5.0 Description of the Preferred Alternative

A preliminary design was completed for the preferred alternative (site development, LFG and leachate) identified in the evaluation of alternatives. As the preliminary design was developed and further refined, adjustments were made to various sizes and capacities of the features of the preferred alternatives to account for the results of the detailed impact assessment studies undertaken to develop the design. For example, the stormwater management study, which included climate change impacts, dictated the size of the required stormwater ponds. The size and shape of landfill expansion areas required minor modifications to permit the placement of the appropriately sized stormwater ponds. As such, the preliminary design described in this section has been developed beyond the initial conceptual designs evaluated in the previous section (**Section 4.0**). The design development has not changed the overall concept described in the previous section, simply the design has been updated to reflect the latest information and details.

5.1 Proposed Engineering Design of Preferred Alternative

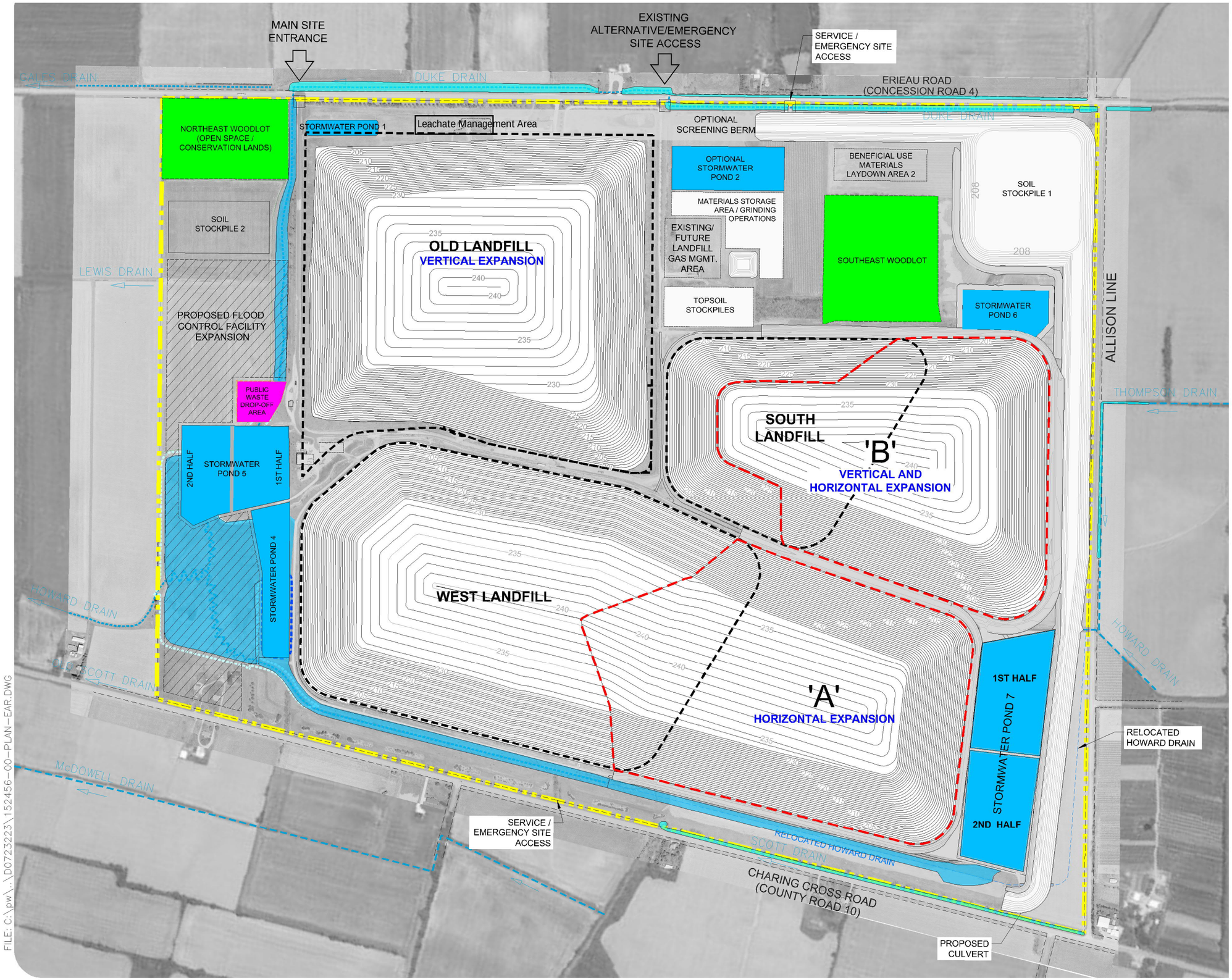
The preliminary design of the proposed landfill expansion of the Ridge Landfill was developed in accordance with applicable MECP regulations, policies, and guidelines, including *O.Reg. 232/98*[149]. The preliminary design is based on an annual waste disposal rate of 1.3 million tonnes over the 20-year planning period and on all required features being accommodated on the existing site envelope. In total, the new footprint waste fill area outside of the existing approved waste fill area will be 54.9 ha, located on the southern side of the site. Additional berms will be constructed around the southern perimeter of the site in order to shield and screen the landfill expansion activities from view.

The preferred site alternative consists of three (3) distinct waste disposal areas on the site plus LFG flaring and a leachate management system with leachate treatment at the BWTL. The three (3) distinct waste areas consist of the Old Landfill, the West Landfill, and the South Landfill. Refer to **FIGURE 5-1**.

[149] Ministry of the Environment, Conservation and Parks (1998a). *Landfilling Sites: Ontario Regulation (O.Reg.) 232/98*. Last Updated: June 2011.

The following landfill expansion areas are proposed:

- **Old Landfill:** Vertical expansion comprising approximately 30 m in height and a minor infill expansion to the east within the existing approved waste fill area of approximately 55.2 ha.
- **South Landfill:** Horizontal expansion comprising approximately 22.8 ha of new waste fill area to the south of the existing waste mound. This expansion area is termed "Area B". Also included is a minor vertical expansion of approximately 5 m and reshaping of the existing South Landfill mound. For clarity, in the future, the term South Landfill will include the area of the existing South Landfill area, the 22.8 ha expansion area (Area B) and the minor vertical expansion.
- **West Landfill:** Horizontal expansion comprising approximately 32.1 ha of new waste fill area to the south of the existing waste mound. This expansion area is termed "Area A". In the future, the term West Landfill will include the existing West Landfill area and the 32.1 ha expansion area (Area A).



FILE: C:\pw\..\D0723223\152456-00-PLAN-EAR.DWG

WASTE CONNECTIONS OF CANADA

RIDGE LANDFILL
ENVIRONMENTAL ASSESSMENT

PROPOSED LANDFILL EXPANSION - PREFERRED ALTERNATIVE

Figure 5-1

- PROPERTY BOUNDARY
- APPROVED WASTE LIMIT
- EXISTING WATER COURSE
- PROPOSED WASTE LIMIT FOR EXPANSION AREAS
- PROPOSED STORMWATER POND
- EXISTING WOODLOT AREAS
- EXISTING FLOOD CONTROL FACILITY

0 100 200 400m

TRUE NORTH

MAP/DRAWING INFORMATION
MAPPING FROM THE BASE MAP CO. LTD., MAY 1, 2018

CREATED BY: SKB
CHECKED BY: CO
DESIGNED BY: FG

PLAN NORTH

DILLON CONSULTING

PROJECT: 15 2456

DATE: 07/03/19

Page intentionally left blank

5.1.1 Landfill Gas

LFG is currently captured on-site through a series of vertical extraction wells and from the leachate collection system. The collected gas is then flared at the two (2) existing flares on-site. The current approval for the landfill contains a provision to add a third flare and this is expected to be completed in the year 2020. Over the life of the expansion additional vertical gas collection wells and flares will be installed to capture and flare LFG.

5.1.2 Leachate Management

Leachate is currently collected at the site in perimeter drains surrounding the Old Landfill and underdrains located beneath the West and South Landfills. The collected leachate is pumped to a temporary storage tank on-site and subsequently pumped to the BWTL for treatment. For the expansion, the collection system will be expanded and the leachate will continue to be pumped and treated at the BWTL.

