open house, a Government Review Team (GRT) meeting and presentation, individual discussions with the Ministry of the Environment, Conservation and Parks (MECP) on surface water and air quality investigations, and meetings with municipalities and Indigenous communities.

In general, the preliminary evaluation criteria and indicators remained unchanged with minor revisions including the addition of criteria to specifically address issues raised. Table 5.1 present the finalized evaluation criteria and indicators.

Table 5.1 Final Evaluation Criteria and Indicators Applied to the Alternative Methods

Evaluation Criteria		Indicators
Natural Environment		
Geology / Hydrogeology	Effect on groundwater quality	– Predicted effects to groundwater quality at property boundaries and off-Site
	Effect on groundwater flow	– Predicted effects to groundwater flow at property boundaries and off-Site
Surface Water	Effect on surface water quality	– Predicted effects on surface water quality on-Site and off-Site
	Effect on surface water quantity	– Predicted change in drainage areas and land use – Predicted occurrence and degree of off-Site effects
Atmospheric - Air Quality, Odour and Noise	Effect of air quality on off-Site receptors	– Predicted off-Site point of impingement concentrations ($\mu g/m^3$) of indicator compounds – Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions) – Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors.
	Effect of odours on off-Site receptors	– Predicted off-Site odour concentrations ($\mu g /m^3$ and odour units) – Number of off-Site receptors potentially affected (residential properties, public facilities, businesses and institutions) – Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors
	Effect of noise on off-Site receptors	– Predicted off-Site noise level – Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions) – Predicted sound from traffic
Terrestrial and Aquatic Environment	Effect on terrestrial ecosystems	– Predicted impact on vegetation communities – Predicted impact on wildlife habitat – Predicted impact on vegetation and wildlife including rare, threatened or endangered species
	Effect on aquatic ecosystems	– Predicted impact on aquatic habitat – Predicted impact on aquatic biota
	Effect on culturally significant species to Indigenous peoples, and rare (vulnerable), threatened or endangered species of flora or fauna or their habitat	– Predicted impact on culturally significant, rare, threatened, or endangered flora and fauna species and their habitat
	Effect on wetlands	– Predicted impact on wetlands
	Effect on wildlife habitat, populations, corridors or movement	– Predicted impact on wildlife habitat, populations, corridors or movement

Evaluation Criteria		Indicators
	Effect on fish or their habitat, spawning, movement or environmental conditions (e.g., water temperature, turbidity, etc.)	– Predicted impact on fish, fish habitat, spawning behaviour, movement or environmental conditions
	Effect on locally important or valued ecosystems or vegetation	– Predicted impact on locally important or valued ecosystems or vegetation
Built Environment		
Land Use	Effect on existing and proposed planned future land uses and associated infrastructure	– Current and planned future land use – Proximity to off-Site sensitive land uses (e.g., dwellings, churches, parks) and features (e.g., wetlands, woodlots, etc.)
	Effect on views of the facility	– Predicted changes in views of the facility from the surrounding area – Visibility of project features from selected receptor locations – Level of visual contrast of project features from selected receptor locations
Agriculture	Effects on existing agricultural land base	– Canada Land Inventory (CLI) soil capability classification – Soil suitability classification – Climate – Level of fragmentation – Proximity to non-farm land uses – End use agricultural area
	Effects on agri-food network	– Type(s) and proximity of agricultural operations – Type(s) and proximity of agricultural-related facilities – Predicted impacts on surrounding agricultural operations & agricultural-related facilities
Social Environment		
Transportation	Effect on traffic	– Operational Level of Service at intersections around the Campus
	Road safety and geometry	– Traffic collision assessment – Vertical and Horizontal Sightlines
Social	Displacement of residents from houses	– The number of households/residents (property owners and tenants) to be displaced (i.e., forced relocation) by the project itself regardless of whether their property has been purchased or not – The potential for or likelihood of voluntary out-migration of residents for consideration of the indirect effects on community character and cohesion
	Disruption to use and enjoyment of residential properties	– The number of existing residential households and/or future households that are located at specific receptor locations and potentially affected by noise, dust, odour, traffic, agricultural and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls

Evaluation Criteria		Indicators
		– The number of existing residential households fronting/backing onto a haul route and potentially affected by changes in project related traffic and traffic noise – Potential for or likelihood of changes in peoples' use of residential property
	Disruption to use and enjoyment of public facilities and institutions	– The number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls – Potential for or likelihood of changes in operations of public facilities and institutions – Potential for or likelihood of changes in use and enjoyment of public facilities and institutions
	Loss/disruption of recreational resources	– The number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project-related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls – Potential for or likelihood of changes in operations of recreational features – Potential for or likelihood of changes in use and enjoyment of recreational resources
	Changes to community character	– Compatibility of landfill operations with the existing and likely future character of the community – Compatibility of the proposed end use with the existing and likely future character of the community
	Changes to community cohesion	– The extent of displacement – The potential for or likelihood of voluntary out-migration – Loss and the extent of disruption of recreational resources, public facilities and institutions, and the use and enjoyment of residential properties
Economic Environment		
Economic Environment	Effect on local economy	– Impact on businesses • Disruption/displacement of businesses (including tourism and farms) • Business opportunities – Labour market impacts • Impact on direct, indirect, and induced employment – GDP impacts • Impact on direct, indirect, and induced GDP • Retention of economic benefits within local economy
	Effect on real estate	– Property value impacts
	Effect on public finance	– Impact on municipal revenue – Impacts on municipal cost – Impact on assessment base
	Cost of services	– Impact on customer cost of waste services
Cultural Environment		

Evaluation Criteria		Indicators
Cultural Heritage Resources	Effect on known or potential built heritage resources and cultural heritage landscapes	– Number of known and potential built heritage resources and cultural heritage landscapes displaced or disrupted
	Effect on archaeological resources and areas of archaeological potential	– Number and type of archaeological sites affected – Area (ha) of archaeological potential (i.e., areas with the likelihood to contain archaeological resources)

5.1.2 Application of Net Effects Analysis

Identify Potential Effects on the Environment

The potential effects on the environment (both positive and negative) were identified for each of the Alternative Methods by applying the final evaluation criteria and indicators to each of them. The application was completed within the context of the developed conceptual designs, the associated environment as documented in the Existing Conditions Reports, and for all three defined timeframes (construction, operation, and closure/post-closure).

The identified potential effects from applying the indicators were expressed within the context of their corresponding measures either quantitatively or qualitatively, as appropriate, in the “Potential Effects” column of the net effects analysis tables for each alternative.

Develop and Apply Impact Management Measures

Next, impact management measures were developed, where possible and as required, and applied to prevent, minimize, and/or offset potential negative environmental effects for each Alternative Method.

More specifically, the intent of the impact management measures is as follows:

Avoidance: The first priority is to prevent the occurrence of negative effects (adverse environmental effects) associated with implementing an Alternative Method.

Mitigation: Where adverse environmental effects cannot be avoided, appropriate measures to remove or alleviate, to some degree, the negative effects associated with implementing an Alternative Method were sought.

Compensation: In situations where appropriate impact management measures were not available, or significant net adverse effects would remain following the application of mitigation, compensation measures may be required to counterbalance the negative effects through replacement in kind, substitution, reimbursement, or other agreed compensation.

The impact management measures were developed based on professional expertise of the Project Team reflecting on current procedures, historical performance, and existing environmental conditions. These measures were documented in the “Impact Management Measures” column of the net effects analysis tables for each Alternative Method.

Determine Net Effects on the Environment

Once the appropriate impact management measures were developed and applied to the potential environmental effects of each Alternative Method, the remaining net effect(s) were determined and documented in the “Net Effects” column of the net effects analysis tables for each Alternative Method. In cases where the net effect could not be improved through the application of impact management measure(s), the potential net effect remained unchanged. Therefore, it was still identified as the “net effect.”

With the preceding three activities in mind, the completed net effects analysis for the Alternative Methods is provided in **Appendix B** (Landfill Configuration) and **Appendix C** (Leachate Management).

5.2 Description of Comparative Evaluation Methodology

With the net effects determined, the Alternative Methods were comparatively evaluated using a “Reasoned Argument” methodology to select a Recommended Method as specified in the Minister-approved ToR. The methodology was composed of three activities to identify the advantages or disadvantages of each Alternative Method based on their net effects, which are described below. It is important to note that the landfill configuration options were only evaluated in comparison to one another, as were leachate management options, ensuring that the assessment remained distinct for each category.

1st Activity: First, the net effects identified for each Alternative Method by criteria were compared to one another to identify the level of effect ('No Net Effects', 'Low Net Effects', 'Moderate Net Effects' or 'High Net Effects'), in order to facilitate a ranking of the Alternative Methods associated with the Second Activity.

2nd Activity: Next, environmental component-specific rankings were established based on the level of effect and discipline-specific professional judgement/analysis accompanied by a rationale for each Alternative Method (e.g., more preferred, less preferred, etc.).

3rd Activity: Finally, overall rankings for each Alternative Method (e.g., most preferred, less preferred, least preferred) were established based on the identified component-specific rankings. The results of applying the preceding comparative evaluation approach are documented in Section 7.

6. Application of Assessment Methodology and Results

The application of the assessment methodology to the Alternative Methods is documented individually, beginning with the Landfill Configuration Options A to C and followed by Leachate Management Options A and B. With this in mind, the potential effects are described first, followed by the identification of the proposed impact management measures. Finally, the net effects resulting from the application of the proposed impact management measures are presented.

6.1 Landfill Configuration Options

The potential effects and associated impact management measures were found to be similar between the three Landfill Configuration Options. Therefore, the focus of the following subsections is to summarise the potential effects, proposed impact management measures and the resultant net effects associated with the Landfill Configuration Options, highlighting where there are differences between the options. Full details of the analysis are provided in the net effects tables contained in **Appendix B**, and within the discipline-specific memos that form **Appendix D**.

6.1.1 Landfill Configuration Option A

6.1.1.1 Potential Effects and Impact Management Measures

The potential effects, proposed impact management measures, and the resultant net effects associated with Landfill Configuration Option A are described in the following subsections. **Appendix B-1** provides the net effects table for Landfill Configuration Option B and **Appendix D** provides the discipline-specific memos.

Natural Environment

Geology and Hydrogeology

Option A is not expected to significantly alter existing hydrogeologic conditions at the Site. Groundwater flow and quality are well understood due to decades of monitoring, and the proposed landfill will be placed within an already-excavated quarry, maintaining the current drawdown cone and groundwater levels. Inward hydraulic gradients toward the Site are expected to remain stable, ensuring that off-Site groundwater receptors, including residential supplies, are not impacted. The landfill design includes a liner and a LCS that meet or exceed regulatory standards, providing protection for the underlying bedrock aquifers. Additionally, the Rochester shale acts as a natural barrier, hydraulically separating deeper groundwater systems from the landfill, further reducing the potential for off-Site effects.

No impact management measures are proposed in relation to geology and hydrogeology.

Surface Water

Option A may present some potential effects on surface water and stormwater management (SWM), though these are expected to be manageable with appropriate design. While there is a risk of accidental leachate seepage, the landfill is proposed to include a liner and a LCS designed to meet or exceed regulatory standards, minimizing this risk. The Site's hydrologic conditions are well understood from decades of monitoring, and surface water levels in nearby watercourses are expected to remain stable. However, landfill construction could alter natural drainage patterns, potentially increasing flood risk and stormwater runoff volumes. Factors such as slope angle and total catchment area influence peak flow and sediment loading, which will need to be addressed through SWM systems designed to meet quality and quantity control objectives.

To help address the potential surface water and leachate-related effects associated with Option A, a SWM facility is anticipated to provide enhanced sediment removal and attenuate peak flows to pre-development levels, helping to mitigate off-Site impacts. This SWM facility is expected to support total suspended solids (TSS) removal, provide emergency storage for potential leachate seeps, and help manage stormwater flows to approximate pre-development peak conditions. Based on current assessments and the engineered design of the landfill, no additional mitigation measures are anticipated to be necessary at this time.

Atmospheric

Air Quality

Option A is expected to maintain environmental conditions similar to current operations in most areas, with some localized changes. Dust and combustion byproduct levels are predicted to remain consistent with existing quarry and landfill activities, while emissions from flares and generators are not expected to increase unless new equipment is added. However, landfill gas and odour concentrations may rise due to increased waste volumes, potentially affecting more receptors along the north and east boundaries. Conversely, impacts may decrease along the west and south boundaries as operations shift and older landfill areas are capped. The potential for wind-blown litter remains unchanged, though its distribution may shift with the relocation of operations. Overall, while most impacts are expected to remain stable, some receptors, particularly to the north and east, may experience increased exposure to odour, landfill gas, and litter.

To manage the potential effects of Option A, several impact mitigation measures may be considered. These include continuing the current best practices for controlling dust and blowing litter as used at the existing South Landfill Phase 1, and updating mitigation strategies as needed based on updated modelling results. Public engagement would continue to involve responding to odour complaints through assessment and investigation. Additionally, the landfill gas collection and destruction systems, such as flaring or gas utilization, will be progressively installed to manage emissions effectively throughout the project's development.

Noise

Option A may lead to occasional exceedances of daytime noise guidelines. While the higher peak elevation of Option A could allow for greater sound propagation, it may also provide some noise shielding for residences east of the Site when machinery operates on the west side. Due to the lesser slope of the landfill for Option A (Option A and C 5% vs Option B 6.7%), equipment would operate on a gentler gradient, which may accelerate its progression away from the bottom of the slope, the perimeter of fill area and nearby receptors, potentially reducing direct noise impacts. Pest control activities may introduce short, impulsive sounds, and vehicle noise from haul routes is expected to be transient and consistent with typical heavy vehicle traffic. Seven residential receptors have been identified for sound level evaluation, though nearby vacant lots are not expected to be developed during landfill operations.

To help manage potential impacts associated with Option A, a range of measures could be considered. These may include constructing localized and perimeter berms to help shield nearby receptors from noise and limiting active equipment operation near the landfill perimeter. A working berm might also be used around active landfilling areas. Public engagement would continue to involve responding to noise complaints through assessment and investigation. Other strategies might involve notifying the public about pest control activities, considering the purchase of nearby

residential properties to increase separation distances, and discouraging development of vacant lots near the Site. Additionally, haul routes can be planned to reduce impacts on nearby receptors, and efforts made to maintain efficient traffic flow and use well-maintained vehicles with effective mufflers.

Terrestrial and Aquatic Environment

Option A involves the potential removal of approximately 19.85 ha of vegetation, including cultural thicket, deciduous forest, cultural meadow, hedgerow, and a small area of wetland. These areas support various wildlife and plant species, including several that are rare or of conservation concern. Habitat loss may lead to changes in plant community composition and structure, increased presence of invasive species, disruption of natural succession, and reduction in quality of deer wintering areas. There is potential for leachate contamination, which could affect soil and water quality, and harm native species. Construction and operation activities may introduce sensory disturbances such as noise, light, and odours, which could impact wildlife behavior and habitat use. Changes to hydrology and dust deposition may also affect wetland ecosystems, potentially reducing biodiversity and altering ecological functions. Additionally, the project may affect culturally significant plant species and habitats valued by Indigenous Peoples.

To address the potential effects to the terrestrial and aquatic environment associated with Option A, a comprehensive range of impact management measures will be considered. These include minimizing the project footprint and creating compensation habitat on Walker-owned lands to offset vegetation loss, ideally adjacent to existing habitats or in areas that replicate or enhance ecological functions. A Construction Environmental Management Plan (CEMP), or similar, will guide all phases of construction and include detailed plans for sediment and erosion control, wildlife and invasive species management, tree protection, dust mitigation, and environmental monitoring. Sensitive areas will be clearly marked to prevent encroachment, and surveys will be conducted to identify rare or culturally significant plant species, with salvage or transplant efforts undertaken where feasible and in consultation with Indigenous participants.

To protect aquatic ecosystems, the project will avoid harmful alteration, disruption, or destruction (HADD) of fish habitat by maintaining undisturbed vegetated buffer zones between construction activities and fish-bearing watercourses. Riparian areas will be preserved, and any impacted aquatic or riparian zones will be restored to their original condition or better. An engineered double-composite clay liner and leachate treatment system will be installed to prevent contamination, supported by long-term groundwater and surface water monitoring.

Additional measures include restricting vegetation clearing during sensitive wildlife periods, using low-impact lighting, implementing speed limits and idling restrictions, and installing exclusion fencing for amphibians and reptiles. Where existing recreational trails are affected, alternative trail access may be provided within compensation habitat, where suitable. All disturbed areas will be restored post-construction, and permanent barriers and signage will be installed to protect adjacent ecosystems during the operational phase. These measures are designed to reduce ecological disruption, support habitat restoration, and maintain biodiversity and cultural values throughout the life of the project.

Built Environment

Land Use

Option A involves a shift in interim land use within the Site Study Area (SSA) from mineral aggregate extraction to landfill operations, which would require amendments to local and regional planning documents. Within the Local Study Area (LSA), there is potential for nuisance impacts on existing and future sensitive land uses, including rural residences and vacant lots zoned for such uses. The introduction of new sensitive uses may be subject to planning restrictions due to proximity to the landfill.

Option A has the highest peak elevation of the three options (31 m) and gentler side slopes (5%). The area available for agricultural end use is 36.7 ha, a decrease of approximately 11.5 ha compared to the current rehabilitation plan. While several natural heritage features are located near the SSA, no direct land use impacts on these features are anticipated.

Compliance with applicable provincial standards is expected to be achieved through the implementation of best management practices (BMPs) and mitigation measures across related environmental components, such as noise, dust, and traffic. These measures could help reduce potential nuisance impacts on nearby sensitive uses and zoned

lots. While no specific mitigation is proposed for the potential reduction in agricultural land, opportunities may be explored to enhance natural connectivity through design elements like vegetative screening, with an emphasis on using locally native species.

As development of Option A progresses, the landfill is expected to become increasingly visible from surrounding viewpoints, particularly once it rises above existing grade. Initially, it will be below grade and not visible, but as it reaches its maximum height, features such as the landfill mound, active face, machinery, and gas flares may become visible from locations including select viewpoints identified in visibility modelling. While theoretical visibility extends beyond the LSA, existing vegetation is anticipated to screen much of the Site. Views from below the Niagara Escarpment may occur, though visual impacts at that distance are expected to be minimal, aside from the potential contrast created by machinery. Given the Site's proximity to existing landfill areas, the visual change may be perceived as part of the established landscape. Over time, visual contrast is expected to diminish as interim and final caps are applied, with low visual impact anticipated at closure and post-closure as the Site transitions to its final use.

To help manage the potential visual impacts associated with Option A, several measures may be considered. These include retaining and enhancing existing visual screening features from the quarry and installing additional permanent elements such as berms and vegetation to reduce visibility of the landfill. Temporary screening, like fencing or netting, could also be used to obscure the active face during operations. Operational planning may help limit how often and for how long machinery is visible, particularly from sensitive viewpoints. Additionally, visual landscape considerations are expected to be incorporated into the development of the Closure Plan to support long-term visual integration with the surrounding environment.

Agriculture

Option A is expected to result in a reduction of land available for agricultural end use compared to the existing quarry rehabilitation plan, with approximately 36.7 ha of Class 2T and 25.87 ha of Class 5T Canada Land Inventory (CLI) lands affected. However, the Site design may improve microclimatic conditions and soil suitability for specialty crop production by enhancing cold air drainage. No significant effects are anticipated in terms of land fragmentation or impacts on surrounding agricultural or non-agricultural operations. Agricultural operations in the area are limited, with the nearest active operation being a nursery, and no agriculture-related uses are located within the LSA.

No impact management measures are proposed in relation to agriculture.

Social Environment

Transportation

Option A is not expected to significantly impact traffic operations in the area. All key study area intersections are projected to continue operating at acceptable levels of service (LOS) and volume-to-capacity ratios. Although the intersection of Beechwood Road and Thorold Stone Road is anticipated to retain critical delays on the minor approach, this condition mirrors existing patterns and is not expected to worsen under future traffic scenarios. Collisions are projected to remain consistent with those expected by the end of 2025. Additionally, existing horizontal and vertical sightlines are considered adequate to support safe traffic operations.

As a result, no impact management measures are currently recommended in relation to transportation.

Social

From a social perspective, Landfill Configuration Option A is anticipated to have limited and manageable impacts on the surrounding community. There are no households, public facilities, or recreational resources located directly on the landfill footprint, meaning no displacement or forced relocation is required. The continuation of landfill operations in the area, ongoing since the 1980s, is considered compatible with both the existing and future character of the community. Option A represents a continuation of an established industrial presence, and future development in the area is expected to have accounted for its existence. Importantly, landfill operations are not expected to negatively affect key aspects of community character such as social cohesion, tourism, or public safety, nor are they anticipated to exacerbate broader social issues like homelessness or affordability.

While some residents within 1000 to 2000 meters of the landfill, particularly those on top of the Niagara Escarpment, may experience occasional disruptions from noise, dust, odour, traffic, and visual effects, these impacts are not expected to be severe or long-lasting. A small number of residents may choose to relocate voluntarily due to these nuisance effects, but such out-migration is expected to be minimal and unlikely to disrupt community cohesion, especially as new residents may move in and contribute positively to the area. Recreational resources, including one walking trail and four biking routes within 1000 meters of the landfill, may be affected on occasion, potentially discouraging some users. However, these effects are not expected to be of sufficient magnitude, duration, or frequency to require operational changes. Similarly, public facilities and institutions, particularly those west of the landfill or below the Niagara Escarpment, are not expected to experience disruptions from visual or other landfill-related effects.

The proposed agricultural end use of the landfill Site further supports community compatibility by promoting productive land use post-quarrying and aligning with existing agricultural activity and municipal planning goals.

To manage the potential social impacts associated with Option A, impact management measures associated with the existing South Landfill will continue to be implemented. These include applying best industry practices in landfill design and operations to minimize adverse effects related to noise, dust, odour, traffic, visual impacts, and the presence of vermin and gulls. Regulatory compliance related to noise and air quality will be maintained, and truck traffic managed through designated haul routes to reduce disruption to nearby communities. Additionally, the existing community engagement efforts and established processes for addressing concerns will be maintained, helping to foster positive relationships with local residents and mitigate shifts in public perception of the landfill.

Economic Environment

Option A is not expected to displace any existing businesses or farms, though minor nuisance effects could cause some disruption to nearby sensitive operations. Property values in the vicinity may be affected by the presence of the landfill and associated nuisance effects.

While no landfill configuration-specific effects are identified, the project may generate economic benefits through business opportunities related to supply and service contracts during construction and approximately 17.9 years of operation. Additional opportunities may arise from the agricultural end use of 36.7 ha post-closure. The project is also expected to support local employment and gross domestic product (GDP) through direct, indirect, and induced economic activity, with much of this activity retained within the local and regional economy. The landfill's proximity may also offer continued cost-effective disposal services for customers over its operational life. Additionally, the Site will contribute to municipal revenues through property taxes, royalties on residual waste, and potentially increased property assessments following closure.