Key parameters used in the development of the landfill design included:

- 1.3 million tonnes per year over a 20-year planning period;
- Apparent waste density of 0.9 tonnes/m^3 (based on historical survey data);
- Volumetric capacity of 28.9 million m^3 for waste and daily cover (represents what is currently achieved – i.e., historical density of waste);
- Above-grade side slopes no steeper than a 4(H):1(V) ratio (horizontal versus vertical);
- Top slopes no flatter than a ratio of 20(H):1(V); and
- Minimum 1 m thickness of vegetated final cover soil (not included in the total volume calculation).

Future precipitation and rainfall intensity projections were taken into account to consider potential climate change impacts.

The proposed main features included in the preliminary design for the landfill expansion are shown on **FIGURE 5-1.** The drawing clearly shows that there is adequate space on-site for the landfill expansion, stormwater facilities, temporary stockpiles and all ancillary facilities. As previously stated, the design of the preferred alternative is described and detailed in Appendix D6 – Design and Operations Report. The following sections summarize the specific aspects of the proposed expansion.

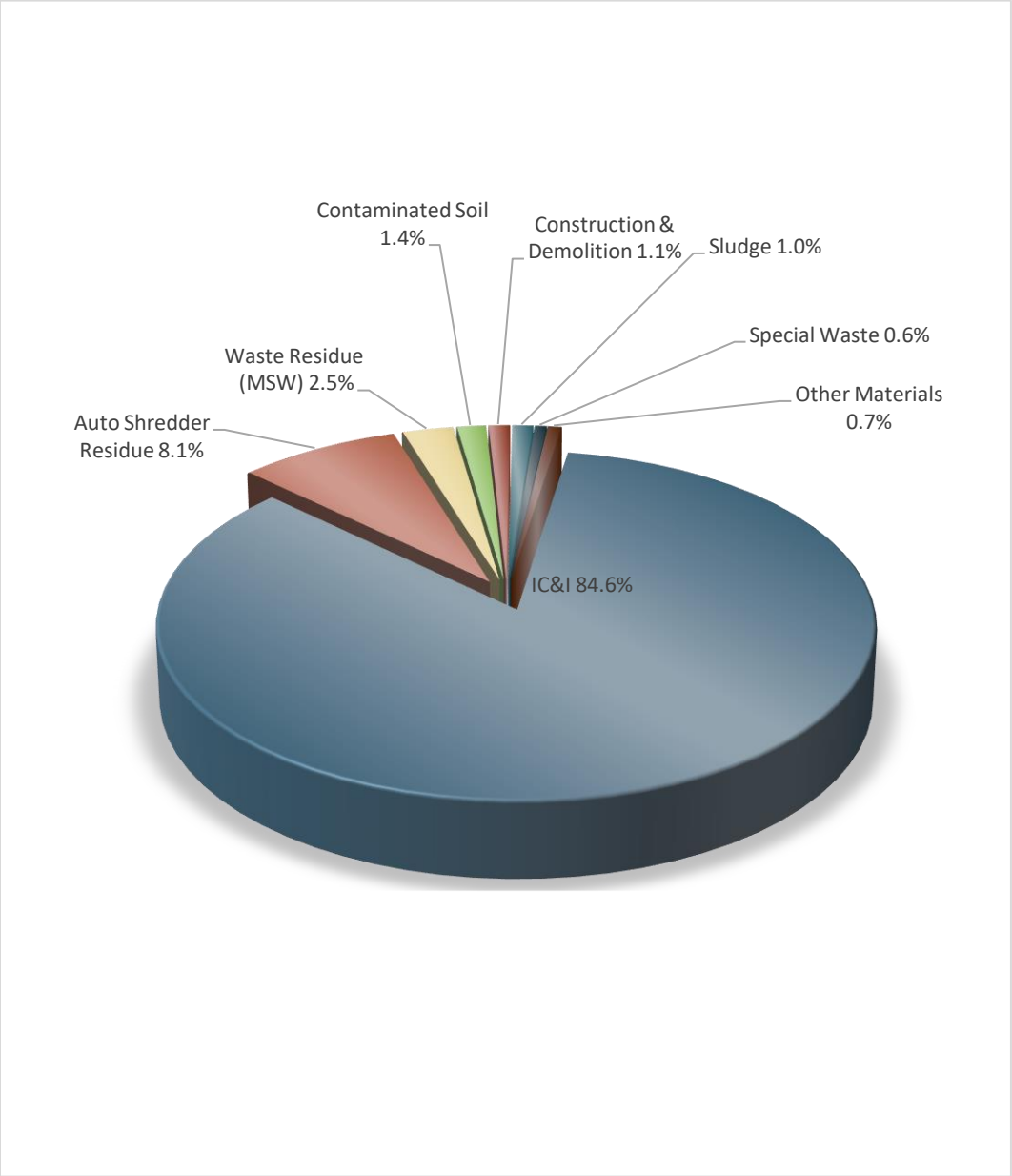
5.2 Waste Quantities and Characteristics

An amendment to the ECA No. A021601 was issued on March 15, 2012, approving a fill rate of up to 1,300,000 tonnes per year, including approved alternative daily cover. No changes are proposed to the maximum daily and annual fill rates as part of this EA process.

The waste currently accepted at the Ridge Landfill consists of solid, non-hazardous waste generated mostly from the IC&I sector in Ontario and a relatively small amount of residential waste from the Municipality of Chatham-Kent and the surrounding Counties of Essex, Lambton, Middlesex and Elgin. Liquid, hazardous, toxic, pathological, and radioactive wastes are all specifically prohibited. For the expansion period (2021 to 2041) the service area for the Ridge Landfill will be reduced to the Municipality of Chatham-Kent for residential waste, and southern and central Ontario for IC&I waste.

FIGURE 5-2 illustrates the 5-year average annual proportion of waste types received at the Ridge Landfill between 2014 and 2018. IC&I waste makes up approximately 85% of the waste received at the Ridge Landfill, followed by auto shredder residue at 8% and residential waste residue (MSW) at 2.5%. Together, contaminated soil, construction and demolition waste, sewage sludge, special waste, and other materials (e.g., asbestos, glass, and sand) make up about 5% of the total waste received at the Ridge Landfill. Approximately 10% of the waste received (i.e., auto shredder residue, contaminated soil, sludge, glass) is reused onsite for daily cover and road operations and maintenance, displacing the need for virgin materials.

FIGURE 5-2: TYPES OF WASTE RECEIVED AT THE RIDGE LANDFILL



5.3 Proposed Expanded Fill Area Design

The proposed expansion will increase the waste fill area by approximately 55 ha for an overall waste fill area of approximately 186 ha. The Old Landfill approved waste fill area (55.2 ha) will remain unchanged; the proposed Area A will add a waste fill area of 32.1 ha to the existing West Landfill (55.3 ha) for a combined waste fill area of 87.4 ha; the proposed Area B will add a waste fill area of 22.8 ha to the existing South Landfill (20.3 ha) for a combined waste fill area of 43.1 ha. The base of the landfill expansion areas was designed to:

- Achieve an overall capacity of 28.9 million m^3 in conjunction with the final contours of the landfill surface;
- Establish the landfill base in unweathered clayey silt till;
- Provide base grades appropriate for long-term leachate collection; and
- Meet the MECP RUG for protection of off-site groundwater quality.

The proposed base contours for Areas A and B were designed to be consistent with the design of the existing West and South Landfills to which they are adjacent, respectively. The lowest point of Area A base grades will be approximately 11 m below the existing ground elevation in that area and the lowest point of Area B base grades will be approximately 10.5 m below the existing ground elevation in that area. The base grade side slopes will be no steeper than a 3(H):1(V) ratio and will be lined with a 0.6 m (minimum) thick compacted clay liner.

The proposed Old Landfill vertical expansion will not require a base grade design. The existing cover soil on the Old Landfill will be stripped prior to landfilling in the expansion airspace. The relatively minor lateral infill area proposed for the Old Landfill is within the existing approved waste fill area; this minor lateral infill area will have base grades approximately 6 metres below existing ground.

At the completion of the expansion, the Old Landfill, West Landfill and South Landfill will have a maximum height of approximately 42 m above original ground level. The proposed landfill expansion design will provide a landfill capacity of 28.9 million m^3 for waste and daily cover, which meets that specified capacity requirement for the 20-year planning period.

The soil excavation and fill volumes for activities involved with landfill construction, landfill operations and closure were calculated and are summarized in **Table 5-1** below.

A 7:1 waste to cover ratio (by volume) was determined and utilized in the soil balance calculations based on the historical usage of daily cover since 2000. The Ridge Landfill's relatively low usage of cover compared to the industry standard ratio of 4:1 is due to the Ridge Landfill accepting alternative daily cover that is tracked as waste. The soil surplus identified in **Table 5-1 is not significant and** will be used for the construction of roads and landfill perimeter berms, or placed in stockpiles.

Table 5-1: Soil Balance

Description	Quantity
Areas A and B and Old Landfill Infill Base Excavation	4,070,000 m^3
Surplus from Existing Landfill Operations	230,000 m^3
Strip and Stockpile Existing Cover in the Old Landfill	680,000 m^3
Stormwater Pond Excavation	350,000 m^3
Flood Control Facility Expansion	200,000 m^3
Daily Cover Requirement Assuming 7:1 Waste to Daily Cover Ratio (by volume)	-3,600,000 m^3
Final Cover Requirement	-1,300,000 m^3
Screening Berms Requirement	-500,000 m^3
Perimeter Roads/Berms Requirement	-95,000 m^3
Soil Surplus	**35,000 m^3**

5.4 Site Features

Most site features already exist under the current approval and include the site entrance, on-site roads, weigh scales and scale house, administration and maintenance buildings, LFG management facility, leachate storage and pumping facility, stormwater ponds, flood control facility, municipal drains, stockpiles and screening berms.

5.4.1 Site Access and Roads

The main entrance is designed such that trucks waiting to enter the site queue within the landfill property boundary and not on the municipal road. There are also three (3) other access points to the site (refer to **FIGURE 5-1**) that are to be used only for service, maintenance or emergency purposes:

- The former site entrance on Erieau Road will be converted to the Leachate Management Entrance. This existing entrance provides access to the Old Landfill and Existing/Future Leachate Management Area;

- A Service/Emergency site access is proposed off Erieau Road to provide access to the Existing/Future Landfill Gas Management Area; and
- Another emergency entrance is located off Charing Cross Road (Country Road 10) to access the Howard Drain. It utilizes an existing gap in the Charing Cross Road (County Road 10) berm.

Single lane maintenance perimeter roads have been constructed around the Old Landfill, West Landfill and South Landfill. The perimeter roads will be extended around expansion Area A and Area B. Access roads will be provided to the Leachate Management Area and to the Landfill Gas Management Area. Adjacent to the perimeter road, a 12 m wide equipment road is proposed south of Area B. This proposed equipment road will be used to haul soils from Area A and Area B excavations during cell construction and will also allow movement of large heavy equipment such as compactors. A maintenance access road to the relocated Howard Drain will also be provided.

Temporary haul roads over the waste fill area will be constructed as needed to provide access to the landfill working face. Where possible, permanent roads built with concrete rubble or gravel will remain as service roads to the top of the landfill.

5.4.2 Leachate and Landfill Gas Management

The leachate collected in the expansion areas will be temporarily stored in the existing leachate storage tank located in the Leachate Management Area. From the leachate storage tank, leachate will be pumped off-site through a forcemain for treatment at the BWTL. The LFG collection system will be expanded to collect LFG from the proposed landfill expansion areas. Additional flares will be installed at the Landfill Gas Management Area to combust the collected LFG.

5.4.3 Surface Water Management

Surface water will be collected at perimeter ditches around the waste fill areas and discharged to stormwater management ponds. The stormwater ponds will provide surface water quality and quantity control. There are currently five (5) stormwater ponds on the site (Ponds 1 to 5). Ponds 1, 4 and 5 will be expanded to accommodate the expansion; Pond 2 will either be expanded or reconstructed because of its location adjacent to the Old Landfill; and Pond 3 will be decommissioned as it is located within a proposed expansion area. Two (2) new stormwater ponds (Ponds 6 and 7) will be constructed to accommodate additional runoff from the proposed landfill expansion. Pond 6 will receive runoff from the east and south portions of Area B and will discharge to the Duke Drain. Pond 7 will receive runoff from the west portion of Area B and east and south portions of Area A and will discharge to the Howard Drain.

In summary, the proposed landfill expansion will require:

- Stormwater Pond 3 decommissioning;
- Stormwater Ponds 1, 4 and 5 expansion;
- Stormwater Pond 2 expansion or reconstruction; and
- Stormwater Ponds 6 and 7 new construction.

The existing flood control facility covers an area of approximately 10 ha and provides a total storage volume of approximately 269,000 m^3. The flood control facility will be expanded by approximately 7 ha for a total area of approximately 17 ha and will have its storage capacity increased by 196,000 m^3 for a total volume of 465,000 m^3. A vegetative planting scheme will be incorporated into the flood control facility to enhance surface water quality and nutrient removal prior to out-letting to the Howard Drain downstream.

There is a network of man-made municipal drains that convey surface drainage in the vicinity of the landfill site, including the Howard, Scott, Duke and Lewis Drains. The proposed landfill expansion will require the relocation of the Howard Drain on the south side of Area A and minor modifications to the Lewis and Duke Drains.

5.4.4 Soil Management, Berms and Buffers

Topsoil and soil from the excavation of the landfill cells, municipal drain relocations, stormwater ponds and flood control facility will be stockpiled on-site at areas shown on **FIGURE 5-1** or other temporary locations for future use. Exposed portions of soil stockpiles that become inactive during the growing season (April to October) for an extended period of time, will be seeded to establish vegetative growth.

The Ridge Landfill currently has screening berms that provide screening of the existing site operations to mitigate potential effects such as visual, noise and other potential nuisances from off-site locations. The existing screening berms will be modified to accommodate the proposed landfill expansion as shown on **FIGURE 5-1**. The berms will be vegetated based on a naturalized landscape plan including native and low maintenance plant species. A 100 m minimum buffer between the property line and all waste fill areas will encompass the entirety of the expansion area.

5.4.5 Woodlots

The Ridge Landfill currently has three (3) woodlots: the northeast, southeast and southwest woodlots. The southwest woodlot will be removed to accommodate expansion Area A and replaced adjacent to the site, east of Erieau Road and at other sites in the same "ecoregion" at a ratio of 2:1. The other two (2) existing woodlots will remain.

5.4.6 Ancillary Works

Secondary changes to existing site features that are being considered include construction of drainage ditches along the main internal paved roadway and installation of methane detection systems in the maintenance and administration buildings.

The existing Public Waste Drop-Off Area used by local residents and located in the portion of the Old Landfill area will be relocated to the Proposed Ancillary Facilities area shown on **FIGURE 5-1**. A future expanded Public Recycling Area/Drop-Off is also being considered at the Proposed Ancillary Facilities area. Wood chipping and concrete crushing operations will move to either the Beneficial Use Materials Laydown Area 1 located at the southeast corner of Area A or to the Beneficial Use Materials Laydown Area 2 located immediately east of the Southeast Woodlot.

5.5 Surface Water Management Plan

The overall goal of the proposed surface water management plan will be the protection and preservation of the upstream and downstream drainage systems. This will be achieved through the adoption of an integrated strategy that combines site design features, best operational management practices, and practical stormwater management practices.

The stormwater plan will eliminate and/or minimize the potential for increased flood risk both upstream and downstream of the site. Peak flow rates and flood elevations will not change from existing levels for all storm events up to and including the 250-year Regional Storm. To avoid and/or minimize the potential for increased erosion, flow velocities in the receiving drainage system will be maintained at current levels or lower. To account for impacts associated with climate change, the stormwater management system is sized to accommodate the future mean rainfall conditions projected for the year 2050 at the Ridgetown RCS Climate Station. Note that future climate change rainfall projections were determined by Risk Sciences International and are contained in Appendix D10 – Surface Water Impact Assessment.