To help manage the potential economic effects of Option A, several measures may be considered. These include continuing to implement BMPs already in place for South Landfill Phase 1, and consistent with Ontario Regulation 232/98, such as dust suppression, odour and litter control, speed limits, and a public complaint-response system to address concerns from nearby residents and businesses. Existing berms and vegetation around the Site are expected to provide visual screening and help reduce noise. Additionally, potential impacts on property values will be further evaluated during the detailed assessment phase, with mitigation options such as a property value protection plan being considered as part of that process.

Cultural Environment

Cultural Heritage Resources

Built Heritage Resources and Cultural Heritage Landscapes

The LSA includes a mix of rural residential and agricultural land uses. One identified cultural heritage resource is located approximately 1.8 km northeast of the SSA. No other cultural heritage resources, potential or confirmed, were identified within the LSA. As a result, no impacts to built heritage resources of cultural heritage landscapes are anticipated, and no impact management measures specific to this environmental component are recommended.

Archaeological Resources

Option A may result in potential adverse effects on approximately 15.39 ha of land identified as having archaeological potential. These areas could contain previously unidentified archaeological resources with cultural heritage value or interest. As such, there is a possibility of disturbing known or unknown archaeological sites within these zones during project development.

To manage the potential impacts on archaeological resources associated with Option A, a Stage 2 archaeological assessment is recommended for all areas identified as having archaeological potential. This assessment would help identify any previously unknown resources before any ground disturbance occurs. If resources with cultural heritage value or interest are found, they would be subject to further investigation through a Stage 3 Site-specific assessment and, if necessary, Stage 4 mitigation to address development impacts.

6.1.1.2 Summary of Net Effects

The net effects for each environmental component and details on the impact management measures for Landfill Configuration Option A can be viewed in Table 7.1, **Appendix B-1**, and within the discipline-specific memos that form **Appendix D**. However, a brief overview of the net effects is summarized below in Table 6.1.

Table 6.1 Landfill Configuration Option A – Summary of Net Effects

Environmental Component	Summary of Net Effects
Geology and Hydrogeology	– No effect in relation to any of the criteria and indicators
Surface Water	– No effect in relation to any of the criteria and indicators
Atmospheric	– Low effect in relation to air quality, odours, and noise at off-Site receptors
Terrestrial and Aquatic Environment	– Low effects in relation to all criteria and indicators
Land Use	– No effect in relation to existing and proposed planned future land uses and associated infrastructure when considering a potential agricultural end use – Low effect in relation to existing and proposed planned future land uses and associated infrastructure when considering the proposed Interim Waste Management Facility Use – Low to Moderate effect in relation to visual criteria and indicators
Agriculture	– Low effect in relation to CLI soil capability classification and agricultural end use area – Low (positive) effect in relation to soil suitability classification and climate – No effect in relation to remaining criteria and indicators
Transportation	– Low effect in relation to effect on traffic – No effect in relation to road safety and geometry
Social	– No effect in relation to: • displacement of residents from houses due to the project itself • the potential for or likelihood of changes in operations of public facilities and institutions • the potential for or likelihood of changes in operations of recreational features • changes to community character, or cohesion – Low effect in relation to: • voluntary out migration of residents for consideration of the indirect effects on community character and cohesion • disruption to use and enjoyment of residential properties • the number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects;

Environmental Component	Summary of Net Effects
	and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of public facilities and institutions • the number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of recreational resources
Economic Environment	– Low (positive) effect in relation to impact on business, and assessment base – Moderate (positive) effect in relation to labour market, GDP, municipal revenue, and customer cost of waste service – No effect in relation to property value impacts, and municipal cost
Cultural Heritage Resources	– No effect on any criteria and indicators relating to built heritage resource, cultural heritage landscapes, archaeological resources, or areas of archaeological potential.

6.1.2 Landfill Configuration Option B

6.1.2.1 Potential Effects and Impact Management Measures

The potential effects, proposed impact management measures, and the resultant net effects associated with Landfill Configuration Option B are described in the following subsections. **Appendix B-2** provides the net effects table for Landfill Configuration Option B and **Appendix D** provides the discipline-specific memos.

Natural Environment

Geology and Hydrogeology

Option B is not expected to significantly alter existing hydrogeologic conditions at the Site. Groundwater flow and quality are well understood due to decades of monitoring, and the proposed landfill will be placed within an already-excavated quarry, maintaining the current drawdown cone and groundwater levels. Inward hydraulic gradients toward the Site are expected to remain stable, ensuring that off-Site groundwater receptors, including residential supplies, are not impacted. The landfill design includes a liner and a LCS that meet or exceed regulatory standards, providing protection for the underlying bedrock aquifers. Additionally, the Rochester shale acts as a natural barrier, hydraulically separating deeper groundwater systems from the landfill, further reducing the potential for off-Site effects.

No impact management measures are proposed in relation to geology and hydrogeology.

Surface Water

Option B may present some potential effects on surface water and stormwater management, though these are expected to be manageable with appropriate design. While there is a risk of accidental leachate seepage, the landfill is proposed to include a liner and a LCS designed to meet or exceed regulatory standards, minimizing this risk. The Site's hydrologic conditions are well understood from decades of monitoring, and surface water levels in nearby watercourses are expected to remain stable. However, landfill construction could alter natural drainage patterns, potentially increasing flood risk and stormwater runoff volumes. Factors such as slope angle and total catchment area influence peak flow and sediment loading, which will need to be addressed through stormwater management (SWM) systems designed to meet quality and quantity control objectives.

To help address the potential surface water and leachate-related effects associated with Option B, a SWM facility is anticipated to provide enhanced sediment removal and attenuate peak flows to pre-development levels, helping to

mitigate off-Site impacts. This SWM facility is expected to support total suspended solids (TSS) removal, provide emergency storage for potential leachate seeps, and help manage stormwater flows to approximate pre-development peak conditions. Based on current assessments and the engineered design of the landfill, no additional mitigation measures are anticipated to be necessary at this time.

Atmospheric

Air Quality

Option B is expected to maintain environmental conditions similar to current operations in most areas, with some localized changes. Dust and combustion byproduct levels are predicted to remain consistent with existing quarry and landfill activities, while emissions from flares and generators are not expected to increase unless new equipment is added. However, landfill gas and odour concentrations may rise due to increased waste volumes, potentially affecting more receptors along the north and east boundaries. Conversely, impacts may decrease along the west and south boundaries as operations shift and older landfill areas are capped. The potential for wind-blown litter remains unchanged, though its distribution may shift with the relocation of operations. Overall, while most impacts are expected to remain stable, some receptors, particularly to the north and east, may experience increased exposure to odour, landfill gas, and litter.

To manage the potential effects of Option B, several impact mitigation measures may be considered. These include continuing the current best practices for controlling dust and blowing litter as used at the existing South Landfill Phase 1, and updating mitigation strategies as needed based on updated modelling results. Public engagement would continue to involve responding to odour complaints through assessment and investigation. Additionally, the landfill gas collection and destruction systems, such as flaring or gas utilization, will be progressively installed to manage emissions effectively throughout the project's development.

Noise

Option B may lead to occasional exceedances of daytime noise guidelines. The lesser peak elevation of Option B decreases the source height , potentially resulting in lower sound propagation. Option B may also provide some noise shielding for residences east of the Site when machinery operates on the west side. Due to the greater slope of the landfill for Option B (Option A and C 5% vs Option B 6.7%), equipment would operate on a steeper gradient, which may slow its progression away from the bottom of the slope, the perimeter of fill area and nearby receptors. Pest control activities may introduce short, impulsive sounds, and vehicle noise from haul routes is expected to be transient and consistent with typical heavy vehicle traffic. Seven residential receptors have been identified for sound level evaluation, though nearby vacant lots are not expected to be developed during landfill operations.

To help manage potential impacts associated with Option B, a range of measures could be considered. These may include constructing localized and perimeter berms to help shield nearby receptors from noise and limiting the number of active equipment operation near the landfill perimeter. A working berm might also be used around active landfilling areas. Public engagement would continue to involve responding to noise complaints through assessment and investigation. Other strategies might involve notifying the public about pest control activities, considering the purchase of nearby residential properties to increase separation distances, and discouraging development of vacant lots near the Site. Additionally, haul routes can be planned to reduce impacts on nearby receptors, and efforts made to maintain efficient traffic flow and use well-maintained vehicles with effective mufflers.

Terrestrial and Aquatic Environment

Option B involves the potential removal of approximately 19.85 ha of vegetation, including cultural thicket, deciduous forest, cultural meadow, hedgerow, and a small area of wetland. These areas support various wildlife and plant species, including several that are rare or of conservation concern. Habitat loss may lead to changes in plant community composition and structure, increased presence of invasive species, disruption of natural succession, and reduction in quality of deer wintering areas. There is potential for leachate contamination, which could affect soil and water quality, and harm native species. Construction and operation activities may introduce sensory disturbances such as noise, light, and odours, which could impact wildlife behavior and habitat use. Changes to hydrology and dust

deposition may also affect wetland ecosystems, potentially reducing biodiversity and altering ecological functions. Additionally, the project may affect culturally significant plant species and habitats valued by Indigenous Peoples.

To address the potential effects to the terrestrial and aquatic environment associated with Option B, a comprehensive range of impact management measures will be considered. These include minimizing the project footprint and creating compensation habitat on Walker-owned lands to offset vegetation loss, ideally adjacent to existing habitats or in areas that replicate or enhance ecological functions. A CEMP, or similar, will guide all phases of construction and include detailed plans for sediment and erosion control, wildlife and invasive species management, tree protection, dust mitigation, and environmental monitoring. Sensitive areas will be clearly marked to prevent encroachment, and surveys will be conducted to identify rare or culturally significant plant species, with salvage or transplant efforts undertaken where feasible and in consultation with Indigenous participants.

To protect aquatic ecosystems, the project will avoid harmful alteration, disruption, or destruction (HADD) of fish habitat by maintaining undisturbed vegetated buffer zones between construction activities and fish-bearing watercourses. Riparian areas will be preserved, and any impacted aquatic or riparian zones will be restored to their original condition or better. An engineered double-composite clay liner and leachate treatment system will be installed to prevent contamination, supported by long-term groundwater and surface water monitoring.

Additional measures include restricting vegetation clearing during sensitive wildlife periods, using low-impact lighting, implementing speed limits and idling restrictions, and installing exclusion fencing for amphibians and reptiles. Where existing recreational trails are affected, alternative trail access may be provided within compensation habitat, where suitable. All disturbed areas will be restored post-construction, and permanent barriers and signage will be installed to protect adjacent ecosystems during the operational phase. These measures are designed to reduce ecological disruption, support habitat restoration, and maintain biodiversity and cultural values throughout the life of the project.

Built Environment

Land Use

Option B involves a shift in interim land use within the SSA from mineral aggregate extraction to landfill operations, which would require amendments to local and regional planning documents. Within the LSA, there is potential for nuisance impacts on existing and future sensitive land uses, including rural residences and vacant lots zoned for such uses. The introduction of new sensitive uses may be subject to planning restrictions due to proximity to the landfill.

Option B has a moderate peak elevation (30 m) and steeper side slopes (6.7%), resulting in an area available for agricultural end use of 51.4 ha, an increase of approximately 3.2 ha compared to the current rehabilitation plan. While several natural heritage features are located near the SSA, no direct land use impacts on these features are anticipated.

Compliance with applicable provincial standards is expected to be achieved through the implementation of BMPs and mitigation measures across related environmental components, such as noise, dust, and traffic. These measures could help reduce potential nuisance impacts on nearby sensitive uses and zoned lots. While no specific mitigation is proposed for the potential reduction in agricultural land, opportunities may be explored to enhance natural connectivity through design elements like vegetative screening, with an emphasis on using locally native species.

As development of Option B progresses, the landfill is expected to become increasingly visible from surrounding viewpoints, particularly once it rises above existing grade. Initially, it will be below grade and not visible, but as it reaches its maximum height, features such as the landfill mound, active face, machinery, and gas flares may become visible from locations including select viewpoints identified in visibility modelling. While theoretical visibility extends beyond the LSA, existing vegetation is anticipated to screen much of the Site. Views from below the Niagara Escarpment may occur, though visual impacts at that distance are expected to be minimal, aside from the potential contrast created by machinery. Given the Site's proximity to existing landfill areas, the visual change may be perceived as part of the established landscape. Over time, visual contrast is expected to diminish as interim and final caps are applied, with low visual impact anticipated at closure and post-closure as the Site transitions to its final use.

To help manage the potential visual impacts associated with Option B, several measures may be considered. These include retaining and enhancing existing visual screening features from the quarry and installing additional permanent elements such as berms and vegetation to reduce visibility of the landfill. Temporary screening, like fencing or netting, could also be used to obscure the active face during operations. Operational planning may help limit how often and for how long machinery is visible, particularly from sensitive viewpoints. Additionally, visual landscape considerations are expected to be incorporated into the development of the Closure Plan to support long-term visual integration with the surrounding environment.

Agriculture

Option B is expected to result in a increase of land available for agricultural end use compared to the existing quarry rehabilitation plan, with approximately 51.4 ha of Class 3T and 11.17 ha of Class 5T CLI lands affected. However, the Site design may improve microclimatic conditions and soil suitability for specialty crop production by enhancing cold air drainage. No significant effects are anticipated in terms of land fragmentation or impacts on surrounding agricultural or non-agricultural operations. Agricultural operations in the area are limited, with the nearest active operation being a nursery, and no agriculture-related uses are located within the LSA.

No impact management measures are proposed in relation to agriculture.

Social Environment

Transportation

Option B is not expected to significantly impact traffic operations in the area. All key study area intersections are projected to continue operating at acceptable LOS and volume-to-capacity ratios. Although the intersection of Beechwood Road and Thorold Stone Road is anticipated to retain critical delays on the minor approach, this condition mirrors existing patterns and is not expected to worsen under future traffic scenarios. Collisions are projected to remain consistent with those expected by the end of 2025. Additionally, existing horizontal and vertical sightlines are considered adequate to support safe traffic operations.

As a result, no impact management measures are currently recommended in relation to transportation.

Social

From a social perspective, Landfill Configuration Option B is anticipated to have limited and manageable impacts on the surrounding community. There are no households, public facilities, or recreational resources located directly on the landfill footprint, meaning no displacement or forced relocation is required. The continuation of landfill operations in the area, ongoing since the 1980s, is considered compatible with both the existing and future character of the community. Option B represents a continuation of an established industrial presence, and future development in the area is expected to have accounted for its existence. Importantly, landfill operations are not expected to negatively affect key aspects of community character such as social cohesion, tourism, or public safety, nor are they anticipated to exacerbate broader social issues like homelessness or affordability.

While some residents within 1000 to 2000 meters of the landfill, particularly those on top of the Niagara Escarpment, may experience occasional disruptions from noise, dust, odour, traffic, and visual effects, these impacts are not expected to be severe or long-lasting. A small number of residents may choose to relocate voluntarily due to these nuisance effects, but such out-migration is expected to be minimal and unlikely to disrupt community cohesion, especially as new residents may move in and contribute positively to the area. Recreational resources, including one walking trail and four biking routes within 1000 meters of the landfill, may be affected on occasion, potentially discouraging some users. However, these effects are not expected to be of sufficient magnitude, duration, or frequency to require operational changes. Similarly, public facilities and institutions, particularly those west of the landfill or below the Niagara Escarpment, are not expected to experience disruptions from visual or other landfill-related effects.

The proposed agricultural end use of the landfill Site further supports community compatibility by promoting productive land use post-quarrying and aligning with existing agricultural activity and municipal planning goals.

To manage the potential social impacts associated with Option B, impact management measures associated with the existing South Landfill will continue to be implemented. These include applying best industry practices in landfill design and operations to minimize adverse effects related to noise, dust, odour, traffic, visual impacts, and the presence of vermin and gulls. Regulatory compliance related to noise and air quality will be maintained, and truck traffic managed through designated haul routes to reduce disruption to nearby communities. Additionally, the existing community engagement efforts and established processes for addressing concerns will be maintained, helping to foster positive relationships with local residents and mitigate shifts in public perception of the landfill.

Economic Environment

Option B is not expected to displace any existing businesses or farms, though minor nuisance effects could cause some disruption to nearby sensitive operations. Property values in the vicinity may be affected by the presence of the landfill and associated nuisance effects.

While no landfill configuration-specific effects are identified, the project may generate economic benefits through business opportunities related to supply and service contracts during construction and approximately 16.2 years of operation. Additional opportunities may arise from the agricultural end use of 51.4 ha post-closure. The project is also expected to support local employment and gross domestic product (GDP) through direct, indirect, and induced economic activity, with much of this activity retained within the local and regional economy. The landfill's proximity may also offer continued cost-effective disposal services for customers over its operational life. Additionally, the Site will contribute to municipal revenues through property taxes, royalties on residual waste, and potentially increased property assessments following closure.

To help manage the potential economic effects of Option B, several measures may be considered. These include continuing to implement BMPs already in place for South Landfill Phase 1, and consistent with Ontario Regulation 232/98, such as dust suppression, odour and litter control, speed limits, and a public complaint-response system to address concerns from nearby residents and businesses. Existing berms and vegetation around the Site are expected to provide visual screening and help reduce noise. Additionally, potential impacts on property values will be further evaluated during the detailed assessment phase, with mitigation options such as a property value protection plan being considered as part of that process.

Cultural Environment

Cultural Heritage Resources

Built Heritage Resources and Cultural Heritage Landscapes

The LSA includes a mix of rural residential and agricultural land uses. One identified cultural heritage resource is located approximately 1.8 km northeast of the SSA. No other cultural heritage resources, potential or confirmed, were identified within the LSA. As a result, no impacts to built heritage resources of cultural heritage landscapes are anticipated, and no impact management measures specific to this environmental component are recommended.

Archaeological Resources

Option B may result in potential adverse effects on approximately 15.39 ha of land identified as having archaeological potential. These areas could contain previously unidentified archaeological resources with cultural heritage value or interest. As such, there is a possibility of disturbing known or unknown archaeological sites within these zones during project development.

To manage the potential impacts on archaeological resources associated with Option B, a Stage 2 archaeological assessment is recommended for all areas identified as having archaeological potential. This assessment would help identify any previously unknown resources before any ground disturbance occurs. If resources with cultural heritage value or interest are found, they would be subject to further investigation through a Stage 3 Site-specific assessment and, if necessary, Stage 4 mitigation to address development impacts.

6.1.2.2 Summary of Net Effects

The net effects for each environmental component and details on the impact management measures for Landfill Configuration Option B can be viewed in Table 7.1, **Appendix B-2**, and within the discipline-specific memos that form **Appendix D**. However, a brief overview of the net effects is summarized below in Table 6.2.

Table 6.2 Landfill Configuration Option B – Summary of Net Effects

Environmental Component	Summary of Net Effects
Geology and Hydrogeology	– No effect in relation to any of the criteria and indicators
Surface Water	– No effect in relation to any of the criteria and indicators
Atmospheric	– Low effect in relation to air quality, odours, and noise at off-Site receptors
Terrestrial and Aquatic Environment	– Low effects in relation to all criteria and indicators
Land Use	– No effect in relation to existing and proposed planned future land uses and associated infrastructure when considering a potential agricultural end use – Low effect in relation to existing and proposed planned future land uses and associated infrastructure when considering the proposed Interim Waste Management Facility Use – Low to Moderate effect in relation to visual criteria and indicators
Agriculture	– Low effect in relation to CLI soil capability classification – Low (positive) effect in relation to soil suitability classification, climate, and agricultural end use area – No effect in relation to remaining criteria and indicators
Transportation	– Low effect in relation to effect on traffic – No effect in relation to road safety and geometry
Social	– No effect in relation to: • displacement of residents from houses due to the project itself • the potential for or likelihood of changes in operations of public facilities and institutions • the potential for or likelihood of changes in operations of recreational features • changes to community character, or cohesion – Low effect in relation to: • voluntary out migration of residents for consideration of the indirect effects on community character and cohesion • disruption to use and enjoyment of residential properties • the number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of public facilities and institutions • the number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of recreational resources
Economic Environment	– Low (positive) effect in relation to impact on business, and assessment base – Moderate (positive) effect in relation to labour market, GDP, municipal revenue, and customer cost of waste service

Environmental Component	Summary of Net Effects
	– No effect in relation to property value impacts, and municipal cost
Cultural Heritage Resources	– No effect on any criteria and indicators relating to built heritage resource, cultural heritage landscapes, archaeological resources, or areas of archaeological potential.

6.1.3 Landfill Configuration Option C

6.1.3.1 Potential Effects and Impact Management Measures

The potential effects, proposed impact management measures, and the resultant net effects associated with Landfill Configuration Option C are described in the following sections. **Appendix B-3** provides the net effects table for Landfill Configuration Option C and **Appendix D** provides the discipline-specific memos.

Natural Environment

Geology and Hydrogeology

Option C is not expected to significantly alter existing hydrogeologic conditions at the Site. Groundwater flow and quality are well understood due to decades of monitoring, and the proposed landfill will be placed within an already-excavated quarry, maintaining the current drawdown cone and groundwater levels. Inward hydraulic gradients toward the Site are expected to remain stable, ensuring that off-Site groundwater receptors, including residential supplies, are not impacted. The landfill design includes a liner and a LCS that meet or exceed regulatory standards, providing protection for the underlying bedrock aquifers. Additionally, the Rochester shale acts as a natural barrier, hydraulically separating deeper groundwater systems from the landfill, further reducing the potential for off-Site effects.

No impact management measures are proposed in relation to geology and hydrogeology.

Surface Water

Option C may present some potential effects on surface water and stormwater management, though these are expected to be manageable with appropriate design. While there is a risk of accidental leachate seepage, the landfill is proposed to include a liner and a LCS designed to meet or exceed regulatory standards, minimizing this risk. The Site's hydrologic conditions are well understood from decades of monitoring, and surface water levels in nearby watercourses are expected to remain stable. However, landfill construction could alter natural drainage patterns, potentially increasing flood risk and stormwater runoff volumes. Factors such as slope angle and total catchment area influence peak flow and sediment loading, which will need to be addressed through stormwater management (SWM) systems designed to meet quality and quantity control objectives.

To help address the potential surface water and leachate-related effects associated with Option C, a SWM facility is anticipated to play to provide enhanced sediment removal and attenuate peak flows to pre-development levels, helping to mitigate off-Site impacts. This SWM facility is expected to support total suspended solids (TSS) removal, provide emergency storage for potential leachate seeps, and help manage stormwater flows to approximate pre-development peak conditions. Based on current assessments and the engineered design of the landfill, no additional mitigation measures are anticipated to be necessary at this time.

Atmospheric

Air Quality

Option C is expected to maintain environmental conditions similar to current operations in most areas, with some localized changes. Dust and combustion byproduct levels are predicted to remain consistent with existing quarry and landfill activities, while emissions from flares and generators are not expected to increase unless new equipment is added. However, landfill gas and odour concentrations may rise due to increased waste volumes, potentially affecting more receptors along the north and east boundaries. Conversely, impacts may decrease along the west and south

boundaries as operations shift and older landfill areas are capped. The potential for wind-blown litter remains unchanged, though its distribution may shift with the relocation of operations. Overall, while most impacts are expected to remain stable, some receptors, particularly to the north and east, may experience increased exposure to odour, landfill gas, and litter.