The site design includes both a surface water drainage system and a leachate collection system, which were designed to operate as separate systems. Any surface water in contact with waste will be considered leachate. Leachate produced on-site will be collected by the leachate

collection system, temporarily stored in the leachate storage tank and pumped through a forcemain to the BWTL for treatment. No leachate will be discharged to drainage ditches, watercourses, or municipal drains outside of the waste fill areas. The on-site surface water drainage system will consist of ditches along the perimeters of the Old Landfill, West Landfill and South Landfill. The perimeter ditches will be graded to low points that allow collected stormwater to discharge into the stormwater ponds through culverts. The surface water drainage system includes sufficient storage that in the event of a leachate break-out or emergency spill, all collected water at the waste fill areas can be contained in the stormwater ponds for all storms up to and including a 100-year, 24-hour event.

The stormwater ponds on-site will operate in batch mode during the operating life of the landfill and in a passive/continuous discharge configuration following the closure of the landfill. Batch mode requires that the water in the stormwater ponds be tested before it is released to a municipal drain. The stormwater ponds have been sized to provide quantity/flood control for the mean adjusted 100-year, 24-hour event under the 2050 future climate change scenario, with additional flood control storage for the 250-year Regional Storm event provided by the flood control facility. This method of control will provide increased water quality treatment, minimize potential flood and erosion impacts to the receiving watercourses, and function as an emergency containment system in the event of surface water contamination, potential leachate breakouts or potential spills.

5.6 Leachate Management System

The leachate management system for the expanded site has been designed to comply with the MECP requirements for both groundwater and surface water protection. The policy concerning groundwater is described in Guideline B-7: *Incorporation of the Reasonable Use Concept into MOEE Groundwater Management*[150]. This is referred to as the Reasonable Use Guideline (RUG). The RUG describes the basis for limiting contaminant concentrations in groundwater on properties adjacent to landfills. Meeting the RUG requires the proponent to determine the reasonable use of groundwater on the adjacent property and then design the landfill such that the maximum concentration of a particular contaminant is predicted to be in compliance with Guideline B-7 at the landfill property boundary. The leachate management objectives for the design of the Ridge Landfill will meet or exceed the requirements for surface water, and with the requirements of the RUG for groundwater. Based on the historic leachate monitoring data available, the leachate quality at the Ridge Landfill is generally similar to typical municipal solid waste landfill leachate.

[150] Ministry of the Environment, Conservation and Parks (1994a). Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities. (Formerly Policy 15-08).

The philosophy for leachate management adopted for the Ridge Landfill consists of containment, collection, removal and treatment of leachate from the landfill. As the contaminating life span depends on the removal of contaminants from the landfill, leachate collection and removal is necessary. Also, collection and removal of leachate will prevent its mounding within the landfill. Rising leachate levels would increase the potential for contaminant release through the sides of the landfill potentially discharging to the surface as seeps. To prevent these releases, leachate collection and removal are necessary.

The existing and proposed final cover design for the Ridge Landfill will meet the following objectives:

- Allow controlled infiltration of precipitation. Controlled infiltration will be encouraged as moisture flowing through the waste will be essential for leaching and removal of contaminants from the landfill by leachate collection and removal;
- Limit intrusion of air when the LFG collection system is operating. This will minimize air from being drawn into the landfill by the vacuum applied by the LFG collection system. The intrusion of air is undesirable in a landfill that has a gas collection system because it can upset the anaerobic methane-producing conditions (causing diminished gas generation), dilute the concentration of methane in the collected gas and increase the risk of spontaneous ignition of subsurface fires; and
- Support vegetation for landfill rehabilitation. The final cover will support vegetation so that, as part of the rehabilitation of the site, the landfill areas can be integrated with the surrounding area and can possibly allow some alternative uses after closure.

Consistent with the existing fill areas, an un-compacted native soil cover has been selected for the proposed expansion. All existing and proposed final cover thicknesses include a 0.15 m thick topsoil layer to support vegetative growth. The goal is to establish a mixture of annual species that establish quickly and perennial species that will remain over the long term and will control erosion.

The leachate control system design approach for the existing Old Landfill is and will continue to be different from the design approach for the existing West and South Landfills. The Old Landfill used a finger drain perimeter leachate collection system and a recompacted clay cut-off wall to control lateral movement of contaminants through the weathered zone of the clay till. The exception was for the approved Infill area and the proposed east infill, which used a recompacted clay side slope liner to control lateral movement of contaminants through the weathered zone

of the clay till. The design of the proposed vertical expansion of the Old Landfill area will be based on and built upon the existing leachate collection system of the Old Landfill. The leachate control system for the vertical expansion will continue to consist of an additional finger drain system and either a recompacted clay cut-off wall or a recompacted clay side slope liner.

The design of the existing West Landfill and South Landfill includes a full, continuous underdrain (drainage blanket) to collect leachate and a recompacted clay side slope liner to control lateral contaminant migration through the weathered zone of the clay till. The proposed leachate collection system for expansion Areas A and B consists of the following components:

- Leachate collection lateral pipes;
- Leachate collection header pipes located at the toe of the side slopes;
- Four (4) low points designed to collect leachate and allow the installation of sump pumps to extract collected leachate;
- 450 mm diameter perforated high-density polyethylene (HDPE) extraction pipes at each sump. A redundant extraction pipe will be included to each sump as a contingency;
- A 50 mm clear stone drainage layer consisting of a continuous blanket 0.15 m thick at the drainage divide between collection pipes (ridges) and 0.43 m thick at the collection pipes (valleys);
- Two non-woven geotextiles, one laid at the bottom and another laid at the top of the 50 mm clear stone drainage layer; and
- A 0.2 m thick sand protective layer above the drainage layer.

Leachate will flow by gravity from the lateral pipes to the header pipes. Once collected at the header pipes, leachate will flow by gravity to the low points of Areas A and B, where sump pumps will be installed to pump leachate to the leachate storage tank via forcemain. From the leachate storage tank, leachate will be conveyed to the BWTL for treatment.

A future toe drain will be installed around the proposed Areas A and B and existing West and South Landfills at the toe of the 4(H):1(V) landfill side slopes. The purpose of the future toe drain is to allow for leachate to be collected at the perimeter of the landfill cells after failure of the underdrain leachate collection system far in the future, after closure of the landfill. This will reduce the potential for the development of leachate seeps and impacts to surface water when leachate eventually mounds within the landfill. The future toe drain will be constructed at the

end of the service life of the underdrain leachate collection system, which is estimated at just over 100 years after it is constructed.

The long-term annual average leachate generation rate will increase to about 780 m^3/day. The maximum annual peak leachate generation rate is expected to be about 900 m^3/day in 2040 when the waste footprint is fully constructed and some portions of the landfill are operating and do not have final cover. The leachate storage tank and pumping facilities on-site, the forcemain to the BWTL for treatment and the BWTL all have adequate capacity to treat the volume of leachate predicted over the expansion period and beyond. It is predicted that the BWTL will be at less than 70% of its capacity at the end of the expansion period with the volume of leachate predicted. The quality of the leachate and the effluent from the BWTL will be monitored to anticipate and install any needed upgrades over the life of the expansion. The BWTL is currently in compliance with all of its discharge criteria and it is expected that this will be maintained during the expansion period.

In the event that leachate cannot be pumped to the BWTL, Waste Connections has a contingency plan reached in agreement with the Chatham-Kent PUC to truck the leachate to the Chatham Wastewater Treatment Plant.

5.7 Landfill Gas Management System

The purpose of the site LFG system is to manage LFG generated within the landfill areas and to mitigate any potential effects on human health and the environment. The specific objectives of the LFG collection system are to:

- Minimize subsurface migration of LFG from the waste fill areas to the extent practicable;
- Minimize atmospheric LFG emissions (including odour bearing components) from both uncompleted and completed landfill areas to the extent practicable; and
- Incorporate flexibility to accommodate potential future LFG utilization.

LFG utilization (e.g., energy recovery) is currently being pursued and will depend on market conditions and available technology. The LFG system is designed to allow for future LFG utilization.

LFG generation is a function of waste tonnages in place, annual waste disposal rate and two (2) parameters that are specific to the type of waste and influenced by environmental conditions (i.e., Lo - potential methane generation capacity and k - methane generation rate).
The following parameters were used in the LFG generation model for the Ridge Landfill:

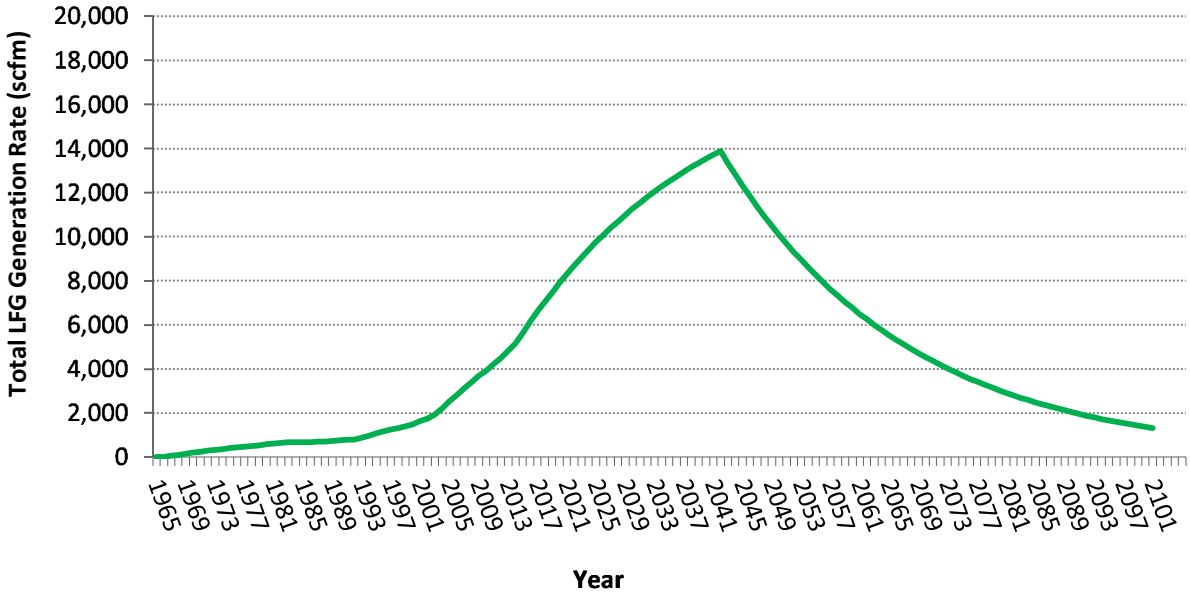
- Landfill opening year: 1966;
- Methane generation rate (k): 0.040/year; and
- Potential methane generation capacity (Lo): 125 m^3/Mg.

In addition, the following closure years were assumed in the model:

- Landfill closure year for the "do nothing" condition (i.e., the Ridge Landfill is not expanded): 2021; and
- Landfill closure year for the expansion condition: 2041.

The model results for LFG generation rates over time for the proposed Ridge Landfill expansion are presented in **FIGURE 5-3**.

FIGURE 5-3: LANDFILL GAS GENERATION RESULTS



The LFG generation quantities illustrated by **FIGURE 5-3** are for the total LFG generation (i.e., it includes all gas constituents) for the entire landfill. The units for generation rate are standard cubic feet per minute (scfm). Based on the data inputs, the LFG model approximated the maximum LFG collected at the Ridge Landfill would be approximately 18,700 m^3/hour (11,000 scfm), or 5.2 cubic metres/second, and will occur in 2041/2042, coinciding with the anticipated closure of the proposed expanded waste fill areas.

The expanded LFG collection system will be a similar, but expanded version of the existing LFG collection system, which will be comprised of three (3) major components:

- LFG collection system (e.g., vertical gas extraction wells and/or horizontal collection trenches, wellheads, LFG header pipe, LFG sub-header, and later piping);
- LFG control system (e.g., blowers and flares); and
- Condensate management system.

Vertical gas extraction wells and horizontal collection trenches will be installed within the waste mass to extract LFG. The vertical gas extraction wells will be connected by a series of sub-header and lateral pipes connected to a perimeter header system that will convey the collected LFG to the LFG control system. Horizontal collection trenches will be connected in a similar fashion. The collected LFG will ultimately be combusted via a series of blowers and flares. The condensate formed in the LFG collection system and at the blower/flare stations will be collected and transferred to the facility's leachate management system.

As previously noted, there are currently two (2) flares installed on-site and a third one will be installed under the current approval. Each blower/flare has 3,600 m^3/hour (2,100 scfm) capacity. With the additional estimated LFG flows, it is anticipated that additional flaring capacity will be needed in the future to accommodate the additional gas quantities associated with the proposed landfill expansion. The timing, size and number of flares to be installed will be dependent upon the actual quantity of gas produced. Any variability or changes in gas production will be accommodated by matching it to flaring capacity. Detailed design with equipment selection details will be submitted to MECP for approval following the EA approval.

Based on the physical site setting of the Ridge Landfill, potential migration of LFG through the subsurface is expected to be negligible due to the impermeable soils at the site. The native silty clay soil is about 30 m deep, is generally homogeneous and has a low permeability. In addition, the upper groundwater level in the surficial weathered soils is relatively shallow. Those two (2) site conditions are natural limiting factors to prevent subsurface lateral migration of LFG between the waste disposal areas and potential receptors.

5.8 Compliance with Engineered Facilities Guideline and Landfill Standards

The Engineered Facilities Guideline, or Guideline C-13[151], applies to the following facilities and the component parts at the Ridge Landfill:

- Landfill final cover;
- Leachate collection systems;
- Perimeter cut-off walls;
- Recompacted clay side slope liner;
- Toe drain system;
- Leachate storage tank and the forcemains; and
- LFG collection and management facilities.

According to Procedure C-13-1 (under Guideline C-13) these facilities must meet five (5) requirements, briefly described as follows:

- It must be possible to monitor the engineered facility to verify that it performs to specification;
- The contaminating life span of the landfill must be addressed in the contexts of the service lives of the various engineered facilities that are used to control contamination;
- Provision must be made for the maintenance of an engineered facility and its operation for as long as is required;
- Technical supporting data are required on the performance of engineered contaminant control facilities employing new technologies; and
- It is the responsibility of the applicant to specify the time period for the decommissioning of an engineered facility.

The Landfill Standards[152] amended the definition of Engineered Facilities and included examples of common engineered facilities that must meet the stated requirements.

[151] Ministry of the Environment, Conservation and Parks (1993). Guideline C-13: Engineered Facilities at Landfills that Receive Municipal and/or Non-Hazardous Wastes. (Formerly Policy 14-15). Last Updated: April, 1994.
[152] Ministry of the Environment, Conservation and Parks (2012). Landfill Standards – A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites. Available at: https://www.ontario.ca/page/landfillstandards-guideline-regulatory-and-approval-requirements-newexpanding-land. Last updated on March 22, 2019.

For groundwater, an unacceptable impact is considered to be an increase in contaminant concentrations in excess of the maximum allowable concentrations defined in accordance with the MECP's RUG. For surface water, an unacceptable impact is considered to be an impact on a surface water feature in excess of the Landfill Standards[153].

For LFG migration below surface, an unacceptable impact is considered to be the migration of LFG at concentrations in excess of the allowable methane concentrations defined in Section 4.10 of the Landfill Standards[154].

The proposed design of the engineered facilities of the expansion of the Ridge Landfill was developed consistent with regulations, the Engineered Facility Guideline and Landfill Standards.

5.9 Climate Change Considerations

The document entitled "*Considering Climate Change in the Environmental Assessment Process*"[155] was used as a guide for incorporating measures in the landfill expansion design that reduces both its impact on climate change (i.e., climate change mitigation) and the impact of climate change on the landfill (i.e., climate change adaptation).

Climate change adaptation was incorporated in the landfill expansion design in the following ways:

- Surface water diversion berms are proposed on the landfill final cover to reduce runoff velocity and minimize erosion;
- The proposed perimeter ditches, stormwater ponds and Howard Drain relocation were sized to include an allowance for increased storm intensity associated with climate change. These surface water features were sized to accommodate the storm conditions projected post 2050 at the Ridgetown RCS Climate Station, which are approximately 15% higher than current storm conditions derived from historical data; and
- The side slope stability analyses included in Sub-Appendix D6-A considered the potential effect of a rapid increase in leachate mound height in the landfill caused by an extreme precipitation event.

[153] Ibid.
[154] Ibid.
[155] Ministry of the Environment, Conservation and Parks (2017c). Considering Climate Change in the Environmental Assessment Process. Available at: https://www.ontario.ca/page/considering-climatechange-environmental-assessment-process. Last Update: May 8, 2019.