To manage the potential effects of Option C, several impact mitigation measures may be considered. These include continuing the current best practices for controlling dust and blowing litter as used at the existing South Landfill Phase 1, and updating mitigation strategies as needed based on updated modelling results. Public engagement would continue to involve responding to odour complaints through assessment and investigation. Additionally, the landfill gas collection and destruction systems, such as flaring or gas utilization, will be progressively installed to manage emissions effectively throughout the project's development.

Noise

Option C may lead to occasional exceedances of daytime noise guidelines. While the lower peak elevation of Option A decreases the source height, potentially resulting in lower sound propagation. Option C may also provide some noise shielding for residences east of the Site when machinery operates on the west side. Due to the lesser slope of the landfill for Option C (Option A and C 5% vs Option B 6.7%), equipment would operate on a gentler gradient, which may accelerate its progression away from the bottom of the slope, the perimeter of fill area and nearby receptors, potentially reducing direct noise impacts. Pest control activities may introduce short, impulsive sounds, and vehicle noise from haul routes is expected to be transient and consistent with typical heavy vehicle traffic. Seven residential receptors have been identified for sound level evaluation, though nearby vacant lots are not expected to be developed during landfill operations.

To help manage potential impacts associated with Option C, a range of measures could be considered. These may include constructing localized and perimeter berms to help shield nearby receptors from noise and limiting the number of active equipment operation near the landfill perimeter. A working berm might also be used around active landfilling areas. Public engagement would continue to involve responding to noise complaints through assessment and investigation. Other strategies might involve notifying the public about pest control activities, considering the purchase of nearby residential properties to increase separation distances, and discouraging development of vacant lots near the Site. Additionally, haul routes can be planned to reduce impacts on nearby receptors, and efforts made to maintain efficient traffic flow and use well-maintained vehicles with effective mufflers.

Terrestrial and Aquatic Environment

Option C involves the potential removal of approximately 19.85 ha of vegetation, including cultural thicket, deciduous forest, cultural meadow, hedgerow, and a small area of wetland. These areas support various wildlife and plant species, including several that are rare or of conservation concern. Habitat loss may lead to changes in plant community composition and structure, increased presence of invasive species, disruption of natural succession, and reduction in quality of deer wintering areas. There is potential for leachate contamination, which could affect soil and water quality, and harm native species. Construction and operation activities may introduce sensory disturbances such as noise, light, and odours, which could impact wildlife behavior and habitat use. Changes to hydrology and dust deposition may also affect wetland ecosystems, potentially reducing biodiversity and altering ecological functions. Additionally, the project may affect culturally significant plant species and habitats valued by Indigenous Peoples.

To address the potential effects to the terrestrial and aquatic environment associated with Option C, a comprehensive range of impact management measures will be considered. These include minimizing the project footprint and creating compensation habitat on Walker-owned lands to offset vegetation loss, ideally adjacent to existing habitats or in areas that replicate or enhance ecological functions. A CEMP, or similar, will guide all phases of construction and include detailed plans for sediment and erosion control, wildlife and invasive species management, tree protection, dust mitigation, and environmental monitoring. Sensitive areas will be clearly marked to prevent encroachment, and surveys will be conducted to identify rare or culturally significant plant species, with salvage or transplant efforts undertaken where feasible and in consultation with Indigenous participants.

To protect aquatic ecosystems, the project will avoid harmful alteration, disruption, or destruction (HADD) of fish habitat by maintaining undisturbed vegetated buffer zones between construction activities and fish-bearing watercourses. Riparian areas will be preserved, and any impacted aquatic or riparian zones will be restored to their original condition or better. An engineered double-composite clay liner and leachate treatment system will be installed to prevent contamination, supported by long-term groundwater and surface water monitoring.

Additional measures include restricting vegetation clearing during sensitive wildlife periods, using low-impact lighting, implementing speed limits and idling restrictions, and installing exclusion fencing for amphibians and reptiles. Where existing recreational trails are affected, alternative trail access may be provided within compensation habitat, where suitable. All disturbed areas will be restored post-construction, and permanent barriers and signage will be installed to protect adjacent ecosystems during the operational phase. These measures are designed to reduce ecological disruption, support habitat restoration, and maintain biodiversity and cultural values throughout the life of the project.

Built Environment

Land Use

Option C involves a shift in interim land use within the SSA from mineral aggregate extraction to landfill operations, which would require amendments to local and regional planning documents. Within the LSA, there is potential for nuisance impacts on existing and future sensitive land uses, including rural residences and vacant lots zoned for such uses. The introduction of new sensitive uses may be subject to planning restrictions due to proximity to the landfill.

Option C has the lowest peak elevation of the three options (24 m) and steeper side slopes (5%). The area available for agricultural end use is 45.0 ha, a decrease of approximately 3.2 ha compared to the current rehabilitation plan. While several natural heritage features are located near the SSA, no direct land use impacts on these features are anticipated.

Compliance with applicable provincial standards is expected to be achieved through the implementation of BMPs and mitigation measures across related environmental components, such as noise, dust, and traffic. These measures could help reduce potential nuisance impacts on nearby sensitive uses and zoned lots. While no specific mitigation is proposed for the potential reduction in agricultural land, opportunities may be explored to enhance natural connectivity through design elements like vegetative screening, with an emphasis on using locally native species.

As development of Option C progresses, the landfill is expected to become increasingly visible from surrounding viewpoints, particularly once it rises above existing grade. Initially, it will be below grade and not visible, but as it reaches its maximum height, features such as the landfill mound, active face, machinery, and gas flares may become visible from locations including select viewpoints identified in visibility modelling. While theoretical visibility extends beyond the LSA, existing vegetation is anticipated to screen much of the Site. Views from below the Niagara Escarpment may occur, though visual impacts at that distance are expected to be minimal, aside from the potential contrast created by machinery. Given the Site's proximity to existing landfill areas, the visual change may be perceived as part of the established landscape. Over time, visual contrast is expected to diminish as interim and final caps are applied, with low visual impact anticipated at closure and post-closure as the Site transitions to its final use.

To help manage the potential visual impacts associated with Option C, several measures may be considered. These include retaining and enhancing existing visual screening features from the quarry and installing additional permanent elements such as berms and vegetation to reduce visibility of the landfill. Temporary screening, like fencing or netting, could also be used to obscure the active face during operations. Operational planning may help limit how often and for how long machinery is visible, particularly from sensitive viewpoints. Additionally, visual landscape considerations are expected to be incorporated into the development of the Closure Plan to support long-term visual integration with the surrounding environment.

Agriculture

Option C is expected to result in a reduction of land available for agricultural end use compared to the existing quarry rehabilitation plan, with approximately 45.0 ha of Class 2T and 17.57 ha of Class 5T CLI lands affected. However, the Site design may improve microclimatic conditions and soil suitability for specialty crop production by enhancing cold

air drainage. No significant effects are anticipated in terms of land fragmentation or impacts on surrounding agricultural or non-agricultural operations. Agricultural operations in the area are limited, with the nearest active operation being a nursery, and no agriculture-related uses are located within the LSA.

No impact management measures are proposed in relation to agriculture.

Social Environment

Transportation

Option C is not expected to significantly impact traffic operations in the area. All key study area intersections are projected to continue operating at acceptable LOS and volume-to-capacity ratios. Although the intersection of Beechwood Road and Thorold Stone Road is anticipated to retain critical delays on the minor approach, this condition mirrors existing patterns and is not expected to worsen under future traffic scenarios. Collisions are projected to remain consistent with those expected by the end of 2025. Additionally, existing horizontal and vertical sightlines are considered adequate to support safe traffic operations.

As a result, no impact management measures are currently recommended in relation to transportation.

Social

From a social perspective, Landfill Configuration Option C is anticipated to have limited and manageable impacts on the surrounding community. There are no households, public facilities, or recreational resources located directly on the landfill footprint, meaning no displacement or forced relocation is required. The continuation of landfill operations in the area, ongoing since the 1980s, is considered compatible with both the existing and future character of the community. Option C represents a continuation of an established industrial presence, and future development in the area is expected to have accounted for its existence. Importantly, landfill operations are not expected to negatively affect key aspects of community character such as social cohesion, tourism, or public safety, nor are they anticipated to exacerbate broader social issues like homelessness or affordability.

While some residents within 1000 to 2000 meters of the landfill, particularly those on top of the Niagara Escarpment, may experience occasional disruptions from noise, dust, odour, traffic, and visual effects, these impacts are not expected to be severe or long-lasting. A small number of residents may choose to relocate voluntarily due to these nuisance effects, but such out-migration is expected to be minimal and unlikely to disrupt community cohesion, especially as new residents may move in and contribute positively to the area. Recreational resources, including one walking trail and four biking routes within 1000 meters of the landfill, may be affected on occasion, potentially discouraging some users. However, these effects are not expected to be of sufficient magnitude, duration, or frequency to require operational changes. Similarly, public facilities and institutions, particularly those west of the landfill or below the Niagara Escarpment, are not expected to experience disruptions from visual or other landfill-related effects.

The proposed agricultural end use of the landfill Site further supports community compatibility by promoting productive land use post-quarrying and aligning with existing agricultural activity and municipal planning goals.

To manage the potential social impacts associated with Option C, impact management measures associated with the existing South Landfill will continue to be implemented. These include applying best industry practices in landfill design and operations to minimize adverse effects related to noise, dust, odour, traffic, visual impacts, and the presence of vermin and gulls. Regulatory compliance related to noise and air quality will be maintained, and truck traffic managed through designated haul routes to reduce disruption to nearby communities. Additionally, the existing community engagement efforts and established processes for addressing concerns will be maintained, helping to foster positive relationships with local residents and mitigate shifts in public perception of the landfill.

Economic Environment

Option C is not expected to displace any existing businesses or farms, though minor nuisance effects could cause some disruption to nearby sensitive operations. Property values in the vicinity may be affected by the presence of the landfill and associated nuisance effects.

While no landfill configuration-specific effects are identified, the project may generate economic benefits through business opportunities related to supply and service contracts during construction and approximately 15.9 years of operation. Additional opportunities may arise from the agricultural end use of 45.0 ha post-closure. The project is also expected to support local employment and gross domestic product (GDP) through direct, indirect, and induced economic activity, with much of this activity retained within the local and regional economy. The landfill's proximity may also offer continued cost-effective disposal services for customers over its operational life. Additionally, the Site will contribute to municipal revenues through property taxes, royalties on residual waste, and potentially increased property assessments following closure.

To help manage the potential economic effects of Option C, several measures may be considered. These include continuing to implement BMPs already in place for South Landfill Phase 1, and consistent with Ontario Regulation 232/98, such as dust suppression, odour and litter control, speed limits, and a public complaint-response system to address concerns from nearby residents and businesses. Existing berms and vegetation around the Site are expected to provide visual screening and help reduce noise. Additionally, potential impacts on property values will be further evaluated during the detailed assessment phase, with mitigation options such as a property value protection plan being considered as part of that process.

Cultural Environment

Cultural Heritage Resources

Built Heritage Resources and Cultural Heritage Landscapes

The LSA includes a mix of rural residential and agricultural land uses. One identified cultural heritage resource is located approximately 1.8 km northeast of the SSA. No other cultural heritage resources, potential or confirmed, were identified within the LSA. As a result, no impacts to built heritage resources of cultural heritage landscapes are anticipated, and no impact management measures specific to this environmental component are recommended.

Archaeological Resources

Option C may result in potential adverse effects on approximately 15.39 ha of land identified as having archaeological potential. These areas could contain previously unidentified archaeological resources with cultural heritage value or interest. As such, there is a possibility of disturbing known or unknown archaeological sites within these zones during project development.

To manage the potential impacts on archaeological resources associated with Option C, a Stage 2 archaeological assessment is recommended for all areas identified as having archaeological potential. This assessment would help identify any previously unknown resources before any ground disturbance occurs. If resources with cultural heritage value or interest are found, they would be subject to further investigation through a Stage 3 site-specific assessment and, if necessary, Stage 4 mitigation to address development impacts.

6.1.3.2 Summary of Net Effects

The net effects for each environmental component and details on the impact management measures for Landfill Configuration Option C can be viewed in Table 7.1, **Appendix B-3**, and within the discipline-specific memos that form **Appendix D**. However, a brief overview of the net effects is summarized below in Table 6.3.

Table 6.3 Landfill Configuration Option C – Summary of Net Effects

Environmental Component	Summary of Net Effects
Geology and Hydrogeology	No effect in relation to any of the criteria and indicators
Surface Water	No effect in relation to any of the criteria and indicators
Atmospheric	Low effect in relation to air quality, odours, and noise at off-Site receptors
Terrestrial and Aquatic Environment	Low effects in relation to all criteria and indicators
Land Use	– No effect in relation to existing and proposed planned future land uses and associated infrastructure when considering a potential agricultural end use – Low effect in relation to existing and proposed planned future land uses and associated infrastructure when considering the proposed Interim Waste Management Facility Use – Low to Moderate effect in relation to visual criteria and indicators
Agriculture	– Low effect in relation to CLI soil capability classification and agricultural end use area – Low (positive) effect in relation to soil suitability classification and climate – No effect in relation to remaining criteria and indicators
Transportation	– Low effect in relation to effect on traffic – No effect in relation to road safety and geometry
Social	– No effect in relation to: • displacement of residents from houses due to the project itself • the potential for or likelihood of changes in operations of public facilities and institutions • the potential for or likelihood of changes in operations of recreational features • changes to community character, or cohesion – Low effect in relation to: • voluntary out migration of residents for consideration of the indirect effects on community character and cohesion • disruption to use and enjoyment of residential properties • the number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of public facilities and institutions • the number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls • the potential for or likelihood of changes in use and enjoyment of recreational resources

Environmental Component	Summary of Net Effects
Economic Environment	– Low (positive) effect in relation to impact on business, and assessment base – Moderate (positive) effect in relation to labour market, GDP, municipal revenue, and customer cost of waste service – No effect in relation to property value impacts, and municipal cost
Cultural Heritage Resources	No effect on any criteria and indicators relating to built heritage resource, cultural heritage landscapes, archaeological resources, or areas of archaeological potential.

6.2 Leachate Management Options

The following subsections summarise the potential effects, proposed impact management measures and the resultant net effects associated with the Leachate Management Options. Details of the analysis are provided in the net effects tables contained in **Appendix C**, and within the discipline-specific memos that form **Appendix D**.

6.2.1 Leachate Management Option A

6.2.1.1 Potential Effects and Impact Management Measures

The potential effects, proposed impact management measures, and the resultant net effects associated with Leachate Management Option A are described in the following subsections. **Appendix C-1** provides the net effects table for Leachate Management Option A and **Appendix D** provides the discipline specific memos.

Natural Environment

Geology and Hydrogeology

Under Option A, the potential effects on geology and hydrogeology are expected to be minimal due to the well-characterized and stable hydrogeologic conditions at the Site and surrounding areas, established through decades of monitoring at the East Landfill, South Landfill, and former quarries. The addition of a third lined leachate lagoon, hydraulically isolated from natural groundwater systems, will not alter existing groundwater flow patterns. Groundwater in the key bedrock units, Lockport dolostone and Rochester shale, will continue to be drawn inward toward the Site by the existing Groundwater Collection System (GWCS) preserving current flow regimes and hydraulic gradients. The Rochester shale will continue to act as a regional aquitard, maintaining hydraulic separation from the deeper Irondequoit limestone aquifer. As a result, off-Site residential groundwater supplies, located upgradient of the Site, will remain unaffected. No mitigation measures are required. Implementation of an Environmental Monitoring Program (EMP) appropriate to the leachate management option will ensure compliance with groundwater quality standards at property boundaries.

Surface Water

While the existing hydrologic conditions at the Site and surrounding areas are well understood due to decades of monitoring at the East and South Landfills and former quarries, the introduction of new infrastructure adds new risk. The construction of a third on-Site lagoon for aeration and discharge, along with the need for an additional forcemain to transport leachate to this lagoon, involves potential for system failures. Breakages in either the new or existing forcemains could result in the unintended discharge of untreated or partially treated leachate into the natural environment, potentially impacting surface water quality. As the landfill grows, the strength of the leachate will increase, altering treatment requirements.

To manage the potential impacts associated with Option A, several mitigation measures are proposed. A leachate sump equipped with a pump, metering equipment, and control systems will be installed to enable continuous

monitoring and provide contingency capabilities in case of system anomalies. The implementation of an on-Site pre-treatment lagoon will serve multiple functions, including flow equalization and peak flow management, ensuring that discharge rates are consistent and manageable. Adequate pre-treatment and equalization storage volume and area are essential for effective flow pacing and discharge flow management. Additionally, a review of the current sampling methodology is recommended to ensure it meets the requirements for wastewater treatment plant discharge, thereby maintaining compliance and minimizing environmental risks.

Atmospheric

Air Quality

Option A, which involves the continued use of the municipal wastewater treatment system along with the addition of a third leachate lagoon and associated collection infrastructure, is not expected to significantly impact air quality. Dust, combustion byproducts, and blowing litter are not anticipated to be concerns. While leachate can emit volatile organic compounds (VOCs) and odours, the proposed lagoon may slightly increase fugitive emissions, particularly affecting receptors to the north and east. However, these increases are expected to be minor, with no substantial change in predicted concentrations or the number of affected receptors. Emissions from maintenance holes are considered negligible, and the overall frequency of exceedances at off-Site receptors may rise slightly but will remain consistent with existing conditions due to the infrastructure being located in the same area as current operations.

To manage the potential effects associated with the proposed leachate infrastructure, several impact mitigation measures already in place will continue to be implemented. The LCS will be maintained under negative pressure, which helps to minimize the release of fugitive emissions, including VOCs and odours, into the surrounding environment. Additionally, BMPs for leachate handling will continue to be enforced and will be adapted to incorporate the new infrastructure.

Noise

Option A may result in intermittent exceedances of applicable noise guidelines, potentially affecting nearby residential areas. The introduction of additional leachate sump pumps and lagoon aeration systems will contribute to the overall facility sound levels, increasing the ambient noise environment. Temporary noise spikes are also expected during earthworks associated with lagoon excavation. Seven residential receptors have been identified for predicted sound level evaluation. No change in vehicle traffic is anticipated, suggesting that traffic-related noise will remain consistent.

To manage the potential noise impacts associated with Option A, several mitigation measures are proposed. These include constructing enclosures or barriers around noise-generating equipment to shield nearby receptors, particularly where predicted sound levels may exceed applicable guidelines. For instance, sump pumps may be installed below grade within sump wells or enclosed structures, and aeration air blower or pump systems may be similarly contained to reduce noise emissions. Construction activities will be restricted to daytime hours between 07:00 and 22:00 to minimize disturbance during sensitive nighttime periods. Additionally, the new pump and aeration systems will be strategically located near the existing water treatment pump infrastructure, which is situated farther from residential receptors, thereby reducing the potential for noise intrusion into neighbouring communities.

Terrestrial and Aquatic Environment

The installation of a new forcemain may lead to the removal or disturbance of low-quality cover, foraging, nesting, and movement habitats for wildlife associated with hedgerows and roadside ditches. These habitats are potentially used by culturally significant species and roosting bats. Further, leachate contamination could affect surface and groundwater, impacting aquatic biota, riparian vegetation, and wetland ecosystems in the surrounding area. Leachate contamination poses toxicity risks to terrestrial and aquatic species, potentially altering growth, survival, species composition, and community structure.

To manage the potential environmental impacts associated with Option A, a comprehensive set of mitigation measures is proposed. These include minimizing the footprint of vegetation clearing and clearly marking work boundaries in the field to avoid unnecessary disturbance. A CEMP, or similar, will guide all phases of the project to

ensure environmental protection. Habitat restoration and enhancement will be undertaken post-construction, with compensation habitat considered, if necessary. To protect wildlife, vegetation clearing will adhere to timing windows that avoid sensitive periods for migratory birds and bats (April 1 to September 30), and exclusion fencing will be installed to prevent wildlife intrusion into active work zones. Prior to construction, surveys will confirm the absence of rare or culturally significant species and habitats, with appropriate protection or relocation measures implemented, if needed. Leachate management infrastructure will be regularly inspected and maintained to prevent leaks, with immediate remediation if a release occurs. Surface and groundwater monitoring will be maintained throughout the LSA. For aquatic environments, instream work will follow fisheries least-risk timing windows, and buffer zones will be preserved to protect riparian areas. Compliance with relevant legislation, including the *Endangered Species Act*, *Species at Risk Act*, *Aggregate Resources Act*, *Migratory Birds Convention Act*, and *Fisheries Act*, will be maintained throughout the project.

Built Environment

Land Use

Option A is anticipated to have minimal impact on land use due to its reliance on existing infrastructure and the off-Site management of leachate treatment within an established industrial area. The approach accommodates future growth projections, including high-density development within the Glendale Secondary Plan area, with municipal sewers confirmed to have sufficient capacity for projected 2051 flows, including during a 10-year design storm. While the implementation of Option A will require regulatory approvals under the *Niagara Escarpment Planning and Development Act*, the *Aggregate Resources Act*, and potentially under the *Planning Act*, no adverse effects are expected on current or planned land uses, nor on off-Site sensitive land uses, the nearest of which is over 1,175 m away. Additionally, although nearby natural heritage features are identified in the Niagara Region Official Plan, including significant woodlands and wetlands, no land use-related impacts to these features are anticipated. No impact management measures specific to land use are recommended.

Option A is not anticipated to significantly affect the visual landscape. The proposed third lagoon would be located adjacent to the existing lagoons within the Walker Campus, an area already characterized by aggregate and waste management operations. As such, the addition would be visually consistent with the current setting and not perceived as a contrasting element. Furthermore, the new lagoon is not expected to be visible from viewpoints outside the Walker Campus. No additional visual impact management measures are considered necessary for Option A, provided that the existing berm and vegetation are retained.

Agriculture

Option A is located within the Walker Campus on previously disturbed lands that are not capable of agricultural production. As such, no potential effects were identified in relation to the agricultural criteria and indicators, and no agricultural impact management measures are proposed for Option A.

Social Environment

Transportation

Option A is located within the Walker Campus and is not expected to impact the operational level of service at intersections around the Site, collision frequency, nor sightlines. As such, no potential effects were identified in relation to the transportation criteria and indicators, and no transportation impact management measures are proposed for Option A.

Social

From a social perspective, Leachate Management Option A for is expected to have minimal adverse impacts on the surrounding community. Since there are no households within the Campus boundary, no displacement or forced relocation is required. The continued use of the municipal wastewater treatment system, supplemented by an

additional on-Site leachate pond, aligns with existing practices and is not anticipated to significantly alter public attitudes or community character.

Furthermore, the project is not expected to introduce substantial changes in environmental factors such as noise, dust, odour, traffic, or the presence of vermin and gulls. These effects are projected to remain at levels that do not interfere with the use and enjoyment of nearby residential properties, public facilities, institutions, or recreational resources. The absence of truck-based leachate transport also means no increase in traffic or traffic-related noise. Importantly, the proposed leachate pond continues a long-standing industrial activity at the Site, which is familiar to the community and compatible with both current and future land uses, including agriculture.