5.10 Canada-Ontario Lake Erie Action Plan

The MECP's Made in Ontario Environment Plan includes a commitment to reduce harmful algal blooms in Lake Erie and continue to support the Canada-Ontario Lake Erie Action Plan. This plan includes more than 120 actions to reduce phosphorus loadings and algal blooms. The Ridge Landfill does not have a significant impact to the water quality of the municipal drains that adjoin the site. Historical water quality analysis and analysis conducted as part of this EA has demonstrated that up-stream of the landfill water quality is similar to downstream of the landfill. The Ridge Landfill is not a significant source of phosphorus loading to Lake Erie, however, the two (2) main measures employed to continue controlling phosphorus loadings to Lake Erie from the landfill are:

- Stormwater runoff at the site will be collected and contained in stormwater management ponds. Water discharged from the ponds to the adjoining municipal drains will be tested prior to release ensuring compliance with regulatory criteria (including phosphorus); and
- Limiting the use of fertilizers at the site both during operation and post closure will prevent phosphorus from being captured in stormwater runoff from the landfill and impacting surface water that drains to the Great Lakes.

5.11 Landfill Development (Phasing)

The existing Ridge Landfill is expected to reach capacity in 2021. The first cell of the proposed landfill expansion needs to be available as soon as possible after all expansion approvals are received. The first area of expansion will be the Old Landfill area because its design will allow:

- Shorter construction duration;
- Suitability for winter construction; and
- Suitability for construction in phases to allow earlier waste filling operations while a portion of the cell expansion is still being constructed.

Area B will be filled next as it will be closer to the Old Landfill area and hence will allow a shorter haul distance of cell excavation material to the Old Landfill for use as landfill cover. Area A will be the last area of the proposed landfill expansion to be constructed and filled.

FIGURE 5-4 shows the proposed filling sequence, assuming a waste filling rate of 1.3 million tonnes per year and an apparent waste density of 900 kg/m^3 (based on historical survey data). In addition to cell construction, various supporting structures such as LFG system expansion,

stormwater ponds, screening berms, municipal drains and leachate management facilities will be constructed or modified as part of the landfill development sequence.

5.12 Landfill Operations

The Ridge Landfill will be open to receive waste from Monday to Saturday, 7:00 a.m. to 5:00 p.m. The site will be closed on Sundays. The site will be open on statutory holidays to honour municipal collection contracts and private sector contracts. If the quantities of waste are sufficiently low, the hours of operation may be reduced. Equipment hours of operation extend beyond the hours that the site will be open to the public to allow for preparation and soil covering activities. The hours of equipment operation will be Monday to Saturday, 6:30 a.m. to 6:00 p.m. No changes to receiving and operating times are proposed.

The currently approved daily maximum fill rate is 6,661 tonnes per day and the annual maximum fill rate is 1,300,000 tonnes per year, including approved alternative daily cover. This filling rate will apply to any proposed expansion area. Initially, after a new cell has been constructed, waste will be placed carefully in a thin layer over the entire area of the cell in order to avoid damage to the leachate collection system due to equipment travel and frost. No changes to daily or annual maximum fill rates are proposed.

Normal daily landfilling operations (as described below) will take place once the first layer of waste is placed. The landfill will be constructed in lifts of approximately 5 m thick. Waste haul vehicles (packer trucks, roll-off trucks, trailers, etc.) will travel to the working face via gravel access roads. Operations supervisors oversee traffic control responsibilities, assign tipping locations, maintain a small and orderly working face, and promote safety. Waste will be either tipped using the power of the vehicle/trailer itself (e.g., walking floor trailers, roll-off and front-end trucks, etc.) or by using stationary tippers to unload transfer trailers.

Waste will be deposited from waste vehicles or tippers at the base of the working face and spread over the working face by bulldozers and landfill compactors. The waste will then be compacted by several passes of the compactors. The working face will continue to be covered with clean cover soil or alternative daily cover at the end of each operating day. The native soil from cell excavations or stockpiles will also be used as intermediate or final cover.

5.13 Site Control and Maintenance

Regular access to the site is from the main site entrance, at Erieau Road. Waste haul trucks, staff and visitors will be required to use this access point. From the site entrance, the landfill access road allows access to the waste fill areas and all other facilities on-site. Lockable gates have been installed across the access road entrance. The gates prevent trespassing when the site is closed and will be locked at the end of each day of operation. The site is deemed to be closed when a site supervisor is not present at the site and the site entrance and exit gates will be locked or otherwise secured against access by unauthorized persons. When the site is operating, all incoming waste haul vehicles are required to report to the scale house to be weighed before proceeding to the landfill working area. Visitors must report to the administration building and fill out the visitor's log.

Incoming wastes will be subject to checking by the scale house personnel. If a load is considered "unacceptable," (i.e., waste type or materials not identified on the ECA), the scale house personnel has the authority to reject the load. Another opportunity for waste control is at the working area. If a controller identifies an "unacceptable" waste when a vehicle is unloading, it will be reloaded back into the source vehicle for removal. If the source vehicle has left the site, the waste will be removed by a front-end loader and placed aside near the working face. The hauler and generator will be identified, if possible, and the hauler will be asked to remove the waste promptly.

5.14 Monitoring and Reporting

A comprehensive program of operational, development and environmental monitoring will continue to be implemented. For operational and development monitoring the program focuses on the proper construction, operation, and maintenance of the site. Environmental monitoring focuses on observing and recording change in the environment to forecast and manage impacts off-site. Details of the monitoring and reporting programs are documented in **Section 7.0**

5.15 Site Closure

As outlined in previous sections, the landfilling areas will be progressively completed and rehabilitated as landfill development reaches final contours. A Closure Plan will be submitted to the Regional Director of the MECP for approval when the landfill site is two (2) years from its projected closure. A closure plan appropriate for this site would include the following:

- Plans for long-term fencing and access control;
- Details on the final grading, final cover requirements and the source(s) of the cover materials used;

- Details of vegetative cover requirements;
- End-use plan for the site;
- Plans for continued monitoring of the groundwater, surface water, leachate and LFG;
- Plans for continued maintenance, operation and monitoring of the engineered facilities at the site including the leachate collection system, gas management system and the surface water drainage facilities;
- Plans and schedules for routine inspection and maintenance of the site upon closure; and
- Updated contingency plans for groundwater, surface water and gas control.

The activities to be carried out for closure will include application of final cover composed of 0.85 m thick soil layer, 0.15 m thick topsoil and seeding. As part of the final capping construction of berms and down chutes for erosion control will be installed as part of the final cover An access road to the top of the three (3) landfill areas will be constructed for maintenance purposes. Installation of remaining landfill gas collection system will be completed. Signage will be posted at the site entrance indicating the landfill is closed and identifying alternatives for disposal arrangements. The closure will include the removal of unnecessary landfill related structures, buildings and facilities and the completion of final landscaping (if any pending).

5.16 Post-Closure

Long-term monitoring and maintenance programs will be maintained for the post-closure care of the site. These programs will be designed to address:

- Groundwater levels and quality;
- Surface water quality;
- Leachate quantity and quality (The leachate management system will continue to operate until leachate no longer poses a threat to groundwater or surface water quality);
- Leachate management;
- LFG collection and control;
- Landfill settlement;
- Integrity of cover;
- Erosion control;

- Surface water drainage;
- Health of vegetation;
- Performance of any implemented contingency plans;
- Site security, safety and access control; and
- Any other potential impacts on the surrounding environment.

During the post-closure period, continuous monitoring, maintenance, and repair will be undertaken to provide protection of the environment for the duration of the contaminating life span of the landfill. The gas collection and control systems will continue to be operated for as long as necessary to prevent unacceptable impacts. The stormwater ponds will be operated as wet ponds (with outlet valves permanently open). Erosion, ponding from settlement, and leachate seeps should they occur, will be corrected, as required.

5.17 Comparison of the Preferred Alternative to the "Do Nothing" Alternative

As per the MECP Code of Practice for EAs, the "do nothing" alternative represents what is expected to happen if the preferred alternative is not carried out.[156] This section considers the preferred alternative relative to a "do nothing" scenario. The purpose of this comparison is to confirm whether proceeding with the full impact assessment of the preferred development alternative is appropriate given the potential for impact on the environment.