The South Landfill (Phase 2) is anticipated to be managed using approaches similar to those applied in Phase 1, with the potential use of established industry practices aimed at reducing impacts such as noise, dust, odour, traffic, and visual disturbances, as well as managing the presence of vermin and gulls. Ongoing efforts to meet regulatory requirements related to noise and air quality are also expected. In addition, continued engagement with nearby communities and mechanisms for addressing concerns may help to limit any significant shifts in public perception or social impacts associated with the project.

Economic Environment

Option A, expansion of the existing leachate system, is not anticipated to displace or disrupt any businesses or farms, preserving current economic stability. The construction phase will generate business opportunities for contractors and service providers, while also creating direct, indirect, and induced employment, contributing to local and regional GDP growth. Economic activity is expected to remain largely within the local and regional economy. Additionally, the Town of Niagara-on-the-Lake will benefit from annual revenue through a volumetric charge to Walker for leachate discharge, although it will also incur costs paid to the Region of Niagara for conveyance and treatment at the Port Weller Wastewater Treatment Plant. Tipping fees are not expected to be affected as capital cost recovery will be managed through ongoing volumetric charges, minimizing financial impact on users. No economic impact management measures are proposed for Option A.

Cultural Environment

Cultural Heritage Resources

Built Heritage Resources and Cultural Heritage Landscapes

The LSA includes a mix of rural residential and agricultural land uses. One identified cultural heritage resource is located approximately 1.8 km northeast of the SSA. No other cultural heritage resources, potential or confirmed, were identified within the LSA. As a result, no impacts to built heritage resources of cultural heritage landscapes are anticipated, and no impact management measures specific to this environmental component are recommended for Option A.

Archaeological Resources

Option A may result in potential adverse effects on an additional 0.28 ha of land identified as having archaeological potential, which may contain previously unidentified resources of cultural heritage value or interest. Furthermore, there is a risk of disturbing previously unidentified archaeological resources with cultural heritage value or interest.

To manage potential impact to archaeological resources, a Stage 2 archaeological assessment will be conducted across all areas of archaeological potential to identify any archaeological resources that may be present before any adverse effects occur. Should any archaeological resources with cultural heritage value or interest be discovered during this assessment, they will be subject to a more detailed Stage 3 site-specific assessment. If necessary, a Stage 4 mitigation process will be implemented to address and minimize development impacts on these resources.

6.2.1.2 Summary of Net Effects

The net effects for each environmental component and details on the impact management measures for Leachate Management Option A can be viewed in Table 7.3, **Appendix C-1**, and within the discipline-specific memos that form **Appendix D**. However, a brief overview of the net effects is summarized below in Table 6.4.

Table 6.4 Leachate Management Option A – Summary of Net Effects

Environmental Component	Summary of Net Effects
Geology and Hydrogeology	– No net effect in relation to any of the criteria and indicators
Surface Water	– No net effect in relation to any of the criteria and indicators
Atmospheric	– Low net effect in relation to air quality, odours, and noise at off-Site receptors
Terrestrial and Aquatic Environment	– Low net effect in relation to all criteria and indicators
Land Use	– No net effect in relation to any of the criteria and indicators
Agriculture	– No net effect in relation to any of the criteria and indicators
Transportation	– No net effect in relation to any of the criteria and indicators
Social	– No net effect in relation to any of the criteria and indicators
Economic Environment	– Low (positive) net effect on businesses, labour market, GDP, and municipal revenue – No net effect on property values, and assessment base – Low effect on municipal costs and customer costs of waste services
Cultural Heritage Resources	– No net effect in relation to any of the criteria and indicators

6.2.2 Leachate Management Option B

6.2.2.1 Potential Effects and Impact Management Measures

As mentioned, the potential effects, proposed impact management measures, and the resultant net effects associated with Leachate Management Option B are described in the following subsections. **Appendix C-2** provides the net effects table for Leachate Management Option B and **Appendix D** provides the discipline specific memos.

Natural Environment

Geology and Hydrogeology

Option B is expected to have localized but manageable effects on the geology and hydrogeology of the Site. The hydrogeologic and hydrologic conditions at and around the Site are well characterized due to decades of monitoring at the East Landfill, South Landfill, and former quarries. The existing lined lagoons are hydraulically isolated from natural groundwater systems. However, construction of the on-Site wastewater treatment infrastructure may locally lower groundwater levels northwest of the Site and directly north of the East Landfill, potentially disrupting the inward hydraulic gradient in that area if not mitigated. Despite this, the broader hydrogeologic regime will remain stable, with groundwater in key bedrock units (Lockport dolostone and Rochester shale) continuing to flow toward the existing GWCS, preserving the inward gradients and protecting off-Site residential water supplies. The new wastewater treatment plant, requiring approximately 6.5 ha, will be contained within the existing campus boundary, minimizing broader environmental disruption.

To manage the potential hydrogeologic impacts associated with Option B, several mitigation measures are proposed. The design and construction of the on-Site wastewater treatment plant can incorporate strategies to prevent reductions in local groundwater levels, such as limiting the use of deep foundations, avoiding extensive trenching, and minimizing dewatering activities. Additionally, the plant would be equipped with flow equalization features to ensure that post-construction peak flows do not exceed pre-construction conditions. Overall, with these design considerations in place, no further mitigation measures are deemed necessary.

Surface Water

While the Site's hydrologic conditions are well understood due to decades of monitoring, which supports predictability in surface water flow and quality, constructing a new on-Site wastewater treatment plant, occupying approximately 6.5 ha, could disrupt natural drainage patterns and increase the risk of localized flooding. During operations, the facility may need to manage up to 104,500 m³ of leachate annually, with discharge rates to the Old Welland Canal potentially reaching 12,000 litres per hour (200 litres per minute). While treated effluent is expected to meet regulatory standards under an Industrial Sewage Works ECA, some parameters, such as chloride, may not be effectively treated using Best Available Technologies Economically Achievable (BATEA). This could raise environmental and regulatory concerns, especially given that public and agency perception of discharging treated effluent into the canal may be less favorable than alternatives. Additionally, leachate strength will vary over the landfill's lifecycle, requiring adaptable treatment solutions. The infrastructure and operational costs for this option are expected to be higher than continued use of the municipal wastewater system.

To effectively manage the potential impacts of Option B, several mitigation and planning measures would be necessary. A key component involves designing the on-Site wastewater treatment plant to provide flow equalization and maintain post- to pre-peak flow conditions, thereby minimizing hydrologic disruptions to off-Site receivers. This would reduce the risk of flooding and maintain surface water balance. Additionally, mitigation strategies may be required to address specific contaminants, such as chloride, that cannot be feasibly treated under BATEA. Treatment pilot studies may be required before operation of this option. A comprehensive feasibility study would be essential to evaluate the environmental effects of this alternative, as well as to compare capital and operational costs against the alternative.

Atmospheric

Air Quality

Option B introduces new emission sources such as pre-treatment, biological, chemical, and tertiary treatment processes, along with a third leachate lagoon. These open processes, similar to the existing aerated lagoons, are potential sources of Volatile Organic Compounds (VOC) and odour emissions. While the additional treatment may slightly increase predicted concentrations at off-Site receptors, these contributions are expected to be minor compared to other sources. The facility's location, adjacent to existing leachate infrastructure, means the number of affected receptors is not anticipated to change. Although the frequency of exceedances at off-Site receptors may rise slightly, overall impacts on air quality, including VOCs and odours, are expected to remain similar to current conditions. Furthermore, the facility is not expected to influence dust, combustion byproducts, or blowing litter.

To manage the potential air quality impacts associated with an on-Site leachate treatment facility, several mitigation measures are recommended. The LCS will be maintained under negative pressure to help contain and control emissions. Existing BMPs for leachate handling will continue to be enforced and will be revised to incorporate the new treatment infrastructure and operations. These updated BMPs will ensure consistent and effective management of emissions. Additionally, best design practices and appropriate control technologies will be applied to minimize the release of VOCs and odours from the treatment processes, thereby reducing potential impacts on surrounding receptors.

Noise

Option B may result in intermittent exceedances of applicable noise guidelines, particularly during construction activities of the wastewater treatment plant. Temporary increases in sound levels are expected due to the operation of construction equipment, potentially affecting nearby residential receptors. Seven residential locations have been specifically identified for predicted sound level evaluations. Since no changes in vehicle traffic are anticipated, ongoing traffic-related noise impacts are expected to remain consistent with current conditions.

To manage the potential noise impacts associated with Option B, several mitigation measures are proposed. Key equipment, such as pumps and blowers, will be housed within buildings or enclosures to reduce operational sound levels at nearby residential receptors. Construction activities will be restricted to daytime hours between 07:00 and

22:00 to minimize disturbances during sensitive periods. A comprehensive construction noise management plan will be developed and followed, targeting common sources of complaints such as tonal noise from foundation piling and back-up alarms. All equipment will be maintained in good working order, and internal combustion engines will be fitted with mufflers to further reduce noise emissions. These measures aim to effectively limit both the duration and intensity of noise impacts during construction and operation.

Terrestrial and Aquatic Environment

The installation of a new forcemain may lead to the removal or disturbance of low-quality cover, foraging, nesting, and movement habitats for wildlife associated with hedgerows and roadside ditches. These habitats are potentially used by culturally significant species and roosting bats. Additionally, vegetation removal and habitat disturbance in the Welland Canal valley, to accommodate discharge of treated effluent, could affect plant species of cultural significance and locally valued natural areas. Although direct work near aquatic habitats, wetlands, and fish habitats is not anticipated, the potential future outfall to the Welland Canal introduces risks such as sedimentation and habitat removal. Leachate contamination could affect surface and groundwater, impacting aquatic biota, riparian vegetation, and wetland ecosystems in the surrounding area. Leachate contamination poses toxicity risks to terrestrial and aquatic species, potentially altering growth, survival, species composition, and community structure.

To manage the potential environmental impacts associated with Option B, a comprehensive set of mitigation measures is proposed. These include minimizing the footprint of vegetation clearing and clearly marking work boundaries in the field to avoid unnecessary disturbance. A CEMP, or similar, will guide all phases of the project to ensure environmental protection. Habitat restoration and enhancement will be undertaken post-construction, with compensation habitat considered if necessary. To protect wildlife, vegetation clearing will adhere to timing windows that avoid sensitive periods for migratory birds and bats (April 1 to September 30), and exclusion fencing will be installed to prevent wildlife intrusion into active work zones. Prior to construction, surveys will confirm the absence of rare or culturally significant species and habitats, with appropriate protection or relocation measures implemented if needed. Leachate management infrastructure will be regularly inspected and maintained to prevent leaks, with immediate remediation if a release occurs. Surface and groundwater monitoring will be maintained throughout the LSA. For aquatic environments, instream work will follow fisheries least-risk timing windows, and buffer zones will be preserved to protect riparian areas. Compliance with relevant legislation, including the *Endangered Species Act*, *Species at Risk Act*, *Aggregate Resources Act*, *Migratory Birds Convention Act*, and *Fisheries Act*, will be maintained throughout the project.

Built Environment

Land Use

Option B is expected to have minimal land use impacts. The option involves on-Site treatment adjacent to existing lagoons and introduces a new discharge location, thereby reducing reliance on the municipal system. Although the implementation of Option B will necessitate approvals under the *Niagara Escarpment Planning and Development Act*, the *Aggregate Resources Act*, and potentially the *Planning Act*, the proposed infrastructure will remain within the Walker campus, which is surrounded by industrial uses and Walker-owned lands. As such, no adverse land use effects are anticipated. The nearest sensitive land use, rural residential, is located over 1,075 m away, further minimizing potential impacts. Additionally, while nearby natural heritage features such as significant woodlands and wetlands exist, no land use-related effects on these features are expected. No impact management measures specific to land use are recommended.

Option B is not anticipated to significantly affect the visual landscape due to several mitigating factors. The proposed on-Site wastewater treatment facility would be located within the Walker Campus, adjacent to existing lagoons and among other aggregate and waste management operations, making it visually consistent with the current setting. Its assumed dimensions and placement, combined with existing screening features, such as berms and vegetation, are expected to prevent visibility from areas outside the Campus. Should the project proceed to the design phase, any potential changes in visibility would be addressed through standard visual screening measures to ensure minimal impact on the surrounding views.

Agriculture

Option B is located within the Walker Campus on previously disturbed lands that are not capable of agricultural production. As such, no potential effects were identified in relation to the agricultural criteria and indicators, and no agricultural impact management measures are proposed for Option B.

Social Environment

Transportation

Option B is located within the Walker Campus and is not expected to impact the operational level of service at intersections around the Site, collision frequency, nor sightlines. As such, no potential effects were identified in relation to the transportation criteria and indicators, and no transportation impact management measures are proposed for Option B.

Social

From a social perspective, Leachate Management Option B for is expected to have minimal adverse impacts on the surrounding community. Since there are no households within the Campus boundary, no displacement or forced relocation is required. The development and operation of an on-Site wastewater treatment system is not anticipated to significantly alter public attitudes or community character. Additionally, development of an on-Site wastewater treatment plant will not result in a material change in the capacity of the existing Niagara-on-the-Lake sanitary sewer system and the Region of Niagara's Port Weller Wastewater Treatment Plant.

The project is not expected to introduce substantial changes in environmental factors such as noise, dust, odour, traffic, or the presence of vermin and gulls. These effects are projected to remain at levels that do not interfere with the use and enjoyment of nearby residential properties, public facilities, institutions, or recreational resources. The absence of truck-based leachate transport also means no increase in traffic or traffic-related noise. The proposed on-Site wastewater treatment facility is a continuation of industrial activity at the Site, which is familiar to the community and compatible with both current and future land uses, including agriculture.

The South Landfill (Phase 2) is anticipated to be managed using approaches similar to those applied in Phase 1, with the potential use of established industry practices aimed at reducing impacts such as noise, dust, odour, traffic, and visual disturbances, as well as managing the presence of vermin and gulls. Ongoing efforts to meet regulatory requirements related to noise and air quality are also expected. In addition, continued engagement with nearby communities and mechanisms for addressing concerns may help to limit any significant shifts in public perception or social impacts associated with the project.

Economic Environment

Option B, consisting of development of an on-Site wastewater treatment plant, will not displace or disrupt existing businesses or farms, preserving current economic stability. It will stimulate local economic activity through business opportunities for contractors and service providers, as well as by generating direct, indirect, and induced employment during the construction phase. This activity will contribute to GDP growth, with much of the economic benefit retained within the local and regional economy. While the Town of Niagara-on-the-Lake will lose annual revenue from leachate discharge fees, this will be offset by the elimination of costs associated with conveying and treating leachate at the Port Weller facility. Additionally, the City of Niagara Falls and the Region of Niagara are expected to benefit from increased property tax revenues due to the higher assessed value of the Walker property post-development. However, the project involves significant capital investment ($30–$50 million) and higher ongoing operating costs, which are anticipated to be recovered through increased tipping fees, potentially raising the cost of service for customers. No economic impact management measures are proposed for Option B.

Cultural Environment

Cultural Heritage Resources

Built Heritage Resources and Cultural Heritage Landscapes

The LSA includes a mix of rural residential and agricultural land uses. One identified cultural heritage resource is located approximately 1.8 km northeast of the SSA. No other cultural heritage resources, potential or confirmed, were identified within the LSA. As a result, no impacts to built heritage resources of cultural heritage landscapes are anticipated, and no impact management measures specific to this environmental component are recommended for Option B.

Archaeological Resources

Option A may result in potential adverse effects on an additional 0.28 ha of land identified as having archaeological potential, which may contain previously unidentified resources of cultural heritage value or interest. Furthermore, there is a risk of disturbing previously unidentified archaeological resources with cultural heritage value or interest.

To manage potential impact to archaeological resources, a Stage 2 archaeological assessment will be conducted across all areas of archaeological potential to identify any archaeological resources that may be present before any adverse effects occur. Should any archaeological resources with cultural heritage value or interest be discovered during this assessment, they will be subject to a more detailed Stage 3 site-specific assessment. If necessary, a Stage 4 mitigation process will be implemented to address and minimize development impacts on these resources.

6.2.2.2 Summary of Net Effects

The net effects for each environmental component and details on the impact management measures for Leachate Management Option B can be viewed in Table 7.3, **Appendix C-2**, and within the discipline-specific memos that form **Appendix D**. However, a brief overview of the net effects is summarized below in Table 6.5.

Table 6.5 Leachate Management Option B – Summary of Net Effects

Environmental Component	Summary of Net Effects
Geology and Hydrogeology	– No net effect in relation to any of the criteria and indicators
Surface Water	– No net effect in relation to any of the criteria and indicators
Atmospheric	– Low net effect in relation to air quality, odours, and noise at off-Site receptors
Terrestrial and Aquatic Environment	– Low net effect in relation to all criteria and indicators
Land Use	– No net effect in relation to any of the criteria and indicators
Agriculture	– No net effect in relation to any of the criteria and indicators
Transportation	– No net effect in relation to any of the criteria and indicators
Social	– No net effect in relation to any of the criteria and indicators
Economic Environment	– Moderate (positive) effect on labour market and GDP – Low (positive) net effect on businesses, municipal cost, and assessment base – No net effect on property values – Low effect on municipal revenue – Moderate effect on customer cost of waste services
Cultural Heritage Resources	– No net effect in relation to any of the criteria and indicators

7. Comparative Evaluation Results

As previously described, the Alternative Methods were comparatively evaluated using a “Reasoned Argument” methodology as specified in the Minister-approved ToR. The Landfill Configuration Options and the Leachate Management Options were evaluated separately to select a Recommended Landfill Configuration Method and a Recommended Leachate Management Method. Environmental component-specific rankings were established based on the identified level of effect determined through the “net effects analysis”.

Following this, overall rankings for each Alternative Method (e.g., most preferred, less preferred, least preferred) were determined based on the established component-specific rankings. The comparative evaluation results are presented in the following subsections.

7.1 Comparative Evaluation of the Landfill Configuration Options

Table 7.1 provides a summary of the results for the Landfill Configuration Option comparative evaluation, while full details are provided within the discipline-specific memos that form **Appendix D**.

Table 7.1 Comparative Evaluation Summary of Alternative Landfill Configuration Options

Evaluation Criteria		Indicators	Option A	Option B	Option C
Natural Environment					
Geology and Hydrogeology	Effect on groundwater quality	Predicted effects to groundwater quality at property boundaries and off-Site	No effect to groundwater flow at property boundaries and off-Site. **NO NET EFFECT**	No effect to groundwater flow at property boundaries and off-Site. **NO NET EFFECT**	No effect to groundwater flow at property boundaries and off-Site **NO NET EFFECT**
	Effect on groundwater flow	Predicted effects to groundwater flow at property boundaries and off-Site	No effect to groundwater quality at property boundaries and off-Site. **NO NET EFFECT**	No effect to groundwater quality at property boundaries and off-Site. **NO NET EFFECT**	No effect to groundwater quality at property boundaries and off-Site **NO NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		There is no distinction between the Options in relation to geology and hydrogeology. All Options rank the same. Given the landfill will be designed to meet or exceed O.Reg. 232/98 requirements, and that inward hydraulic gradients will be maintained into the Site, there are no predicted effects at the property boundaries and off-Site for any of the three Landfill Configuration Options in terms of groundwater flow or groundwater quality. Therefore, all Options are equally acceptable from a Geology/Hydrogeology perspective.		
Surface Water	Effect on surface water quality	Predicted effects on surface water quality on-Site and off-Site	Discharge to surface water with no increase in TSS and related parameter concentrations in the receiving and surrounding watercourses (i.e., Old Welland Canal, 10 Mile Creek, etc.). **NO NET EFFECT**	Discharge to surface water with no increase in TSS and related parameter concentrations in the receiving and surrounding watercourses (i.e., Old Welland Canal, 10 Mile Creek, etc.). **NO NET EFFECT**	Discharge to surface water with no increase in TSS and related parameter concentrations in the receiving and surrounding watercourses (i.e., Old Welland Canal, 10 Mile Creek, etc.). **NO NET EFFECT**
	Effect on surface water quantity	Predicted change in drainage areas and land use	– The slope from existing grade to 202 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 202 mAMSL to 212 mAMSL will be 20 units horizontal to one unit vertical (20H to 1V, or 5%). – Resulting decrease in time of concentration and minor increase in peak runoff from waste footprint area. – Peak flow rates off-Site will be mitigated by the stormwater management works. Therefore, no significant effects on water quantity are anticipated. **NO NET EFFECT**	– The slope from existing grade to 194 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 194 mAMSL to 211 mAMSL will be 15 units horizontal to one unit vertical (15H to 1V, or 6.7%). – Resulting decrease in time of concentration and minor increase in peak runoff from waste footprint area. – Peak flow rates off-Site will be mitigated by the stormwater management works. Therefore, no significant effects on water quantity are anticipated. **NO NET EFFECT**	– The slope from existing grade to 195 mAMSL will be four units horizontal to one unit vertical (4H to 1V, or 25%) and the slope from 195 mAMSL to 205 mAMSL will be 20 units horizontal to one unit vertical (20H to 1V, or 5%). – Resulting decrease in time of concentration and minor increase in peak runoff from waste footprint area. – Peak flow rates off-Site will be mitigated by the stormwater management works. Therefore, no significant effects on water quantity are anticipated. **NO NET EFFECT**
		Predicted occurrence and degree of off-Site effects	No effect to surface water quantity at off-Site receivers. **NO NET EFFECT**	No effect to surface water quantity at off-Site receivers. **NO NET EFFECT**	No effect to surface water quantity at off-Site receivers. **NO NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		There is no distinction between the Options in relation to surface water quality. All Options rank the same. Given the landfill will be designed to meet or exceed O.Reg. 232/98 requirements, and that surface water quality and quantity will be maintained for the Site, there are no predicted effects at the property boundaries and off-Site for any of the three Landfill Configuration Options in terms of surface water quality or quantity. Therefore, all Options are generally acceptable from a surface water resources perspective.		
Atmospheric	Effect of air quality on off-Site receptors	Predicted off-Site point of impingement concentrations (mg/m^3) of indicator compounds	– Potential for increases in predicted POI for dust and landfill gas contaminants. – No substantial change to predicted concentrations of combustion byproducts. – No substantial change to the probability of wind-blown litter. **LOW NET EFFECTS**	– Potential for increases in predicted POI for dust and landfill gas contaminants. – No substantial change to predicted concentrations of combustion byproducts. – No substantial change to the probability of wind-blown litter. – Similar to Option C, decreased total landfill gas generation compared to Option A which may slightly decrease the predicted concentrations of landfill gas contaminants at off-site receptors. **LOW NET EFFECT**	– Potential for increases in predicted POI for dust and landfill gas contaminants. – No substantial change to predicted concentrations of combustion byproducts. – No substantial change to the probability of wind-blown litter. – Similar to Option B, decreased total landfill gas generation compared to Option A which will slightly decrease the predicted concentrations of landfill gas contaminants at off-site receptors. Decrease in potential for litter events due to decreased final landfill elevation compared to Options A and B. **LOW NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B	Option C
		Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions)	– Decrease in the number of receptors potentially affected along the western and southern boundaries. – Increase in the number of receptors potentially affected along the northern and eastern boundaries. **LOW NET EFFECTS**	– Decrease in the number of receptors potentially affected along the western and southern boundaries. – Increase in the number of receptors potentially affected along the northern and eastern boundaries. **LOW NET EFFECT**	– Decrease in the number of receptors potentially affected along the western and southern boundaries. – Increase in the number of receptors potentially affected along the northern and eastern boundaries. **LOW NET EFFECT**
		Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors.	– Decrease in the frequency of exceedances at receptors along the western and southern boundaries. – Increase in the frequency of any exceedances at receptors along the northern and eastern boundaries. **LOW NET EFFECT**	– Decrease in the frequency of exceedances at receptors along the western and southern boundaries. – Increase in the frequency of any exceedances at receptors along the northern and eastern boundaries. – Similar to Option C, decrease in total waste in place compared to Option A results in lower volumes of landfill gas which may slightly decrease the frequency of any exceedance at identified receptors. **LOW NET EFFECT**	– Decrease in the frequency of exceedances at receptors along the western and southern boundaries. – Increase in the frequency of any exceedances at receptors along the northern and eastern boundaries. – Similar to Option B, decrease in total waste in place compared to Option A results in lower volumes of landfill gas which will slightly decrease the frequency of any exceedance at identified receptors. – Slight decrease in potential frequency of liter events compared to Options A and B. **LOW NET EFFECT**
	Effect of odours on off-Site receptors	Predicted off-Site odour concentrations (odour units)	– Predicted concentrations of odour may increase with the increase in overall landfill gas emissions from the site. **LOW NET EFFECT**	– Predicted concentrations of odour may increase with the increase in overall landfill gas emissions from the site. – Similar to Option C, decreased total landfill gas generation compared to Option A which may slightly decrease the predicted concentrations of odour at off-site receptors. **LOW NET EFFECT**	– Predicted concentrations of odour may increase with the increase in overall landfill gas emissions from site. – Similar to Option B, decreased total landfill gas generation compared to Option A which may slightly decrease the predicted concentrations of odour at off-site receptors. **LOW NET EFFECT**
		Number of off-Site receptors potentially affected (residential properties, public facilities, businesses and institutions)	The number of receptors potentially affected by odour are expected to decrease along the west and south boundaries, with the relocation of landfilling operations to the northeast and the application of final cover the existing south landfill. **LOW NET EFFECT**	The number of receptors potentially affected by odour are expected to decrease along the west and south boundaries, with the relocation of landfilling operations to the northeast and the application of final cover the existing south landfill. **LOW NET EFFECT**	The number of receptors potentially affected by odour are expected to decrease along the west and south boundaries, with the relocation of landfilling operations to the northeast and the application of final cover the existing south landfill. **LOW NET EFFECT**
		Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors	– The frequency of any exceedances of criteria may decrease at receptors located to the west and south of the site. – The frequency of any exceedances of may increase at identified receptors along the northern and eastern boundaries. **LOW NET EFFECT**	– The frequency of any exceedances of criteria may decrease at receptors located to the west and south of the site. – The frequency of any exceedances of may increase at identified receptors along the northern and eastern boundaries. – Similar to Option C, decrease in total waste in place compared to Option A results in lower volumes of landfill gas which may slightly decrease the frequency of any exceedance at identified receptors. **LOW NET EFFECT**	– The frequency of any exceedances of criteria may decrease at receptors located to the west and south of the site. – The frequency of any exceedances of may increase at identified receptors along the northern and eastern boundaries. – Similar to Option B, decrease in total waste in place compared to Option A results in lower volumes of landfill gas which may slightly decrease the frequency of any exceedance at identified receptors. **LOW NET EFFECT**
	Effect of noise on off-Site receptors	Predicted off-Site noise level	– Predicted noise levels are expected to meet applicable guidelines during operating hours. – Cessation of quarry activities is anticipated to reduce noise impacts on area receptors. – Completion of landfill operations will return area soundscape to existing ambient background levels. – The development timeline is not expected to have significant impact as the worst-case operating scenario is assessed. – A longer filling timeline than Option B and C may increase the duration of noise exposures at	– Predicted noise levels are expected to meet applicable guidelines during operating hours. – Cessation of quarry activities is anticipated to reduce noise impacts on area receptors. – Completion of landfill operations will return area soundscape to existing ambient background levels. – The development timeline is not expected to have significant impact as the worst-case operating scenario is assessed. – A longer filling timeline than Option C but less than A may increase the duration of noise exposures at	– Predicted noise levels are expected to meet applicable guidelines during operating hours. – Cessation of quarry activities is anticipated to reduce noise impacts on area receptors. – Completion of landfill operations will return area soundscape to existing ambient background levels. – The development timeline is not expected to have significant impact as the worst-case operating scenario is assessed. – Option C has the lowest landfilling capacity, thus a shorter filling timeline may decrease noise