In a "do nothing" scenario, the Ridge Landfill would close in 2021 and would no longer accept the 1.3 million tonnes annually of non-hazardous solid waste from its IC&I customers in Ontario and would no longer be available to accept municipal waste from the Municipality of Chatham-Kent. This would mean that waste currently taken to the Ridge Landfill for disposal would have to be diverted to other approved waste disposal facilities. Landfill capacity in Ontario is already limited and will not be able to absorb an additional 1.3 million tonnes of waste annually. Consequently this waste would likely have to be transported out of Province and/or Country, putting additional stress on the provincial waste management system (Refer to **Section 1.5**).

This section identifies the advantages and disadvantages of proceeding with the preferred alternative as opposed to the "do nothing" alternative of closing the landfill in 2021. **Table 5-2** highlights key elements of the preferred alternative and the "do nothing" alternative for the

[156] Ministry of the Environment, Conservation and Parks (2014a). Code of Practice: Preparing and Reviewing Environmental Assessments in Ontario, January 2014.

six (6) environmental components considered. As is demonstrated in **Table 5-2**, the potential impacts associated with the preliminary preferred site development alternative are generally minimal relative to the "do nothing" alternative and can for the most part be eliminated through mitigation.

Table 5-2: Preferred Alternative Compared to the "Do Nothing" Alternative

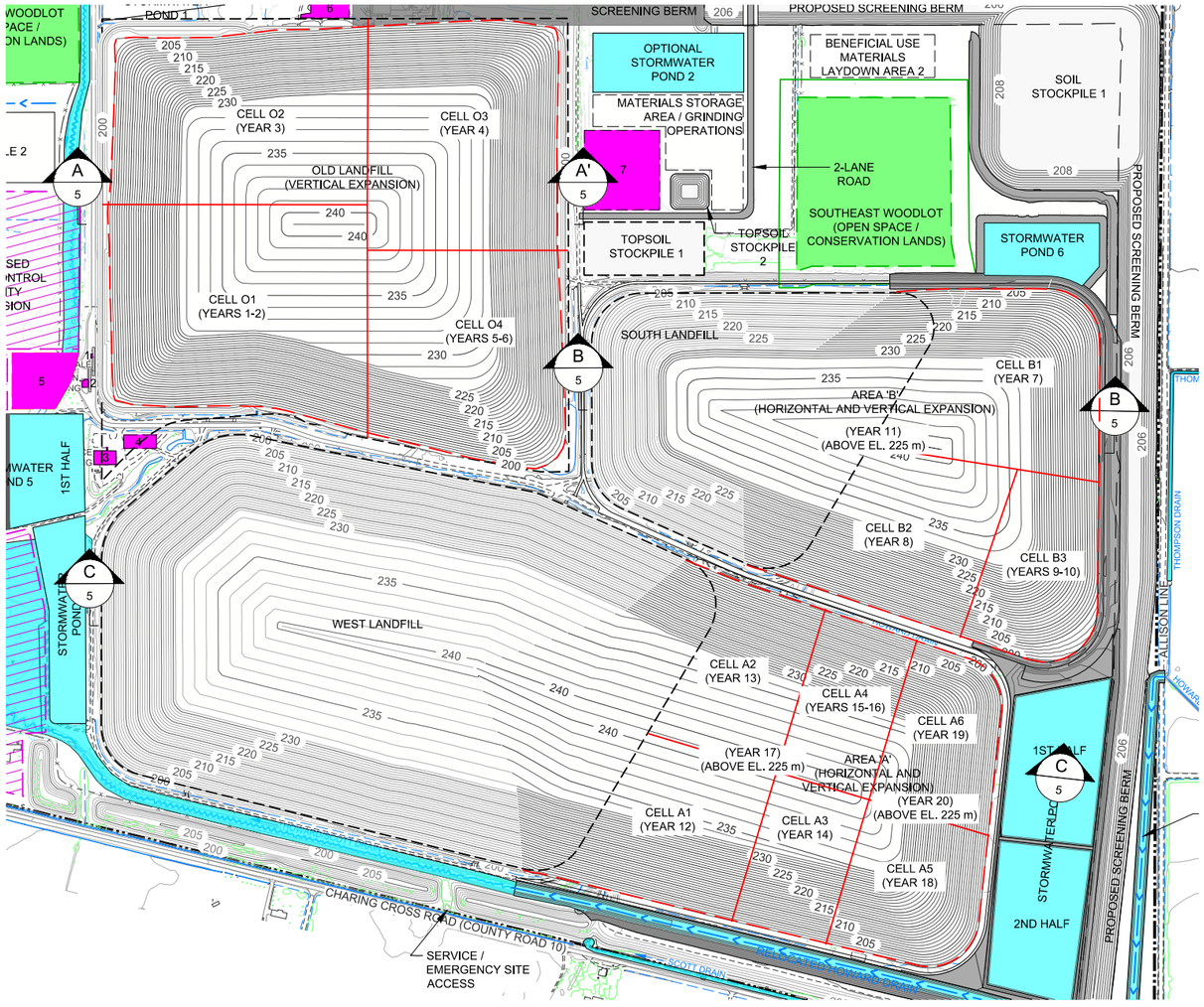
Environmental Component	Preferred Alternative	Do Nothing Alternative	Advantages/Disadvantages and Trade-Offs
Natural Environment – Biological (Terrestrial & Aquatic)	Will remove the 3.7 ha southwest woodlot and replant the woodlot at a 2:1 ratio at different locations resulting in a more robust woodlot with greater ecological function over time. Will temporarily remove eastern meadowlark meadow habitat which will be replaced with a significantly larger area of habitat upon landfill expansion completion. Barn swallow nests may also be removed and replaced on a one to one basis. There may be some disruption to on-site habitat due to construction and operation of the expansion but these impacts would be mitigated through appropriate buffers and best management practices.	The southwest woodlot and meadow habitat would remain. Barn swallow nest may also be removed and replaced on a one to one basis as the agricultural buildings may be removed due to their condition. There would be no on-site disruption to habitat from construction or operational activities.	While there will be a short-term loss of woodlot habitat (15 to 20 years), and meadow habitat (3 to 4 years), the replacement habitat will be larger and in the case of the woodlot be of higher quality and have greater ecological function as it matures over time. There is no trade-off for the barn swallow nests as they may be removed and replaced with either alternative. On-site disruption to habitat from construction and operational activities can be managed and minimized through setting of appropriate buffers and best management practices. There is no trade-off.

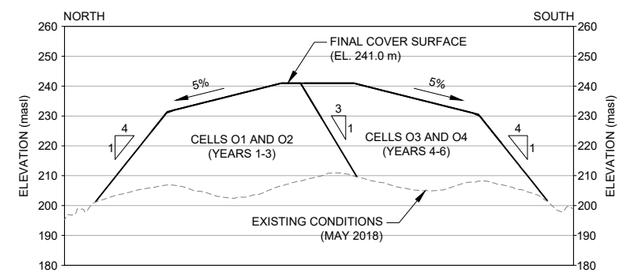
Environmental Component	Preferred Alternative	Do Nothing Alternative	Advantages/Disadvantages and Trade-Offs
Natural Environment – Physical (Hydrogeological)	The protection afforded by the natural setting will continue to meet RUG and that the landfill expansion will have no impact on groundwater recharge.	Historical monitoring activity has shown that the Ridge Landfill site consistently meets the RUG. Groundwater recharge in the area is very limited due to the nature of the soils overlying the bedrock aquifer.	Groundwater is protected and there is no impact on groundwater recharge, there is no advantage/ disadvantage or trade-off.
Natural Environment – Physical (Surface Water)	Temporary disruption to surface water from the relocation of some drains will not impact overall quality or quantity. The preferred alternative would have minimal to no impact on surface water quantity or quality.	The existing site would continue to have minimal to no impact on surface water quality and quantity.	Surface water is protected, there is no trade-off. Although with the "do nothing" alternative existing stormwater ponds may be of insufficient size to manage increased run-off from climate change in the future.
Natural Environment – Physical (Atmospheric)	LFG emissions would continue to be managed by flaring or potential future utilization. Traffic related dust and air quality impacts would likely occur until landfill closure.	LFG emissions would continue to be managed by flaring or potential future utilization. Traffic related dust would diminish and air quality impacts would be reduced, once the site is no longer operational.	LFG emissions would continue for about 20 years longer with the preferred alternative and would require flaring over this time. On-site traffic related dust and air quality would need to be mitigated over the life of the expansion. Mitigation would not be required with "do nothing" alternative. With either alternative off-site impacts are minimal.