Evaluation Criteria		Indicators	Option A	Option B	Option C
			neighbouring receptors; however, these effects are expected to be within guideline requirements. – Due to the greater setback distance between the landfilling activities and perimeter of landfill Option A, the noise effects are expected to be less. **LOW NET EFFECT**	neighbouring receptors; however, these effects are expected to be within guideline requirements. – Due to the lesser setback distance between the landfilling activities and perimeter of landfill Option B, the noise effects are expected to be greater. **LOW NET EFFECT**	exposures at neighbouring receptors; however, these effects are expected to be within guideline requirements. – Due to the greater setback distance between the landfilling activities and perimeter of landfill Option C, the noise effects are expected to be less. **LOW NET EFFECT**
		Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions)	– Sound levels at all receptors are expected to be within guideline limits – Sound may occasionally be audible at some receptors. **LOW NET EFFECT**	– Sound levels at all receptors are expected to be within guideline limits – Sound may occasionally be audible at some receptors. **LOW NET EFFECT**	– Sound levels at all receptors are expected to be within guideline limits – Sound may occasionally be audible at some receptors. **LOW NET EFFECT**
		Predicted sound from traffic	– Sound levels at all receptors are expected to be within guideline limits. – Vehicle sound may occasionally be audible. **LOW NET EFFECT**	– Sound levels at all receptors are expected to be within guideline limits. – Vehicle sound may occasionally be audible. **LOW NET EFFECT**	– Sound levels at all receptors are expected to be within guideline limits. – Vehicle sound may occasionally be audible. **LOW NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		The key parameters used to evaluate potential effects to air quality remain consistent between the three Landfill Configuration Options with the exception of total waste in place and final mound elevation. The total waste between all three Options is within roughly 10% and is not expected to have a substantial influence on the potential for effects. The final elevation may affect the frequency and magnitude of high wind events that can contribute to the potential for litter events, however, mitigation options are expected to adequately control litter regardless of the Option. From an Air Quality perspective all Options are generally equivalent. All three Options are expected to be feasible. The duration of activities for Option C (lowest volume landfill capacity) results in shortest landfill operation noise impacts on neighbouring receptors. However, the duration of landfill activities is generally not relevant to the noise guidelines. From a noise perspective all Options are considered feasible, and the differences are generally negligible between the Options. Therefore, Option A, B and C are ranked equally.		
Terrestrial and Aquatic Environment	Effect on terrestrial ecosystems	Predicted impact on vegetation communities	– Removal of 19.85 ha of vegetation communities. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of 19.85 ha of vegetation communities. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of 19.85 ha of vegetation communities. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**
		Predicted impact on wildlife habitat	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for wildlife. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for wildlife. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for wildlife. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**
		Predicted impact on vegetation and wildlife including rare, threatened or endangered species	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for several species of conservation concern. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for several species of conservation concern. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities that provide foraging, rearing and nesting habitats for several species of conservation concern. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude **LOW NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B	Option C
	Effect on aquatic ecosystems	Predicted impact on aquatic habitat	– No significant adverse net effects to aquatic habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to aquatic habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to aquatic habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
		Predicted impact on aquatic biota	– No significant adverse net effects to aquatic biota are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to aquatic biota are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to aquatic biota are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on culturally significant species to Indigenous peoples, and rare (vulnerable), threatened or endangered species of flora or fauna or their habitat	Predicted impact on culturally significant, rare, threatened, or endangered flora and fauna species and their habitat	– Removal of vegetation communities may result in loss of habitat for rare, threatened, or endangered species or species and habitats of significance to Indigenous Peoples. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of vegetation communities may result in loss of habitat for rare, threatened, or endangered species or species and habitats of significance to Indigenous Peoples. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of vegetation communities may result in loss of habitat for rare, threatened, or endangered species or species and habitats of significance to Indigenous Peoples. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on wetlands	Predicted impact on wetlands	– 0.06 ha of deciduous swamp will be removed. – No significant adverse net effects to wetlands are anticipated with implementation of mitigation measures, including habitat compensation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– 0.06 ha of deciduous swamp will be removed. – No significant adverse net effects to wetlands are anticipated with implementation of mitigation measures, including habitat compensation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– 0.06 ha of deciduous swamp will be removed. – No significant adverse net effects to wetlands are anticipated with implementation of mitigation measures, including habitat compensation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on wildlife habitat, populations, corridors or movement	Predicted impact on wildlife habitat, populations, corridors or movement	– Removal of 19.85 ha of portions of vegetation communities providing wildlife habitats. – With implementation of all mitigation measures, including creation of compensation habitat and provision for corridors, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities providing wildlife habitats. – With implementation of all mitigation measures, including creation of compensation habitat and provision for corridors, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude **LOW NET EFFECT**	– Removal of 19.85 ha of portions of vegetation communities providing wildlife habitats. – With implementation of all mitigation measures, including creation of compensation habitat and provision for corridors, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude **LOW NET EFFECT**
	Effect on fish or their habitat, spawning, movement or environmental conditions (e.g., water temperature, turbidity, etc.)	Predicted impact on fish, fish habitat, spawning behaviour, movement or environmental conditions	– No significant adverse net effects to fish and fish habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to fish and fish habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to fish and fish habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on locally important or valued ecosystems or vegetation	Predicted impact on locally important or valued ecosystems or vegetation	– No significant adverse net effects to locally important or valued ecosystems or vegetation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to locally important or valued ecosystems or vegetation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to locally important or valued ecosystems or vegetation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		All Options have an equivalent potential for impact as the footprint among all options is the same.		

Evaluation Criteria		Indicators	Option A	Option B	Option C
Built Environment					
Land Use	Effect on existing and proposed planned future land uses and associated infrastructure	Current and planned future land use	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and planned sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – The proposed end use represents a smaller quantity of agricultural lands relative to the currently approved agricultural rehabilitation plan for the quarry. However, there will no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and planned sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – The proposed end use represents a smaller quantity of agricultural lands relative to the currently approved agricultural rehabilitation plan for the quarry. However, there will no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and planned sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – The proposed end use represents a smaller quantity of agricultural lands relative to the currently approved agricultural rehabilitation plan for the quarry. However, there will no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**
		Proximity to off-Site sensitive land uses (e.g., dwellings, churches, parks)	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and future sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – There will be no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and future sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – There will be no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**	Interim Waste Management Facility Use: – There is potential for nuisance impacts on nearby current and future sensitive uses. However, applicable provincial standards will be complied with through the implementation of mitigation measures across other environmental components. **LOW NET EFFECT** Agricultural End Use: – There will be no effect from a land use perspective, as the end use is compatible with surrounding land uses. **NO NET EFFECT**
		Proximity to features (e.g., wetlands, woodlots, etc.)	Interim Waste Management Facility Use: – Natural heritage features are located within the Local Study Area (LSA) in proximity to the SSA. Mitigation measures will minimize impacts to these features through assessment and implementation from other environmental disciplines. As such, no effect is anticipated from a land use perspective. **NO NET EFFECT** Agricultural End Use: – The proposed end use represents a similar end use to the currently approved agricultural rehabilitation plan for the quarry. As such, there will no effect from a land use perspective. **NO NET EFFECT**	Interim Waste Management Facility Use: – Natural heritage features are located within the LSA in proximity to the SSA. Mitigation measures will minimize impacts to these features through assessment and implementation from other environmental disciplines. As such, no effect is anticipated from a land use perspective. **NO NET EFFECT** Agricultural End Use: – The proposed end use represents a similar end use to the currently approved agricultural rehabilitation plan for the quarry. As such, there will no effect from a land use perspective. **NO NET EFFECT**	Interim Waste Management Facility Use: – Natural heritage features are located within the LSA in proximity to the SSA. Mitigation measures will minimize impacts to these features through assessment and implementation from other environmental disciplines. As such, no effect is anticipated from a land use perspective. **NO NET EFFECT** Agricultural End Use: – The proposed end use represents a similar end use to the currently approved agricultural rehabilitation plan for the quarry. As such, there will no effect from a land use perspective. **NO NET EFFECT**
	Effect on views of the facility	Predicted changes in views of the facility from the surrounding area	The landfill will become visible from points in the surrounding area. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **LOW NET EFFECT**	The landfill will become visible from points in the surrounding area. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **LOW NET EFFECT**	The landfill will become visible from points in the surrounding area. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **LOW NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B	Option C
		Visibility of project features from selected receptor locations	The landfill will become visible from the selected receptor points. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **MODERATE NET EFFECT**	The landfill will become visible from the selected receptor points. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **MODERATE NET EFFECT**	The landfill will become visible from the selected receptor points. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning. Visual effects are expected to decrease post-closure. **MODERATE NET EFFECT**
		Level of visual contrast of project features from selected receptor locations	Given the proposed location within the existing Walker Campus, and adjacent landfill mounds, the degree of visual contrast is expected to be low and can be further minimized through visual screening measures and operational planning. **LOW NET EFFECT**	Given the proposed location within the existing Walker Campus, and adjacent landfill mounds, the degree of visual contrast is expected to be low and can be further minimized through visual screening measures and operational planning. **LOW NET EFFECT**	Given the proposed location within the existing Walker Campus, and adjacent landfill mounds, the degree of visual contrast is expected to be low and can be further minimized through visual screening measures and operational planning. **LOW NET EFFECT**
	Ranking		3rd	2nd	1st
	Rationale		While net effects are the same for each Option, the magnitude of the potential visual effects will be marginally greater for Option A at 31 m compared to B at 30 m and C at 24 m, and for Option B compared to C, as a result of their maximum top of waste heights above grade. Therefore, from the land use perspective, Option C is preferred.		
Agriculture	Effects on existing agricultural land base	CLI soil capability classification	Minor reduction in agricultural capability from existing conditions (36.7 ha of CLI Class 2T lands and 25.87 ha of CLI Class 5T lands). **LOW NET EFFECT**	Minor reduction in agricultural capability from existing conditions (51.4 ha of CLI Class 3T lands and 11.17 ha of CLI Class 5T lands). **LOW NET EFFECT**	Minor reduction in agricultural capability from existing conditions (45.0 ha of CLI Class 2T lands and 17.57 ha of CLI Class 5T lands). **LOW NET EFFECT**
		Soil suitability classification	Improvement to soil suitability for specialty crop production by allowing for cold air drainage. **LOW (POSITIVE) NET EFFECT**	Improvement to soil suitability for specialty crop production by allowing for cold air drainage. **LOW (POSITIVE) NET EFFECT**	Improvement to soil suitability for specialty crop production by allowing for cold air drainage. **LOW (POSITIVE) NET EFFECT**
		Climate	Existing quarry rehabilitation plan would not allow for cold air drainage. Cold air will no longer be trapped at the pit floor, improving soil suitability. **LOW (POSITIVE) NET EFFECT**	Existing quarry rehabilitation plan would not allow for cold air drainage. Cold air will no longer be trapped at the pit floor, improving soil suitability. **LOW (POSITIVE) NET EFFECT**	Existing quarry rehabilitation plan would not allow for cold air drainage. Cold air will no longer be trapped at the pit floor, improving soil suitability. **LOW (POSITIVE) NET EFFECT**
		Level of fragmentation	No effect associated with fragmentation as lot creation is not proposed. **NO NET EFFECT**	No effect associated with fragmentation as lot creation is not proposed. **NO NET EFFECT**	No effect associated with fragmentation as lot creation is not proposed. **NO NET EFFECT**
		Proximity to non-farm land uses	No impacts on surrounding non-agricultural operations. **NO NET EFFECT**	No impacts on surrounding non-agricultural operations. **NO NET EFFECT**	No impacts on surrounding non-agricultural operations. **NO NET EFFECT**
		End use agricultural area	Reduction of approximately 11.5 ha of land available for agricultural end use compared to existing quarry rehabilitation plan. **LOW NET EFFECT**	Increase of approximately 3.2 ha of land available for agricultural end use compared to existing quarry rehabilitation plan. **LOW (POSITIVE) NET EFFECT**	Reduction of approximately 3.2 ha of land available for agricultural end use compared to existing quarry rehabilitation plan. **LOW NET EFFECT**
	Effects on agri-food network	Type(s) and proximity of agricultural operations	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**
		Type(s) and proximity of agricultural-related facilities	No impacts on surrounding agriculture-related operations. **NO NET EFFECT**	No impacts on surrounding agriculture-related operations. **NO NET EFFECT**	No impacts on surrounding agriculture-related operations. **NO NET EFFECT**
		Predicted impacts on surrounding agricultural operations & agricultural-related facilities	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**
	Ranking		3rd	1st	2nd
	Rationale		Option B is preferred over Option C, and Option C is preferred over Option A. The three alternatives primarily differ in the amount of land available for an agricultural end use, with Option B having the greatest area of agricultural end use. Although Option B will be primarily comprised of CLI Class 3 lands and Option A and C will be primarily comprised of CLI Class 2 lands, the greater area of land available for agricultural production will outweigh any potential decreases in crop yields associated with the lower CLI Capability.		
Social Environment					

Evaluation Criteria		Indicators	Option A	Option B	Option C
Transportation	Effect on traffic	Operational level of service at intersections around the campus	High delays for northbound and southbound traffic at intersection of Beechwood Road & Thorold Stone Road will remain during horizon 1 and 2. These delays are generally not associated to Site-generated traffic. **LOW NET EFFECT**	High delays for northbound and southbound traffic at intersection of Beechwood Road & Thorold Stone Road will remain during horizon 1 and 2. These delays are generally not associated to Site-generated traffic. **LOW NET EFFECT**	High delays for northbound and southbound traffic at intersection of Beechwood Road & Thorold Stone Road will remain during horizon 1 and 2. These delays are generally not associated to Site-generated traffic. **LOW NET EFFECT**
	Road safety and geometry	Traffic collision assessment Vertical and horizontal sightlines	No change in safety conditions, and no change in horizontal and vertical sightlines at Site access locations. **NO NET EFFECT**	No change in safety conditions, and no change in horizontal and vertical sightlines at Site access locations. **NO NET EFFECT**	No change in safety conditions, and no change in horizontal and vertical sightlines at Site access locations. **NO NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		There is no distinction between the Options in relation to effects from truck transport along access roads. All Options retain the current conditions present at the existing primary quarry access, the landfill east access and the landfill northwest access. Internal routes have not been assessed at this point in the study and therefore, no differences are assumed across the three Options.		
Social Environment	Displacement of residents from houses	The number of households/residents (property owners and tenants) to be displaced (i.e., forced relocation) by the project itself regardless of whether their property has been purchased or not	No displacement (i.e., forced relocation) required. **NO NET EFFECT**	No displacement (i.e., forced relocation) required. **NO NET EFFECT**	No displacement (i.e., forced relocation) required **NO NET EFFECT**
		The potential for or likelihood of voluntary out-migration of residents for consideration of the indirect effects on community character and cohesion	Very few LSA residents are expected to be motivated to out-migrate voluntarily. **LOW NET EFFECT**	Very few LSA residents are expected to be motivated to out-migrate voluntarily. **LOW NET EFFECT**	Very few LSA residents are expected to be motivated to out-migrate voluntarily. **LOW NET EFFECT**
	Disruption to use and enjoyment of residential properties	The number of existing residential households and/or future households that are located at specific receptor locations and potentially affected by noise, dust, odour, traffic, agricultural and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls	– A few residents living in existing households within 1000 m of the landfill footprint may experience some disruption from noise, dust, odour, and traffic during operation. – Some residents living in existing households or in new households slated for future development within 2000 m of the landfill footprint and on top of the Niagara Escarpment may consider a landfill that is visible from their property and a more prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– A few residents living in existing households within 1000 m of the landfill footprint may experience some disruption from noise, dust, odour, and traffic during operation. – Some residents living in existing households or in new households slated for future development within 2000 m of the landfill footprint and on top of the Niagara Escarpment may consider a landfill that is visible from their property and a more prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– A few residents living in existing households within 1000 m of the landfill footprint may experience some disruption from noise, dust, odour, and traffic during operation. – Some residents living in existing households or in new households slated for future development within 2000 m of the landfill footprint and on top of the Niagara Escarpment may consider a landfill that is visible from their property and a more prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**
		The number of existing residential households fronting/backing onto a haul route and potentially affected by changes in project related traffic and traffic noise	Some residents may experience disruption should there be a noticeable difference in traffic and traffic noise in comparison to conditions after quarry operations ceased and during operation. **LOW NET EFFECT**	Some residents may experience disruption should there be a noticeable difference in traffic and traffic noise in comparison to conditions after quarry operations ceased and during operation. **LOW NET EFFECT**	Some residents may experience disruption should there be a noticeable difference in traffic and traffic noise in comparison to conditions after quarry operations ceased and during operation. **LOW NET EFFECT**
		Potential for or likelihood of changes in peoples' use of residential property	Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use of residential property. Effects on outdoor activities are expected to be most affected. **LOW NET EFFECT**	Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use of residential property. Effects on outdoor activities are expected to be most affected. **LOW NET EFFECT**	Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use of residential property. Effects on outdoor activities are expected to be most affected. **LOW NET EFFECT**
	Disruption to use and enjoyment of public facilities and institutions	The number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use and enjoyment of the Hutt / Brown Cemetery during operations. – People's use and enjoyment of some public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use and enjoyment of the Hutt / Brown Cemetery during operations. – People's use and enjoyment of some public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people's use and enjoyment of the Hutt / Brown Cemetery during operations. – People's use and enjoyment of some public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the

Evaluation Criteria		Indicators	Option A	Option B	Option C
			Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**
		Potential for or likelihood of changes in operations of public facilities and institutions	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations at the Hutt / Brown Cemetery. – Operations at public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment are not expected to require changes from visual effects. **NO NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations at the Hutt / Brown Cemetery. – Operations at public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment are not expected to require changes from visual effects. **NO NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations at the Hutt / Brown Cemetery. – Operations at public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment are not expected to require changes from visual effects. **NO NET EFFECT**
		Potential for or likelihood of changes in use and enjoyment of public facilities and institutions	– People visiting the Hutt / Brown cemetery may choose not to visit or to shorten their visit on occasions where nuisance effects are noticeable or should the landfill be visible and a prominent feature on the landscape. – People’s use and enjoyment at four public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent future on the landscape. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– People visiting the Hutt / Brown cemetery may choose not to visit or to shorten their visit on occasions where nuisance effects are noticeable or should the landfill be visible and a prominent feature on the landscape. – People’s use and enjoyment at four public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent future on the landscape. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– People visiting the Hutt / Brown cemetery may choose not to visit or to shorten their visit on occasions where nuisance effects are noticeable or should the landfill be visible and a prominent feature on the landscape. – People’s use and enjoyment at four public facilities and institutions located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent future on the landscape. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**
	Loss/disruption of recreational resources	The number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project-related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people’s use and enjoyment of one walking trail and four existing biking routes during operations. – People’s use and enjoyment of some recreational resources located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people’s use and enjoyment of one walking trail and four existing biking routes during operations. – People’s use and enjoyment of some recreational resources located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls may be of sufficient magnitude on occasion to result in a change in people’s use and enjoyment of one walking trail and four existing biking routes during operations. – People’s use and enjoyment of some recreational resources located north, east, south and within 2000 m of the landfill footprint and on top of the Niagara Escarment may experience some disruption from visual effects. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive. The landfill will become more visible and prominent as its final contour is achieved. **LOW NET EFFECT**
		Potential for or likelihood of changes in operations of recreational features	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations of trails and biking routes. – Operations at recreational resources located north, east, south and within 2000 m of the landfill footprint are not expected to require changes from visual effects. **NO NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations of trails and biking routes. – Operations at recreational resources located north, east, south and within 2000 m of the landfill footprint are not expected to require changes from visual effects. **NO NET EFFECT**	– Changes in landfill related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls are not expected to be of sufficient magnitude, duration or frequency to result in a change in operations of trails and biking routes. – Operations at recreational resources located north, east, south and within 2000 m of the landfill footprint are not expected to require changes from visual effects. **NO NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B	Option C
		Potential for or likelihood of changes in use and enjoyment of recreational resources	– There are five recreational resources located within 1000 m of the landfill footprint that may be affected on occasion by landfill related noise, dust, odour, traffic and visual effects; or changes in the presence of vermin and gulls. People walking or biking in the area may choose not to visit or use these recreational resources less frequently. – People's use and enjoyment recreational resources located north, east, south and within 2000 m of the landfill footprint on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent feature on the landscape. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive to undertake recreational activities. **LOW NET EFFECT**	– There are five recreational resources located within 1000 m of the landfill footprint that may be affected on occasion by landfill related noise, dust, odour, traffic and visual effects; or changes in the presence of vermin and gulls. People walking or biking in the area may choose not to visit or use these recreational resources less frequently. – People's use and enjoyment recreational resources located north, east, south and within 2000 m of the landfill footprint on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent feature on the landscape. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive to undertake recreational activities. **LOW NET EFFECT**	– There are five recreational resources located within 1000 m of the landfill footprint that may be affected on occasion by landfill related noise, dust, odour, traffic and visual effects; or changes in the presence of vermin and gulls. People walking or biking in the area may choose not to visit or use these recreational resources less frequently. – People's use and enjoyment recreational resources located north, east, south and within 2000 m of the landfill footprint on top of the Niagara Escarpment may experience some disruption where the landfill is visible and a prominent feature on the landscape. Some people may consider a landfill that is visible and a prominent feature on the landscape as being unattractive to undertake recreational activities. **LOW NET EFFECT**
	Changes to community character	Compatibility of landfill operations with the existing and likely future character of the community	Landfill operations are compatible with the existing and likely future character of the community. **NO NET EFFECT**	Landfill operations are compatible with the existing and likely future character of the community. **NO NET EFFECT**	Landfill operations are compatible with the existing and likely future character of the community. **NO NET EFFECT**
		Compatibility of the proposed end use with the existing and likely future character of the community	The proposed agricultural end use is compatible with the existing and likely future character of the community. **NO NET EFFECT**	The proposed agricultural end use is compatible with the existing and likely future character of the community. **NO NET EFFECT**	The proposed agricultural end use is compatible with the existing and likely future character of the community. **NO NET EFFECT**
	Changes to community cohesion	The extent of displacement	Adverse effects on community cohesion are not likely because no displacement (i.e., forced relocation) is required. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no displacement (i.e., forced relocation) is required. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no displacement (i.e., forced relocation) is required. **NO NET EFFECT**
		The potential for or likelihood of voluntary out migration	Adverse effects on community cohesion are not likely because very few LSA residents are expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because very few LSA residents are expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because very few LSA residents are expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**
		Loss and the extent of disruption of recreational resources, public facilities and institutions, and the use and enjoyment of residential properties	Adverse effects on community cohesion are not likely because no community features that contribute to community cohesion will be displaced and nuisance effects are not expected to be of sufficient magnitude to change their operations or their use and enjoyment by residents. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no community features that contribute to community cohesion will be displaced and nuisance effects are not expected to be of sufficient magnitude to change their operations or their use and enjoyment by residents. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no community features that contribute to community cohesion will be displaced and nuisance effects are not expected to be of sufficient magnitude to change their operations or their use and enjoyment by residents. **NO NET EFFECT**
	Ranking		1st	1st	1st
	Rationale		There are no distinctions between the options in relation to displacement effects, disruption to the use and enjoyment of residential properties, public facilities and institutions, loss/disruption to recreational resources or effects on community character and community cohesion. While there are slight differences between the options with respect to duration of landfill operations and final height, these are not considered to be material.		
Economic Environment					
Economic Environment	Effect on local economy	Impact on businesses Disruption/displacement of businesses (including tourism and farms) Business opportunities	No business or farm displacement, and no significant disruption. Business opportunities are associated with initial construction, ~17.9 years of landfill operations, and agricultural end use of 36.7 ha of land. **LOW (POSITIVE) NET EFFECT**	No business or farm displacement, and no significant disruption. Business opportunities are associated with initial construction, ~16.2 years of landfill operations, and agricultural end use of 51.4 ha of land. **LOW (POSITIVE) NET EFFECT**	No business or farm displacement, and no significant disruption. Business opportunities are associated with initial construction, ~15.9 years of landfill operations, and agricultural end use of 41.5 ha of land. **LOW (POSITIVE) NET EFFECT**
		Labour market impacts Impact on direct, indirect, and induced employment	Employment generated during initial construction and ~17.9 years of landfill operations, encompassing direct, indirect, and induced jobs. **MODERATE (POSITIVE) NET EFFECT**	Employment generated during initial construction and ~16.2 years of landfill operations, encompassing direct, indirect, and induced jobs. **MODERATE (POSITIVE) NET EFFECT**	Employment generated during initial construction and ~15.9 years of landfill operations, encompassing direct, indirect, and induced jobs. **MODERATE (POSITIVE) NET EFFECT**
		GDP impacts	GDP generated during initial construction and ~17.9 years of landfill operations, encompassing direct,	GDP generated during initial construction and ~16.2 years of landfill operations, encompassing direct,	GDP generated during initial construction and ~15.9 years of landfill operations, encompassing direct,

Evaluation Criteria		Indicators	Option A	Option B	Option C
		Impact on direct, indirect, and induced GDP Retention of economic benefits within local economy	indirect, and induced economic activity, with benefits largely retained within the local and regional economy. **MODERATE (POSITIVE) NET EFFECT**	indirect, and induced economic activity, with benefits largely retained within the local and regional economy. **MODERATE (POSITIVE) NET EFFECT**	indirect, and induced economic activity, with benefits largely retained within the local and regional economy. **MODERATE (POSITIVE) NET EFFECT**
	Effect on real estate	Property value impacts	Impact management measures will be appropriate to mitigate potential effects on property values determined in the detailed assessment. There will be no net effects on property values. **NO NET EFFECT**	Impact management measures will be appropriate to mitigate potential effects on property values determined in the detailed assessment. There will be no net effects on property values. **NO NET EFFECT**	Impact management measures will be appropriate to mitigate potential effects on property values determined in the detailed assessment. There will be no net effects on property values. **NO NET EFFECT**
	Effect on public finance	Impact on municipal revenue	Municipal revenues generated during landfill operations period include ~18 years of property taxes and royalties on ~15,249,000 tonnes of residual waste. **MODERATE (POSITIVE) NET EFFECT**	Municipal revenues generated during landfill operations period include ~17 years of property taxes and royalties on ~13,794,000 tonnes of residual waste. **MODERATE (POSITIVE) NET EFFECT**	Municipal revenues generated during landfill operations period include ~16 years of property taxes and royalties on ~13,504,000 tonnes of residual waste. **MODERATE (POSITIVE) NET EFFECT**
		Impacts on municipal cost	No effect on municipal cost **NO NET EFFECT**	No effect on municipal cost. **NO NET EFFECT**	No effect on municipal cost. **NO NET EFFECT**
		Impact on assessment base	Post-closure agricultural end use of 36.7 ha may increase the local property assessment base by ~$1.4 million (based on 2023 farmland market value). **LOW (POSITIVE) NET EFFECT**	Post-closure agricultural end use of 51.4 ha may increase the local property assessment base by ~$1.9 million (based on 2023 farmland market value). **LOW (POSITIVE) NET EFFECT**	Post-closure agricultural end use of 45.0 ha may increase the local property assessment base by ~$1.7 million (based on 2023 farmland market value). **LOW (POSITIVE) NET EFFECT**
	Cost of Services	Impact on customer cost of waste services	Sustained access to local landfill disposal services for ~17.9 years reduces transportation costs for customers. **MODERATE (POSITIVE) NET EFFECT**	Sustained access to local landfill disposal services for ~16.2 years reduces transportation costs for customers. **MODERATE (POSITIVE) NET EFFECT**	Sustained access to local landfill disposal services for ~15.9 years reduces transportation costs for customers **MODERATE (POSITIVE) NET EFFECT**
	Ranking		1st	2nd	3rd
	Rationale		Option A (1st – Preferred) is ranked highest due to its longest operational period (~17.9 years), which maximizes sustained business opportunities, employment, GDP, and municipal revenues (in the form of property taxes on landfill and royalties on a cumulative total of ~15,249,000 tonnes residual waste disposed). This option also ensures the longest period of continued customer access to local landfill disposal services with low transportation costs based on proximity. While its post-closure agricultural use is smaller than other options (36.7 ha), the cumulative economic benefits make it the 1st preferred choice. Post-closure agricultural end use under this option may increase the local property assessment base by ~$1.4 million (based on 2023 farmland market value). Option B (2nd – Less Preferred) provides a shorter operational period (~16.2 years) associated with shorter duration for sustained business opportunities, employment, GDP, and less cumulative municipal revenues (in the form of property taxes on landfill and royalties on ~13,794,000 tonnes residual waste disposed), and shorter period for continued customer access to local landfill disposal services with low transportation costs based on proximity. This option also encompasses the largest post-closure area for agricultural use (51.4 ha). Post-closure agricultural end use under this option may increase the local property assessment base by ~$1.9 million (based on 2023 farmland market value). Option C (3rd – Least Preferred) ranks lowest due to its shortest operational life (~15.9 years), which is associated with the shortest duration for sustained business opportunities, employment, GDP, and least cumulative municipal revenues (in the form of property taxes on landfill and royalties on ~13,504,000 tonnes of residual waste disposed), and shortest period for continued customer access to local landfill disposal services with low transportation costs based on proximity. This option provides moderate post-closure agricultural reuse (45.0 ha) in comparison with the other options. Post-closure agricultural end use under this option may increase the local property assessment base by ~$1.7 million (based on 2023 farmland market value).		
Cultural Environment					
Cultural Heritage Resources	Effect on known or potential built heritage resources and cultural heritage landscapes	Number of known and potential built heritage resources and cultural heritage landscapes displaced or disrupted	There are not effects expected in relation to built heritage resources and cultural heritage landscapes. **NO NET EFFECT**	There are not effects expected in relation to built heritage resources and cultural heritage landscapes. **NO NET EFFECT**	There are not effects expected in relation to built heritage resources and cultural heritage landscapes. **NO NET EFFECT**
	Effect on archaeological resources and areas of archaeological potential	Area (ha) of archaeological potential (i.e., total area which may contain previously unidentified archaeological resources not impacted by previous development)	Areas of archaeological potential will be addressed prior to potential adverse effects to determine appropriate mitigation measures for any archaeological resources with cultural heritage value or interest. **NO NET EFFECTS**	Areas of archaeological potential will be addressed prior to potential adverse effects to determine appropriate mitigation measures for any archaeological resources with cultural heritage value or interest. **NO NET EFFECTS**	Areas of archaeological potential will be addressed prior to potential adverse effects to determine appropriate mitigation measures for any archaeological resources with cultural heritage value or interest. **NO NET EFFECTS**
		Number and type of archaeological sites affected	Potential adverse effects to potential archaeological resources with cultural heritage value or interest would be mitigated either through avoidance and protection or further excavation. **NO NET EFFECTS**	Potential adverse effects to potential archaeological resources with cultural heritage value or interest would be mitigated either through avoidance and protection or further excavation. **NO NET EFFECTS**	Potential adverse effects to potential archaeological resources with cultural heritage value or interest would be mitigated either through avoidance and protection or further excavation. **NO NET EFFECTS**
	Ranking		1st	1st	1st

Evaluation Criteria		Indicators	Option A	Option B	Option C
	Rationale		There is no distinction between the Options in relation to built heritage resources, cultural heritage landscapes, and archaeological resources. All options rank the same.		

7.1.1 Ranking of the Landfill Configuration Options and Selection of the Recommended Method

This section presents a comparative evaluation of the three landfill configuration options based on their potential effects across environmental components. Each option was assessed using a consistent set of criteria encompassing the natural, built, social, economic, and cultural environments. Table 7.2 summarizes the relative rankings assigned to each option. While the options are generally comparable in terms of their potential effects on the natural, social, and cultural environments, more pronounced differences emerge in the built and economic categories. These distinctions, along with the rationale for selecting the preferred configuration, are discussed in the subsections that follow.

Table 7.2 Comparative Ranking of the Landfill Configuration Options

Environmental Component	Option A	Option B	Option C
Natural Environment *Geology and Hydrogeology, Surface Water, Atmospheric, Terrestrial and Aquatic*			
Built Environment *Land Use*, Agriculture*			
Social Environment *Transportation, Social*			
Economic Environment *Economic*			
Cultural Environment *Cultural Heritage Resources***			

Note: Green = most preferred, Orange = less preferred, Red = least preferred

**Includes visual impact considerations.*

***Includes Built Heritage Resources, Cultural Heritage Landscapes, and Archaeological Resources*

7.1.1.1 Differences Between Options

All three landfill configuration options are considered equally preferred in terms of their potential effects on the natural, social, and cultural environments. Differences between the options become more apparent when evaluating the potential effects in relation to the built and economic components of the environment. These differences are described below.

Land Use

From a land use perspective, the primary differences between the landfill configuration options relate to their potential visual impacts. Although the overall net effects are similar across all options, Option A is expected to have slightly greater visual impact than Options B and C due to its higher maximum top-of-waste elevation **(**31 m above grade for Option A, compared to 30 m for Option B and 24 m for Option C**)**. The 1 m difference between Options A and B is unlikely to result in a noticeable difference in visual impact. However, Option C benefits from the smallest Zone of Theoretical Visibility and screening by an existing berm at one of the selected viewpoints. With further design refinements and the addition of screening features such as berms and strategically placed vegetation, the visual impacts of Options A and B could be reduced to levels more comparable with Option C.

Agriculture

From an agricultural perspective, the landfill configuration options differ in the amount of land that could support an agricultural end use. Option B provides 3.2 ha more agriculturally compatible land than would be established under the

current quarry rehabilitation plan. In comparison, Options A and C provide 11.5 ha and 3.2 ha less, respectively. This difference is primarily due to the gentler side slopes in Options A and C, which reduce the usable top-of-mound area compared to the steeper side slopes of Option B. However, with further design refinements, it is anticipated that Options A and C could be modified to offer agriculturally compatible areas for end-use, approaching what was approved for the quarry rehabilitation.

Economic

From the economic perspective, Option A emerged as the preferred choice due to its longest operational period (approximately 17.9 years), which supports extended business opportunities, employment, GDP growth, and municipal revenues from approximately 15.2 million tonnes of residual waste. Although it offers the smallest post-closure agricultural area, the overall economic benefits, including a projected $1.4 million increase in property assessment, make it the most advantageous. Option B, ranked second, provides a slightly shorter operational life (approximately 16.2 years) and lower cumulative revenues, but the largest post-closure agricultural area and a higher potential property assessment increase (approximately $1.9 million). Option C, the least preferred, has the shortest operational period (approximately 15.9 years) and the lowest economic returns, despite offering a moderate post-closure agricultural area and a projected $1.7 million property assessment increase. Ultimately, Option A was selected, from the economic perspective, for its long-term economic and service delivery benefits.

7.1.1.2 Recommended Landfill Configuration Option

In considering the trade-offs among the three configurations, the evaluation ultimately led to the selection of Option A due to its ability to deliver the most substantial long-term benefits. While Option A does present a slightly higher visual profile and a smaller post-closure agricultural area compared to the other options, these impacts are considered manageable. With the incorporation of design refinements, such as enhanced berms, vegetation screening, and potential slope adjustments, Option A's visual and agricultural impacts can be effectively mitigated, bringing them more in line with those of Options B and C.

Option A's clear advantage in terms of economic performance and service delivery identifies it as the most advantageous Option, best able to address the identified project need. Its longer operational lifespan and greater waste capacity support extended employment, increased municipal revenues, and enhanced regional waste management stability. These benefits align with broader planning objectives focused on economic resilience and infrastructure efficiency. When considered alongside the potential to address its lesser impacts through design, Option A emerged as the most balanced solution, leading to its selection as the preferred configuration.

7.2 Comparative Evaluation of the Leachate Management Options

Table 7.3 provides a summary of the results for the Landfill Configuration Option comparative evaluation, while full details are provided within the net effects analysis tables in **Appendix C**, and the discipline-specific memos that form **Appendix D**.

Table 7.3 Comparative Evaluation Summary of Alternative Leachate Management Options

Evaluation Criteria		Indicators	Option A	Option B
Natural Environment				
Geology and Hydrogeology	Effect on groundwater quality	– Predicted effects to groundwater quality at property boundaries and off-Site	No effect to groundwater flow at property boundaries and off-Site **NO NET EFFECTS**	Design the facilities and utilize construction methods to avoid reducing groundwater levels in the area of the on-Site wastewater treatment plant. (e.g. limit deep foundations or trenches, avoid dewatering, etc.). Otherwise, no effect to groundwater flow at property boundaries and off-Site. **NO NET EFFECTS**
	Effect on groundwater flow	– Predicted effects to groundwater flow at property boundaries and off-Site	No effect to groundwater quality at property boundaries and off-Site beyond the implementation of an Environmental Monitoring Program (EMP) that is appropriate to the leachate management option. **NO NET EFFECTS**	No effect to groundwater quality at property boundaries and off-Site, beyond including appropriate spill containment in the design. **NO NET EFFECTS**
	Ranking		1st	2nd
	Rationale		Option A is ranked as the preferred alternative in relation to geology and hydrogeology. All options rank the same in terms of net effects, but Option B may require mitigation measures to maintain inward gradients. Given the current two on-Site lagoons and potential third lagoon will be lined, they will be hydraulically separated from the natural groundwater system, protecting groundwater levels and quality. Inward hydraulic gradients will be maintained into the Site with Option A but may require mitigation measures for Option B. There are no predicted effects at the property boundaries and off-Site for either of the two Leachate Management Options in terms of groundwater flow or groundwater quality with mitigation measures. Though all Options are equally acceptable in terms of net effects from a Geology/Hydrogeology perspective, Option A is preferred because of certainty of inward hydraulic gradients.	
Surface Water	Effect on surface water quality	– Predicted effects on surface water quality on-Site and off-Site	The continued use of the existing municipal wastewater treatment system for the expanded South Landfill area will likely result in no to low net effects with respect to surface water resources. **NO NET EFFECT**	Feasibility study needed to inform the net effects of the potential on-Site wastewater treatment plant. Assuming the feasibility study does not conclude there will be additional potential effects, this option will likely result in no to low net effects with respect to surface water resources. **NO NET EFFECT**
	Effect on surface water quantity	– Predicted change in drainage areas and land use	No effect to surface water quantity at property boundaries. **NO NET EFFECT**	No effect to surface water quantity at property boundaries. **NO NET EFFECT**
		– Predicted occurrence and degree of off-Site effects	No effect to surface water quantity at off-Site receivers. **NO NET EFFECT**	No effect to surface water quantity at off-Site receivers. **NO NET EFFECT**
	Ranking		1st	2nd
	Rationale		Option A is preferred in relation to surface water resources. All options rank the same in terms of net effects, but Option B may require additional mitigation measures, which could be identified through a feasibility study. Given the landfill will be designed to meet or exceed O.Reg. 232/98 requirements, and that surface water quality and quantity will be maintained for the Site, there are no predicted effects at the property boundaries and off-Site for either of the two Leachate Management Options in terms of surface water quality or quantity. Though all Options are equally acceptable in terns of net effects from a surface water resources perspective, Option A is preferred due to the additional mitigation measures that may be required for Option B.	
Atmospheric	Effect of air quality on off-Site receptors	– Predicted off-Site point of impingement concentrations ($\mu g/m^3$) of indicator compounds	– No substantial impact on predicted concentrations at identified receptors for dust, combustion byproducts, or blowing litter. – The additional leachate lagoon is a potential minor source of VOC emissions which may slightly increase predicted concentrations as identified receptors to the north and east of site. **LOW NET EFFECT**	– The on-site leachate treatment facility introduces new emission sources including the lagoon mentioned in Option A and additional pre-treatment, biological treatment, chemical treatment, and tertiary treatment. It also generates new waste streams in the forms of sludge and off-spec system discharge which are potential sources of VOCs. – The addition of the leachate treatment plant may slightly increase predicted concentrations at identified receptors to the north and east of site. – No change to predicted off-site concentrations is expected for the construction of the proposed leachate treatment facility for dust, combustion byproducts, and blowing litter. – Minor increases in predicted VOC concentrations compared to existing conditions. **LOW NET EFFECT**
		– Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions)	– No change to the number of receptors potentially affected **LOW NET EFFECT**	– No change to the number of affected receptors. **LOW NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B
		– Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors	– Potential for slight increase in frequency of any exceedance for VOC criteria. Frequency expected to be similar to existing conditions. **LOW NET EFFECT**	– Potential for minor increases in the frequency of exceedances at off-site receptors. **LOW NET EFFECT**
	Effect of odours on off-Site receptors	– Predicted off-Site odour concentrations ($\mu g /m^3$ and odour units)	– The additional leachate lagoon is a potential minor source of odour emissions which may slightly increase predicted concentrations as identified receptors to the north and east of site. **LOW NET EFFECT**	– The on-site leachate treatment facility introduces new emission sources including the lagoon mentioned in Option A and additionally pre-treatment, biological treatment, chemical treatment, and tertiary treatment. It also generates new waste streams in the forms of sludge and off-spec system discharge which are potential sources of odour. – The addition of the leachate treatment plant may slightly increase predicted concentrations as identified receptors to the north and east of site. – Minor increases in predicted odour concentrations compared to existing conditions. **LOW NET EFFECT**
		– Number of off-Site receptors potentially affected (residential properties, public facilities, businesses and institutions)	– No change to the number of receptors potentially affected. **LOW NET EFFECT**	– No change to the number of affected receptors. **LOW NET EFFECT**
		– Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors	– Potential for slight increase in frequency of any exceedance for odour criteria. Frequency expected to be similar to existing conditions. **LOW NET EFFECT**	– Potential for minor increases in the frequency of exceedances at off-site receptors. **LOW NET EFFECT**
	Effect of noise on off-Site receptors	– Predicted off-Site noise level	– Predicted noise levels are expected to meet applicable guidelines during operating hours. **LOW NET EFFECT**	– Predicted noise levels are expected to meet applicable guidelines during operating hours. **LOW NET EFFECT**
		– Number of off-Site receptors potentially affected (residential properties, public facilities, businesses, and institutions)	– Predicted noise levels are expected to meet applicable guidelines during operating hours. **LOW NET EFFECT**	– Predicted noise levels are expected to meet applicable guidelines during operating hours **LOW NET EFFECT**
		– Predicted sound from traffic	N/A	N/A
	Ranking		1st	2nd
	Rationale		Option A is slightly preferred over Option B as it introduces only one minor source of VOCs and odour emissions opposed to Option B which includes the addition of several processes handling larger volumes of leachate and treatment byproducts which have a higher potential to contribute to off-Site concentrations of VOCs and odour. Option A has the fewest additional related noise emissions. However, with adequate mitigation both options would be considered feasible from a noise perspective.	
Terrestrial and Aquatic Environment	Effect on terrestrial ecosystems	– Predicted impact on vegetation communities	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction, and potential removal of vegetation associated with a water outfall through the Welland Canal valleyland. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**
		– Predicted impact on wildlife habitat	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction may result in removal of and disruption to wildlife habitat. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction, and potential removal of vegetation associated with a water outfall through the Welland Canal valleyland, may result in removal of and disruption to wildlife habitat. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**
		– Predicted impact on vegetation and wildlife including rare, threatened or endangered species	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction may result in removal of and disruption of bat roosting habitat.	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction, and potential removal of vegetation associated with a water outfall through the Welland Canal valleyland,

Evaluation Criteria		Indicators	Option A	Option B
			– With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	may result in removal of and disruption of bat roosting habitat or habitat for other rare, threatened or endangered species. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on aquatic ecosystems	– Predicted impact on aquatic habitat	– No significant adverse net effects to aquatic habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Potential impact on Welland Canal aquatic habitat. – No significant adverse net effects to aquatic habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
		– Predicted impact on aquatic biota	– No significant adverse net effects to aquatic biota are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Potential impact on Welland Canal aquatic habitat. – No significant adverse net effects to aquatic biota are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on culturally significant species to Indigenous peoples, and rare (vulnerable), threatened or endangered species of flora or fauna or their habitat	– Predicted impact on culturally significant, rare, threatened, or endangered flora and fauna species and their habitat	– Removal of vegetation communities may result in removal of plant species, or alteration and loss of habitat for species of cultural significance. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of vegetation communities, including the potential outfall to the Welland Canal, may result in removal of plant species, or alteration and loss of habitat for any species of cultural significance. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on wetlands	– Predicted impact on wetlands	– No significant adverse impacts to wetlands are anticipated with implementation of mitigation measures. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse impacts to wetlands are anticipated with implementation of mitigation measures. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on wildlife habitat, populations, corridors or movement	– Predicted impact on wildlife habitat, populations, corridors or movement	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction may result in removal of and disruption to wildlife habitat. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Removal of low quality vegetation associated with the roadside hedgerow and ditch to accommodate the forcemain construction, and potential removal of vegetation associated with a water outfall through the Welland Canal valleyland, may result in removal of and disruption to wildlife habitat. – With implementation of all mitigation measures, including creation of compensation habitat, no significant adverse net effects are anticipated. – Impacts anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on fish or their habitat, spawning, movement or environmental conditions (e.g., water temperature, turbidity, etc.)	– Predicted impact on fish, fish habitat, spawning behaviour, movement or environmental conditions	– No significant adverse net effects to fish and fish habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– Potential impact to Welland Canal fish and fish habitat. – No significant adverse net effects to fish and fish habitat are anticipated provided the mitigation measures are implemented. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Effect on locally important or valued ecosystems or vegetation	– Predicted impact on locally important or valued ecosystems or vegetation	– No significant adverse net effects to locally important or valued ecosystems or vegetation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**	– No significant adverse net effects to locally important or valued ecosystems or vegetation. – Impacts, if any, anticipated to be short duration and low magnitude. **LOW NET EFFECT**
	Ranking		1st	2nd
	Rationale		Option A is preferred due to lower potential for impact across all Criteria.	

Evaluation Criteria		Indicators	Option A	Option B
Built Environment				
Land Use	Effect on existing and proposed planned future land uses and associated infrastructure	– Current and planned future land use	There are no land use related effects expected as a result of implementing Option A. **NO NET EFFECT**	There are no land use related effects expected as a result of implementing Option B. **NO NET EFFECT**
		– Proximity to off-Site sensitive land uses (e.g., dwellings, churches, parks)	There are no land use related effects expected as a result of implementing Option A. **NO NET EFFECT**	There are no land use related effects expected as a result of implementing Option B. **NO NET EFFECT**
		– Proximity to off-Site sensitive land uses (e.g., dwellings, churches, parks)	There are no land use related effects expected as a result of implementing Option A. **NO NET EFFECT**	There are no land use related effects expected as a result of implementing Option B. **NO NET EFFECT**
	Effect on views of the facility	– Predicted changes in views of the facility from the surrounding area	No changes to existing views of the facility are expected. **NO NET EFFECT**	Views of the facility from outside the Walker Campus are not expected to change. Should elements of the facility become visible from viewpoints outside the Campus, it is expected impacts can be mitigated through standard visual screening measures. **NO NET EFFECT**
		– Visibility of project features from selected receptor locations	Lagoon is not expected to be visible from outside the Walker Campus. **NO NET EFFECT**	Views of the facility from outside the Walker Campus are not expected to change. Should elements of the facility become visible from viewpoints outside the Campus, it is expected impacts can be mitigated through standard visual screening measures. **NO NET EFFECT**
		– Level of visual contrast of project features from selected receptor locations	An additional lagoon at the proposed location is not expected to alter the existing visual character. **NO NET EFFECT**	A wastewater treatment facility at the proposed location is not expected to alter the existing visual character. **NO NET EFFECT**
	Ranking		1st	2nd
	Rationale		While the visual net effects are similar for both options, and both are feasible from the visual perspective, Option A is marginally preferred due to the potential of elements of Option B to become visible to viewpoints outside the Walker Campus as design is further refined, and/or existing screening features change over time. Despite the preference for Option A based on visual considerations, both options are feasible from a land use perspective.	
Agriculture	Effects on existing agricultural land base	– Canada Land Inventory (CLI) soil capability classification	No effect on CLI capability. **NO NET EFFECT**	No effect on CLI capability. **NO NET EFFECT**
		– Soil suitability classification	No effect on soil suitability. **NO NET EFFECT**	No effect on soil suitability. **NO NET EFFECT**
		– Climate	No effects to microclimatic conditions. **NO NET EFFECT**	No effects to microclimatic conditions. **NO NET EFFECT**
		– Level of fragmentation	No effect associated with fragmentation as lot creation is not proposed. **NO NET EFFECT**	No effect associated with fragmentation as lot creation is not proposed. **NO NET EFFECT**
		– Proximity to non farm land uses	No impacts on surrounding non-agricultural operations. **NO NET EFFECT**	No impacts on surrounding non-agricultural operations. **NO NET EFFECT**
		– End use agricultural area	No impact on existing agricultural areas. **NO NET EFFECT**	No impact on existing agricultural areas. **NO NET EFFECT**
	Effects on agri-food network	– Type(s) and proximity of agricultural operations	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**
		– Type(s) and proximity of agricultural related facilities	No impacts on surrounding agriculture-related operations. **NO NET EFFECT**	No impacts on surrounding agriculture-related operations. **NO NET EFFECT**
		– Predicted impacts on surrounding agricultural operations & agricultural related facilities	No impacts on surrounding agricultural operations. **NO NET EFFECT**	No impacts on surrounding agricultural operations. **NO NET EFFECT**
	Ranking		1st	1st
	Rationale		There is a negligible difference between the two leachate options. Neither option will result in the loss of cultivatable lands, and the proposed developments will be located on previously disturbed lands that are not capable of agricultural production.	

Evaluation Criteria		Indicators	Option A	Option B
Social Environment				
Transportation	Effect on traffic	– Operational level of service at intersections around the campus	No change in operational level of service. **NO NET EFFECT**	No change in operational level of service. **NO NET EFFECT**
	Road safety and geometry	– Traffic collision assessment	No change in safety conditions. **NO NET EFFECT**	No change in safety conditions. **NO NET EFFECT**
		– Vertical and horizontal sightlines	No change in horizontal and vertical sightlines. **NO NET EFFECT**	No change in horizontal and vertical sightlines. **NO NET EFFECT**
	Ranking		1st	1st
	Rationale		There is no distinction between the Options in relation to the environmental impacts of the leachate management's transportation operations.	
Social Environment	Displacement of Residents from Houses	– The number of households/residents (property owners and tenants) to be displaced (i.e., forced relocation) by the project itself regardless of whether their property has been purchased or not	No displacement (i.e., forced relocation) required. **NO NET EFFECT**	No displacement (i.e., forced relocation) required. **NO NET EFFECT**
		– The potential for or likelihood of voluntary out migration of residents for consideration of the indirect effects on community character and cohesion	Residents are not expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**	Residents are not expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**
	Disruption to use and enjoyment of residential properties	– The number of existing residential households and/or future households that are located at specific receptor locations and potentially affected by noise, dust, odour, traffic, agricultural and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls	Disruption to use and enjoyment of residential property is not anticipated. **NO NET EFFECT**	Disruption to use and enjoyment of residential property is not anticipated. **NO NET EFFECT**
		– The number of existing residential households fronting/backing onto a haul route and potentially affected by changes in project related traffic and traffic noise	No changes in traffic or traffic noise are anticipated. **NO NET EFFECT**	No changes in traffic or traffic noise are anticipated. **NO NET EFFECT**
		– Potential for or likelihood of changes in peoples' use of residential property	No changes to peoples' use of residential property are anticipated. **NO NET EFFECT**	No changes to peoples' use of residential property are anticipated. **NO NET EFFECT**
	Disruption to use and enjoyment of public facilities and institutions	– The number of existing public facilities and institutions that may be affected by nuisance factors such as noise, dust, odour, traffic and visual effects; and the potential for and likelihood of changes in the presence of vermin and gulls	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in disruption to four public facilities and institutions nearby the Niagara Campus along Thorold Townline Road. **NO NET EFFECT**	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in disruption to four public facilities and institutions nearby the Niagara Campus along Thorold Townline Road. **NO NET EFFECT**
		– Potential for or likelihood of changes in operations of public facilities and institutions	Continued use of existing municipal treatment and disposal systems is not expected to result in a material reduction in the capacity of the existing Niagara-on-the-Lake sanitary sewer system and the Region of Niagara's Port Weller Wastewater Treatment Plant. **NO NET EFFECT**	Development of an on-Site wastewater treatment plant is not expected to result in a material change in the capacity of the existing Niagara-on-the-Lake sanitary sewer system and the Region of Niagara's Port Weller Wastewater Treatment Plant. **NO NET EFFECT**
		– Potential for or likelihood of changes in use and enjoyment of public facilities and institutions	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four public facilities and institutions north and west of the Niagara Campus nearest to proposed additional leachate pond. **NO NET EFFECT**	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four public facilities and institutions north and west of the Niagara Campus nearest to proposed additional leachate pond. **NO NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B
	Loss/disruption of recreational resources	– The number/nature of existing recreational resources and/or future features potentially affected by noise, dust, odour, visual effects and changes in project-related traffic; and the potential for and likelihood of changes in the presence of vermin and gulls –	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond **NO NET EFFECT**	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond **NO NET EFFECT**
		– Potential for or likelihood of changes in operations of recreational features	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the operations at four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond. **NO NET EFFECT**	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the operations at four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond. **NO NET EFFECT**
		– Potential for or likelihood of changes in use and enjoyment of recreational resources	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond **NO NET EFFECT**	Changes in leachate treatment related noise, dust, odour, traffic, agricultural and visual effects; and the presence of vermin and gulls from the continued use of the municipal wastewater treatment system (with an additional on-Site leachate pond) for South Landfill (Phase 2) are not expected to be of sufficient magnitude to result in changes in the use and enjoyment of the four recreation resources north and west of the Niagara Campus nearest the proposed additional leachate pond **NO NET EFFECT**
	Changes to community character	– Compatibility of landfill operations with the existing and likely future character of the community	Continued use of existing municipal wastewater treatment system is compatible with the existing and likely future character of the community. **NO NET EFFECT**	Development of an on-Site wastewater treatment facility is compatible with the existing and likely future character of the community.**NO NET EFFECT**
		– Compatibility of the proposed end use with the existing and likely future character of the community	Continued use of existing municipal wastewater treatment system does not affect the proposed agriculture end use and is therefore compatible with the existing and likely future character of the community. **NO NET EFFECT**	Continued use of existing municipal wastewater treatment system does not affect the proposed agriculture end use and is therefore compatible with the existing and likely future character of the community. **NO NET EFFECT**
	Changes to community cohesion	– The extent of displacement	Adverse effects on community cohesion are not likely because no displacement (i.e., forced relocation) is required. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no displacement (i.e., forced relocation) is required. **NO NET EFFECT**
		– The potential for or likelihood of voluntary out migration	Adverse effects on community cohesion are not likely because very few LSA residents are expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because very few LSA residents are expected to be motivated to out-migrate voluntarily. **NO NET EFFECT**
		– Loss and the extent of disruption of recreational resources, public facilities and institutions, and the use and enjoyment of residential properties	Adverse effects on community cohesion are not likely because no community features that contribute to community cohesion will be displaced and nuisance effects are not expected to be of sufficient magnitude to change their operations, nor the use and enjoyment of residential properties. **NO NET EFFECT**	Adverse effects on community cohesion are not likely because no community features that contribute to community cohesion will be displaced and nuisance effects are not expected to be of sufficient magnitude to change their operations, nor the use and enjoyment of residential properties. **NO NET EFFECT**
	Ranking		1st	1st
	Rationale		There are no distinctions between the options in relation to displacement effects, disruption to the use and enjoyment of residential properties, public facilities and institutions, loss/disruption to recreational resources or effects on community character and community cohesion.	
Economic Environment	Effect on local economy	– Impact on businesses • Disruption/displacement of businesses (including tourism and farms) • Business opportunities	No business or farm displacement, and no disruption. Business opportunities related to construction of the expanded leachate system through contracting and service providers. **LOW (POSITIVE) NET EFFECT**	No business or farm displacement, and no disruption. Business opportunities related to construction of on-Site wastewater treatment plant through contracting and service providers. **LOW (POSITIVE) NET EFFECT**

Evaluation Criteria		Indicators	Option A	Option B
		– Labour market impacts • Impact on direct, indirect, and induced employment	Employment generated during construction of the expanded leachate system encompassing direct, indirect, and induced jobs. **LOW (POSITIVE) NET EFFECT**	Employment generated during construction of on-Site wastewater treatment plant encompassing direct, indirect, and induced jobs. **MODERATE (POSITIVE) NET EFFECT**
		– GDP impacts • Impact on direct, indirect, and induced GDP • Retention of economic benefits within local economy	GDP generated during construction of the expanded leachate system, encompassing direct, indirect, and induced economic activity, with benefits largely retained within the local and regional economy. **LOW (POSITIVE) NET EFFECT**	GDP generated during construction of on-Site wastewater treatment plant, encompassing direct, indirect, and induced economic activity, with benefits largely retained within the local and regional economy. **MODERATE (POSITIVE) NET EFFECT**
	Effect on real estate	– Property value impacts	There will be no effect on property values. **NO NET EFFECT**	There will be no effect on property values. **NO NET EFFECT**
	Effect on public finance	– Impact on municipal revenue	Annual municipal revenue generated through volumetric charges to Walker for up to 104,500 m³/year of leachate discharged to the sanitary sewer system. **LOW (POSITIVE) NET EFFECT**	Loss of annual municipal revenue generated through volumetric charges to Walker for leachate originating from East Landfill and South Landfill discharged to the sanitary sewer system. **LOW NET EFFECT**
		– Impacts on municipal cost	Annual municipal cost incurred for conveyance and treatment of leachate. **LOW NET EFFECT**	No municipal cost incurred for conveyance and treatment of leachate originating from Walker's East Landfill and South Landfill. **LOW (POSITIVE) NET EFFECT**
		– Impact on assessment base	No effect to assessment base. **NO NET EFFECT**	Development of the on-Site wastewater treatment plant may increase the assessed value of the Walker property. **LOW (POSITIVE) NET EFFECT**
	Cost of services	– Impact on customer cost of waste services	Little to no effect on customer cost of waste services. **LOW NET EFFECT**	Tipping fees are expected to increase significantly resulting in higher customer cost of waste services. **MODERATE NET EFFECT**
	Ranking		1st	1st
	Rationale		– Option A involves expansion of the existing leachate management system, resulting in modest construction-related economic benefits, including business opportunities, employment, and GDP contributions. It generates municipal revenue through a volumetric charge for leachate discharged to the sanitary sewer system; however, this is offset by corresponding municipal costs for conveyance and final treatment. Under this option there is little or no impact on customer cost of waste services. – Option B offers stronger economic benefits during construction of an on-Site wastewater treatment plant, generating greater business opportunities, employment, and GDP contributions. Although this option eliminates municipal revenue from volumetric charges, the associated municipal costs for conveyance and treatment are also avoided. This option may increase the assessed value of the Walker property, which could result in higher annual property tax revenues. Tipping fees are expected to increase significantly under this option resulting in higher customer cost of waste services. – Overall, both options are ranked 1st from an economic environment perspective. Option A offers modest construction-related economic benefits with the advantage of lower customer costs of waste services. Option B provides strong construction-related economic benefits and potential gains in municipal property tax revenue but is associated with higher customer costs of waste services. The trade-off between these factors supports an equal ranking for both options.	
Cultural Environment				
Cultural Heritage Resources	Effect on known or potential built heritage resources and cultural heritage landscapes	– Number of known and potential built heritage resources and cultural heritage landscapes displaced or disrupted	There are not effects expected in relation to built heritage resources and cultural heritage landscapes. **NO NET EFFECT**	There are not effects expected in relation to built heritage resources and cultural heritage landscapes. **NO NET EFFECT**
	Effect on archaeological resources and areas of archaeological potential	– Area (ha) of archaeological potential (i.e., areas with the likelihood to contain archaeological resources)	Areas of archaeological potential will be addressed prior to potential adverse effects to determine appropriate mitigation measures for any archaeological resources with cultural heritage value or interest. **NO NET EFFECT**	Areas of archaeological potential will be addressed prior to potential adverse effects to determine appropriate mitigation measures for any archaeological resources with cultural heritage value or interest. **NO NET EFFECT**
		– Number and type of archaeological sites affected	Potential adverse effects on potential archaeological resources with cultural heritage value or interest would be mitigated either through avoidance and protection or further excavation. **NO NET EFFECT**	Potential adverse effects to potential archaeological resources with cultural heritage value or interest would be mitigated either through avoidance and protection or further excavation. **NO NET EFFECT**
	Ranking		1st	1st
	Rationale		All options result in no net effects with respect to built heritage resources and cultural heritage landscapes and no distinction between the options in relation to archaeological resources.	

7.2.1 Ranking of the Leachate Management Options and Selection of the Recommended Method

This section presents a comparative evaluation of the two leachate management options based on their potential effects across environmental components. Each option was assessed using a consistent set of criteria encompassing the natural, built, social, economic, and cultural environments. Table 7.4 summarizes the relative rankings assigned to each option. While the options are generally comparable in terms of their potential effects on the social, economic and cultural environments, differences emerge in the natural and built environment categories. These distinctions, along with the rationale for selecting the preferred configuration, are discussed in the subsections that follow.

Table 7.4 Comparative Ranking of the Leachate Management Options

Environmental Component	Option A	Option B
Natural Environment *Geology and Hydrogeology, Surface Water, Atmospheric, Terrestrial and Aquatic*		
Built Environment *Land Use*, Agriculture*		
Social Environment *Transportation, Social*		
Economic Environment *Economic*		
Cultural Environment *Cultural Heritage Resources***		

Note: Green = most preferred, Orange = less preferred

**Includes visual impact considerations.*

***Includes Built Heritage Resources, Cultural Heritage Landscapes, and Archaeological Resources*

7.2.1.1 Differences Between Options

Option A is preferred across multiple criteria. In terms of geology and hydrogeology, both options have similar net effects, but Option A ensures inward hydraulic gradients without requiring additional mitigation, unlike Option B. For surface water, while both options meet regulatory standards, Option B may necessitate further mitigation measures in relation to chemicals that cannot be feasibly treated under Best Available Technologies Economically Achievable (BATEA). Air quality and noise impacts are lower with Option A due to fewer sources of emissions and less noise generation. Option A also poses a lower risk to terrestrial and aquatic environments and is marginally better in terms of visual impact due to fewer visible elements.

Economically, Option B offers stronger construction-related benefits and potential property tax gains, but at the cost of higher customer waste service fees. As a result, both options are equally preferred from an economic perspective in addition to being equally preferred from the social and cultural perspective.

7.2.1.2 Recommended Leachate Management Option

Option A is recommended due to its overall environmental reliability and operational simplicity. It provides greater certainty in maintaining inward hydraulic gradients without the need for additional mitigation. Its lower potential for air and noise emissions, reduced ecological impact, and minimal visual intrusion further support its selection. While Option B may offer stronger economic gains during construction, these are offset by increased customer costs and the need for more complex mitigation strategies. Option A strikes a more balanced approach, ensuring environmental protection and operational feasibility with fewer uncertainties and long-term risks.

8. Climate Change Considerations

In accordance with the Minister-approved ToR, the Alternative Methods were reviewed from a climate change adaptation and mitigation perspective. In support of the province of Ontario's Climate Change Action Plan, the Ministry of the Environment, Conservation and Parks (MECP) developed a Guide entitled "Consideration of Climate Change in Environmental Assessment in Ontario" (the Guide) to aid proponents in considering climate change as part of EAs for infrastructure and facilities (MECP 2016).

The Guide outlines the Ministry's expectations for considering climate change throughout the Environmental Assessment (EA) process. As stated in Section 3 of the Guide, consideration is to include:

– Greenhouse gas (GHG) emissions
– Effects of a project on climate change
– Effects of climate change on a project
– How the project will minimize identified negative effects on climate change.

The preceding was considered as part of the South Landfill Phase 2 EA in addressing the potential climate risks to the Alternative Methods.

During the impact assessment, the climate change adaptation and mitigation analysis undertaken during this Alternative Methods stage will be used and augmented as needed for the Preferred Method. Climate change mitigation and adaptation measures will be reviewed as part of the detailed site design established for the Preferred Method during the impact assessment stage of the South Landfill Phase 2 EA.

8.1 Historical Climate and Meteorological Trends

As part of reviewing the Alternative Methods from a climate change perspective, an understanding of the historical climate/meteorological trends, as well as the potential for extreme weather events was established. Southern Ontario, including the City of Niagara Falls, has a humid continental climate influenced by the Great Lakes with warm summers and no dry season. The Great Lakes moderate the effects of the weather on their surrounding areas.

Temperature

Regional baseline climate data (climate normal data) was obtained from Environment Canada (EC). The closest EC climate station to the Walker Campus with 30-year climate normal data from 1991 to 2020 is the Vineland Composite Weather Station, located approximately 21 km from the South Landfill. The Vineland Composite Station climate dataset combines information from the Vineland RCS Weather Station and the Vineland Rittenhouse Weather Station. Vineland RCS is located at latitude 43°10' N 79°25' W longitude and at 94.5 m elevation. Vineland Rittenhouse is located at latitude 43°11' N 79°24' W longitude and at 79.2 m elevation. The temperature data for the Vineland Composite Weather Station is summarized in **Table 8.1**. The annual mean temperature is estimated as 9.4˚C. The mean summer high temperature is 22.2˚C for July, while the winter mean low temperature is -3.3˚C in January. The lowest extreme minimum temperature was -24.5˚C which was reached both in December 1980 and January 1981, and the highest extreme maximum was in July of 1998 at 38.0˚C (**Table 8.2**).

Table 8.1 Mean Temperature Profiles from the Vineland Composite Weather Station, 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Daily average (°C)	-3.3	-2.9	1.4	7.0	13.3	19.9	22.2	21.4	17.6	11.3	5.2	0.1	9.4
Daily maximum (°C)	0.2	0.8	5.3	11.6	18.6	42.1	27.1	26.1	22.3	15.5	8.9	3.2	13.6
Daily minimum (°C)	-6.8	-6.4	-2.6	2.4	8.0	14.0	17.2	16.6	12.9	7.1	1.5	-3.0	5.1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Source: EC 1991 to 2020 Canadian Climate Normals (climate ID: 6139143 (Rittenhouse) and 6139148 (RCS))													

Table 8.2 Minimum and Maximum Temperature Extremes from the Vineland Composite Weather Station, 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extreme maximum (°C)	19.0	19.4	27.0	30.5	34.0	36.0	38.0	37.0	35.0	31.9	24.1	21.5
Year	2005	2017	1998	1990	1987	1995	1998	2001	1973	2019	2020	1982
Extreme minimum (°C)	-24.5	-23.1	-19.0	-9.0	-2.2	1.7	6.1	3.3	0.0	-6.7	-11.1	-24.5
Year	1981	2015	1986	1982	1966	1966	1968	1965	1974	1965	1976	1980
Source: EC 1991 to 2020 Canadian Climate Normals (climate ID: 6139143 (Rittenhouse) and 6139148 (RCS))												

Precipitation

The mean climate normal monthly precipitation data are provided in **Table 8.3**. The mean annual average precipitation is 838.0 mm. The extreme daily participation amounts are shown from 1990 to 2020 (**Table 8.4**). The highest rainfall experienced was 75.0 mm in 1999 and the highest snowfall experienced was 21.2 cm in 1994.

Table 8.3 Mean Monthly Precipitation Profiles from the Vineland Composite Weather Station, 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (mm)	71.1	52.4	62.1	82.8	69.8	78.1	74.2	68.7	68.7	76.7	71.8	61.6	838.0
Source: EC 1991 to 2020 Canadian Climate Normals (climate ID: 6139143 (Rittenhouse) and 6139148 (RCS))													

Table 8.4 Extreme Daily Precipitation at the Vineland Composite Weather Station, 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extreme daily precipitation (mm)	49.4	33.4	40.2	61.3	55.0	50.9	83.0	53.5	62.0	70.5	75.0	46.1
Year	1998	1997	2009	2005	1996	2015	2014	2019	1999	2017	1999	2006
Extreme daily rainfall (mm)	49.4	33.4	23.9	34.6	55.0	28.8	42.6	43.2	62.0	54.6	75.0	24.6
Year	1998	1997	1997	1996	1996	2000	1994	1996	1999	2001	1999	1992
Extreme daily snowfall (mm)	19.2	16.6	18.0	21.0	0.0	0.0	0.0	0.0	0.0	2.0	11.6	19.5
Year	1997	1997	1998	1994	1991	1991	1991	1991	1991	1993	1997	1992
Source: EC 1991 to 2020 Canadian Climate Normals (climate ID: 6139143 (Rittenhouse) and 6139148 (RCS))												

Rainfall Intensity Duration Frequency (IDF) data for 2010 were obtained from the Ontario Ministry of Transportation's (MTO) IDF Curve Look-up for the Site at latitude 43.13, longitude -79.16 (**Table 8.5**).

The maximum estimated amount of rain is 127.8 mm for a 100-year 24-hour storm event. It should be noted that the information presented in **Table 8.5** is not a prediction of the future, but an estimation of the probability of a storm occurring within a certain time period (return period) for a certain duration and the intensity of that storm based on statistical analysis of past data.

Table 8.5 Extreme Daily Precipitation

Return Period (year)	Rainfall Depth (mm) by Storm Duration								
	5 min	10 min	15 min	30 min	1 hr	2 hr	6 hr	12 hr	24 hr
2	10.7	79.1	59.6	36.7	22.6	13.9	6.5	4.0	2.5
5	14.2	17.5	19.8	24.4	30.0	37.0	51.4	63.4	78.1
10	16.5	20.3	22.9	28.2	34.8	42.9	59.7	73.5	90.6
25	19.4	23.9	26.9	33.2	40.9	50.4	70.1	86.4	106.5
50	21.5	26.5	30.0	36.9	45.5	56.1	78.0	96.1	118.4
100	23.7	29.2	32.9	40.6	50.0	61.6	85.7	105.6	130.1
MTO IDF Curve Look-up (latitude 43.13, longitude -79.16)									

Wind

The speed of the monthly maximum gust obtained from 1991 to 2020 data from Hamilton A Station (climate ID: 6153194) are presented in **Table 8.6**. Predominate wind comes from the west and south west. In winter and early spring, typically there are more high-speed winds. The average maximum gust speed was the highest in April, which was approximately 109 km/h. Winds are the lowest in the summer months; the lowest average maximum gust speed was in July, which was approximately 67 km/h. In the summer, the wind turns to the north and north west.

Table 8.6 The Average Observed Speed of the Max Gust at the Vineland Composite Weather Station, 1991-2020

Month	Observed Average Speed of Max Gust (2000-2011) (km/h)	Direction
January	91	W
February	103	W
March	98	W
April	109	SW
May	98	SW
June	78	N
July	67	NW
August	77	W
September	74	NW
October	87	SW
November	100	SW
December	91	SW
Source: EC 1991 to 2020 Canadian Climate Normals (climate ID: 6139143 (Rittenhouse) and 6139148 (RCS))		

The historical climate and climate trends described above were used to identify any possible climate change risks of concern for the construction, operation, closure, and post closure stages of the landfill.

8.2 Potential Effects of the Undertaking on Climate Change

As noted in the Guide, “many projects that are planned in accordance with the *Environmental Assessment Act* will result in the generation of GHG emissions in the construction, operation and decommissioning of the project” (MECP,

2016). Specific to landfilling, emissions of methane and other GHGs may be generated from the disposal of waste that contains an organic fraction.

As a continuation of existing operations at the South Landfill, material accepted at the South Landfill Phase 2 would come from a variety of customers and businesses that divert at their own operations and have, or may choose to implement, their own diversion and recovery system. Given Walker's Niagara Compost Facility (located at the Campus) receives and processes the Region of Niagara's source separated organic waste, the municipal waste received from Niagara Region for disposal at the South Landfill Phase 2 would be expected to have a reduced organic fraction.

Residuals or overs from the Niagara Compost Facility's are used at the South Landfill as a biocover material to help control odours and oxidize methane further reducing GHG emissions; a practice anticipated to be continued for the South Landfill Phase 2.

The South Landfill operates a landfill gas collection and utilization system. As noted in Section 2.11, Walker has pioneered the successful utilization of landfill gas from the landfill to provide reliable, low cost and renewable sources of energy within the local community. In 2020, Walker and GM developed a cogeneration project using landfill gas to power and heat GM's St. Catharines Propulsion Plant helping reduce its GHG emissions by 70 percent and protecting it from rising electricity and carbon costs. Most recently, in 2023, Walker and Enbridge built Ontario's largest renewable natural gas (RNG) project, where landfill gas is cleaned and transformed into RNG which is used interchangeably with natural gas. In total, the landfill gas from the Walker Campus can power the equivalent of 16,000 homes.

8.2.1 Mitigation

To reduce the Undertaking's impact on climate change, including GHG emissions from the landfill's construction, operation, closure, and post-closure phases, mitigation measures will be put in place. The Guide defines mitigation as "The use of measures or actions to avoid or reduce GHG emissions, to avoid or reduce effects on carbon sinks, or to protect, enhance, or create carbon sinks" (MECP, 2016). Mitigation measures include actions such as utilizing different technologies and construction materials.

The South Landfill operates a landfill gas management system that will be continued, expanded, and upgraded, as needed, to service the proposed South Landfill Phase 2, following or exceed the applicable regulations. Generally, system upgrades will include a landfill gas control booster station to extract landfill gas from the landfill and convey it across Taylor Road to the existing Landfill Gas Utilization Facility where it will be used to generate renewable energy. The landfill gas management approach will seek to maximize the use of the existing facilities within the Walker Campus and may be utilized within Walker's existing landfill gas projects or additional venues for landfill gas utilization may potentially be explored.

Additional mitigation measures and best management practices (BMPs) to reduce the Undertaking's effect on the environment will be determined during detailed design and implemented at the onset of each stage of the landfill. Possible BMP/mitigation measures for the four stages of the landfill include:

– Implementation and enforcement of an anti-idling policy for all vehicles and machinery on Site during the construction stage and operation stage.
– Using materials that have a lower carbon footprint and a long lifespan or recycled and repurposed materials where feasible.
– Reduction of the size of the uncovered/working area.
– Planting additional vegetation to create a carbon sink.
– Using low-emission machinery and transitioning to electric or hybrid equipment where feasible.
– Minimizing haul distances and optimizing transport logistics to reduce vehicle emissions.
– Regular environmental monitoring to assess and refine mitigation strategies as new technologies and practices emerge.

– Providing staff and contractors with the necessary information to implement sustainable practices and emission-conscious decision-making.

8.3 Effect of Climate Change on the Undertaking

Key potential effects of climate change that may occur during the lifetime of any one of the Alternative Methods may include:

– Increasing frequency of unusually high or low daily temperature extremes.
– Long-term increasing or decreasing mean annual temperatures and/or precipitation.
– Increasing or decreasing frequency of storm events (e.g., rainfall, snowfall, extreme wind) or other extreme weather events, such as drought or flood.

Table 8.7 and **Table 8.8** summarize the assessment of potential effects of climate change on the Alternative Methods.

Table 8.7 Estimated Sensitivity of the Landfill Configuration Options to Potential Climate Change Effects

Climate Parameter	Alternative Landfill Configuration Option			Explanation
	A	B	C	
Mean Temperature	LOW	LOW	LOW	There will be no significant impact on landfill operations, regardless of the Landfill Configuration Option chosen. Landfill operations with a wide range of design solutions and configurations are successfully carried out in regions with significantly different climates and more frequent extreme weather events. However, increasingly severe weather patterns—such as extreme heat, flooding, drought, or high wind events—could introduce challenges for the proposed agricultural end use of the landfill. These conditions may also lead to increased surface water runoff and erosion, elevated leachate volumes, desiccation or cracking of final cover soils, and greater potential for windblown litter or cover material displacement. Notwithstanding this, since the primary differences between the landfill configuration options relate to variations in height and slope, no substantial differences in climate change vulnerability are anticipated between them. The size of the available agricultural area post-closure varies between the Landfill Configuration Options (with Option B providing the largest area) and may influence the Site's potential to function as a carbon sink post-closure with more acreage providing more opportunity for carbon sequestration. Provided that the appropriate mitigation and adaptation measures are implemented, the overall potential impact remains low.
Frequency and Severity of Extreme Temperature	LOW	LOW	LOW	
Total Annual Rainfall	LOW	LOW	LOW	
Total Annual Snowfall	LOW	LOW	LOW	
Frequency and Severity of Precipitation and Weather Extremes	LOW	LOW	LOW	
Soil Moisture & Groundwater	LOW	LOW	LOW	
Evaporation Rate	LOW	LOW	LOW	
Wind Velocity	LOW	LOW	LOW	

Table 8.8 Estimated Sensitivity of the Leachate Management Options to Potential Climate Change Effects

Climate Parameter	Alternative Leachate Management Option		Explanation
	A	B	
Mean Temperature	LOW	LOW	There will be no significant impact on Leachate Management Options as a result of climate change. Both proposed Leachate Management Options are commonly and successfully used in regions experiencing a wide range of climate conditions and extreme weather events. Increased precipitation may elevate leachate volumes, while drought and high temperatures could concentrate leachate constituents or affect evaporation rates. These factors may place additional hydraulic or treatment demands on either
Frequency and Severity of Extreme Temperature	LOW	LOW	
Total Annual Rainfall	LOW	LOW	
Total Annual Snowfall	LOW	LOW	

Climate Parameter	Alternative Leachate Management Option		Explanation
	A	B	
Frequency and Severity of Precipitation and Weather Extremes	LOW	LOW	option, but the overall impact on the viability and effectiveness of both leachate management approaches is expected to be low. Both leachate management options will be designed to accommodate storm events and have sufficient operating flexibility to allow for additional stormwater generated through larger storms. Leachate Management Option A may have a higher degree of resilience to large storm events as it will discharge to the Niagara-on-the-Lake sanitary sewer system, as this would allow increased contingency capacity for a larger storm.
Soil Moisture & Groundwater	LOW	LOW	
Evaporation Rate	LOW	LOW	
Wind Velocity	LOW	LOW	

8.3.1 Adaptation

Additional analysis was undertaken to determine what adaptation measures may be required for the Undertaking. Adaptation was focused on addressing effects of climate change on the Alternative Methods. The Guide defines adaptation as "The process of adjustment in the built and natural environments in response to actual or expected climate change and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (MECP 2016).

To increase the Alternative Methods' and the local ecosystem's resilience to climate change, the Alternative Methods' and local ecosystem's vulnerability to climate change need to be reduced. The degree of vulnerability is associated with unpredictability of climate change. The unpredictability of climate change increases over time. Therefore, the stage with the greatest vulnerability (e.g., most likely to be impacted by climate change) is the stage that occurs over a long period, which is post-closure. As such, resources were focused on employing adaption measures upon closure of the landfill to ensure that it is resilient to climate change during the post-closure stage.

Such measures could include:

– Choosing vegetation known, to withstand erosion and climatic stressors such as extreme heat, drought tolerance, and flood resistance and selecting native or deep-rooted perennial vegetation that promotes carbon sequestration
– Planting additional vegetation every five to ten years
– Modification of existing stormwater management ponds (SWMPs), if necessary
– Designing leachate systems with capacity buffers to handle higher-than-expected volumes due to increased storm intensity
– Selecting final cover profiles and slopes that minimize erosion risk and support long-term vegetation establishment under variable climate conditions
– Monitoring vegetation health over time to ensure optimal carbon uptake is maintained.

9. Closure and Post-Closure Considerations

Closure and post-closure (or decommissioning) of the South Landfill Phase 2 will take place in accordance with O. Reg. 232/98, which includes the future requirement to develop a closure plan. Walker is required to prepare a closure plan when the South Landfill Phase 2 has reached 90 percent of its approved capacity or two years of remaining capacity (whichever comes first).

The Closure and Post-Closure Plan for the Site will also be developed through consultation of an Advisory Panel which will be made up of stakeholders such as the City of Niagara Falls, Niagara Peninsula Conservation Authority, and neighbourhood residents. The plan will address broad considerations such as whether the existing infrastructure not related to post-closure management and monitoring (e.g., Site access, berms, landscaping) will remain in place beyond the closure date, long-term beneficial uses for the Site, and integration into the surrounding community. The post-closure use will also need to reflect the City of Niagara Falls's land use planning controls. Any deviation from the current land use controls would require amendments.

There are no significant differences between the three Landfill Configuration Options in terms of their compatibility with the range of end-uses being considered (agriculture, naturalization, recreation, or a combination of these). As described in Section 7.1.1, Option B provides a larger area compatible with an agricultural end use compared to Options A and C, however it is noted that refinement at the detailed design stage presents an opportunity to maximize the area compatible with an agricultural end use.

10. The Recommended Alternative Methods

Based on the comparative analysis and Reasoned Argument approach as seen in Section 7, climate change considerations in Section 8, and Closure and Post-Closure considerations in Section 9, Landfill Configuration Option A is the Recommended or most preferred Landfill Configuration Method and Leachate Management Option A is the Recommended or most preferred Leachate Management Method.

Section 10 below summarizes the advantages and disadvantages of both the Landfill Configuration Option A and the Leachate Management Option A and further describes why they have been put forward as the Recommended Alternative Methods.

11. Advantages and Disadvantages of the Recommended Alternative Method

In accordance with the Minister-approved ToR, the advantages and disadvantages to the environment of the Alternative Methods compared to the Do Nothing alternative are summarized in Tables 10.1 and 10.2, below. The advantages and disadvantages are based on the net effects, comparative evaluation and the rationale for the recommendation. The advantages and disadvantages were determined by comparing the Recommended Alternative Methods to the Do Nothing alternative which serves as a benchmark when considering the benefits and drawbacks of Recommended Landfill Configuration Method A and the Recommended Leachate Management Method A .

It should be noted that the advantages and disadvantages of the Recommended Alternative Methods will be reviewed and analyzed again at the impact assessment stage when a greater level of detail has been developed for the Preferred Methods.

Table 11.1 Advantages and Disadvantages of the Recommended Landfill Configuration Method A

Environmental Component	Advantages	Disadvantages
Geology and Hydrogeology	Effects on groundwater flow and quality can be mitigated through design of the landfill to meet or exceed O. Reg. 232/98 requirements and maintenance of inward hydraulic gradients into the Site.	There are no disadvantages to geology and hydrogeology.

Environmental Component	Advantages	Disadvantages
Surface Water	Effects on surface water quality and quality can be mitigated through design of the landfill to meet or exceed O. Reg. 232/98 requirements and maintenance (including expansion, where required) of stormwater management works for the Site.	Minor decrease in time of concentration and increase in peak runoff from waste footprint area resulting from the expansion.
Atmospheric	Effects from blowing litter, combustion byproducts, dust and odour can be mitigated through continued application of best management practices (BMPs) and additional measures, as required, based on modelling results. Predicted increased concentrations of landfill gas contaminants can be effectively managed through the progressive installation of the landfill gas collection and destruction systems throughout development of the landfill. Noise levels can meet applicable guidelines during operating hours through the continued application of BMPs and additional measures, as required based on modelling results.	May require construction of working, localized, and perimeter berms to help shield nearby receptors from noise, to be confirmed through modelling results.
Terrestrial and Aquatic Environment	Effects to the terrestrial and aquatic environment can be mitigated through implementation of BMPs. Where effects cannot be avoided (e.g. removal of vegetation), they can be minimized via mitigation through design (e.g. minimizing project footprint) in combination with compensation measures.	Removal of approximately 19.85 ha of existing vegetation to be minimized through design, where feasible, and compensated for on Walker-owned land.
Land Use	Compliance with applicable provincial standards can be achieved through the implementation of BMPs and mitigation measures across related environmental components, such as noise, dust, and traffic. Visual impact can be minimized through retention of existing screening measures, addition of new permanent and temporary screening features, as well as through operational planning.	Amendments to local and regional planning documents required to accommodate the shift in interim land use within the Site Study Area (SSA) from mineral aggregate extraction to landfill operations. The landfill will become visible from points in the surrounding area. May require expansion of existing screening berms and/or construction of additional screening berms to minimize visual impact to sensitive receptors.
Agriculture	Improvement to soil suitability for specialty crop production by allowing for cold air drainage.	Minor reduction in agricultural capability and reduction of approximately 11.5 ha of land available for agricultural end use compared to existing quarry rehabilitation plan.
Transportation	No effects on level of service at intersections, safety conditions or horizontal and vertical sightlines at Site access locations.	There are no disadvantages to transportation.
Social Environment	Effects on the social environment can be minimized through the implementation of BMPs.	Low effects related to displacement of residents from houses, disruption to use and enjoyment of residential properties, disruption to use and enjoyment of public facilities and institutions, and loss or disruption of recreational resources are anticipated during operation and will be minimized through the implementation of BMPs and mitigation measures, such as expansion of

Environmental Component	Advantages	Disadvantages
		existing screening berms and/or construction of additional screening berms.
Economic Environment	Effects on property values can be mitigated through implementation of impact management measures. Positive effects in relation to effect on local economy, effect on public finance, and cost of services.	There are no disadvantages to the economic environment.
Cultural Heritage Resources	No effect on built heritage resource, cultural heritage landscapes, archaeological resources, or areas of archaeological potential.	There are no disadvantages to cultural heritage resources.

Table 11.2 Advantages and Disadvantages of the Recommended Leachate Management Method A

Environmental Component	Advantages	Disadvantages
Geology and Hydrogeology	Effects on groundwater flow and quality can be mitigated through design to meet or exceed O. Reg. 232/98 requirements and maintenance of inward hydraulic gradients into the Site.	There are no disadvantages to geology and hydrogeology.
Surface Water	Effects on surface water quality and quality can be mitigated through design to meet or exceed O. Reg. 232/98 requirements and maintenance of stormwater management works for the Site.	There are no disadvantages to surface water.
Atmospheric	Effects from combustion byproducts, volatile organic compounds (VOCs), dust and odour can be mitigated through continued application of BMPs and additional measures, as required, based on modelling results. Noise levels will meet applicable guidelines during operating hours through the continued application of BMPs and additional measures, as required based on modelling results.	There are no disadvantages to the atmospheric component.
Terrestrial and Aquatic Environment	Effects to the terrestrial and aquatic environment can be mitigated through implementation of BMPs. Where effects cannot be avoided (e.g. removal of vegetation), they can be minimized via mitigation through design (e.g. minimizing project footprint) in combination with compensation measures.	Removal of existing vegetation to be minimized through design, where feasible, and compensated for on Walker-owned land.
Land Use	No effect on land use.	There are no disadvantages to land use.
Agriculture	No effect on agriculture.	There are no disadvantages to agriculture.
Transportation	No effect on transportation.	There are no disadvantages to transportation.
Social Environment	Effects on the social environment can be mitigated through the implementation of BMPs.	There are no disadvantages to the social environment.
Economic Environment	Positive effects in relation to effect on the local economy and impact on municipal revenue.	Low effects anticipated in relation to impacts on municipal costs and impacts on customer cost of waste services.

Environmental Component	Advantages	Disadvantages
Cultural Heritage Resources	No effect on built heritage resource, cultural heritage landscapes, archaeological resources, or areas of archaeological potential.	There are no disadvantages to cultural heritage resources.

Appendices

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→ The Power of Commitment