Environmental Component	Preferred Alternative	Do Nothing Alternative	Advantages/Disadvantages and Trade-Offs
Natural Environment – Physical (Climate Change)	Captured GHG emissions would continue to be managed by flaring or potential future utilization. GHG emissions would increase over the expansion period, peaking in 2042 at site closure at 762,000 tonnes CO_2e/year (about 2% of the emissions from the local service area) and will require management for about 50 years into the future until 2090.	Captured GHG emissions would continue to be managed by flaring or potential future utilization. GHG emissions would peak in 2021 upon landfill closure at 391,000 tonnes CO_2e/year (about 1.3% of the GHG emissions from the local service area) and will required management for about 50 years into the future until 2070.	GHG emissions would increase over expansion period but would still be less than 2% of the GHG's generated in the local service area. Landfill gas management systems would need to operate an additional 20 years with the proposed expansion.
Socio-Economic Environment (Social)	Will continue to generate LFG and have the potential for odour as well as occasional noise and blowing litter impacts to residents over the next 20 years. The visibility of the site will change; however, the overall height will not increase. Truck traffic over the next 20 years is expected to be similar to that experienced today (i.e., approximately 200 waste trucks/day).	Upon closure, disruption from noise, litter and truck traffic would be reduced and would only be associated with landfill maintenance and monitoring. The landfill will continue to generate LFG and have the potential for odours. The site will remain visible from surrounding residences.	Occasional r noise and litter impacts will persist with expansion, landfill views will change for some neighbours and three (3) additional residences will see the landfill. Truck traffic will stay about what it currently is. With the "do nothing" alternative these impacts will not be present but neither will the monetary compensation impacted residents receive. The trade-off for individuals is occasional impacts versus monetary compensation.

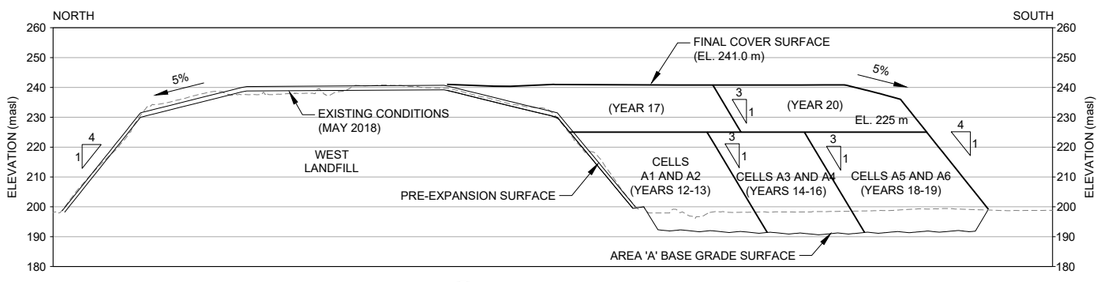
Environmental Component	Preferred Alternative	Do Nothing Alternative	Advantages/Disadvantages and Trade-Offs
Socio-Economic Environment (Economic)	Will result in minor disruption associated with site operation and truck traffic over the next 20 years. There will be some loss of Class 2 lands currently used for agriculture. Waste Connections' financial contributions to Chatham-Kent, the community and site neighbours would continue.	The on-site lands that are currently leased for farming could continue to be farmed, at the discretion of Waste Connections. The Municipality of Chatham-Kent would have to find an alternative disposal facility for its residential waste. There would be a negative local economic impact to the community. Funding for local community projects currently supported through the Ridge Landfill Community Trust would end. The compensation program for area residents would end.	The expansion will require the removal of a small area of farmland that may continue with the "do nothing" alternative. Neither of the tenant farmers will be significantly impacted. With the "do nothing" alternative the financial benefit the community receives will disappear as well as the waste disposal service that Chatham-Kent currently receives. This is a significant trade-off as the financial benefit the community receives far outweighs the benefit received from the small area of farmland that would be displaced. Impacts from the operation of the landfill on adjacent businesses are not significant.
Cultural Environment	Any identified archaeological resources and the barns, residence and farmscape cultural features identified on-site will be documented and removed as appropriate.	Any archaeological resources will remain undiscovered and on-site cultural features may remain, subject to property owner wishes and/or the site closure plan.	Significant cultural and archeological resources will be managed appropriately with either the expansion or the "do nothing" alternative. There is no trade-off.

Environmental Component	Preferred Alternative	Do Nothing Alternative	Advantages/Disadvantages and Trade-Offs
Built Environment	Waste Connections will continue to liaise with the Municipality of Chatham-Kent to provide funding for upkeep of the designated haul route.	A designated haul route would not be required and Waste Connections would no longer pay for its maintenance and upkeep.	Although the wear and tear on the haul route would be decreased with the "do nothing" alternative there is a trade-off that the municipality would lose funding for the upkeep and would have to allocate funds for the on-going maintenance and repair of the roads.

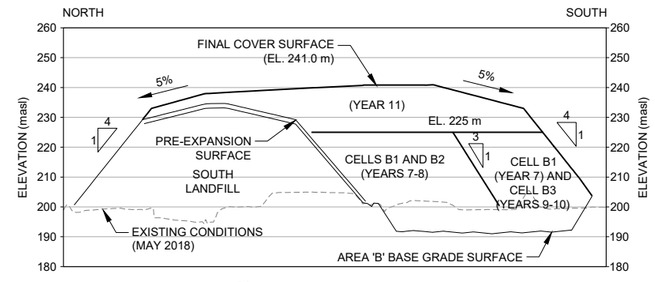




V.E. 5X A/5 CROSS-SECTION A-A'



V.E. 5X C/5 CROSS-SECTION C-C'



V.E. 5X B/5 CROSS-SECTION B-B'

LEGEND

- PROPERTY LIMIT
- APPROVED PRE-EXPANSION WASTE LIMIT
- 235 — APPROVED PRE-EXPANSION LANDFILL FINAL COVER CONTOUR (1.0 masl INTERVAL)
- PROPOSED EXPANSION WASTE LIMIT
- PROPOSED CELL LIMITS
- 230 — PROPOSED EXPANSION LANDFILL FINAL COVER CONTOUR (1.0 masl INTERVAL)
- PROPOSED ACCESS ROAD
- PROPOSED ROAD AND DITCH
- PROPOSED RELOCATED HOWARD DRAIN
- 205 — EXISTING GROUND SURFACE CONTOUR (1.0 masl INTERVAL)
- EXISTING GRAVEL ROAD
- EXISTING PAVED ROAD
- EXISTING DRAINAGE DITCH
- EXISTING WATER BODY
- EXISTING TREE LINE
- 1 SCALE HOUSE
- 2 ADMINISTRATION BUILDING
- 3 MAINTENANCE BUILDING 1
- 4 MAINTENANCE BUILDING 2 / HOT BOX
- 5 PROPOSED ANCILLARY FACILITIES
- 6 EXISTING / FUTURE LEACHATE MANAGEMENT AREA
- 7 EXISTING / FUTURE LANDFILL GAS MANAGEMENT AREA

NOTE(S)

1. PROJECTION: UTM NAD27-17N. VERTICAL DATUM: CGVD28 (GEODETIC).

REFERENCE(S)

1. TOPOGRAPHIC BASE PLAN FROM 6 cm GROUND SAMPLING DISTANCE, DATED MAY 1, 2018 BY THE BASE MAPPING CO. LTD.
2. APPROVED WASTE LIMITS AND PROPERTY LIMITS FROM FIGURE 2 - ALTERNATIVE 1 (HORIZONTAL AND VERTICAL EXPANSION) PREPARED BY DILLON CONSULTING.

0 200 400
1:5,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
C	2019-07-10	ISSUED FOR DESIGN AND OPERATIONS REPORT APPROVAL (EA PHASE) - EA REVIEW	FRG	FC/MR	FRG	FSB
B	2019-06-10	ISSUED FOR DESIGN AND OPERATIONS REPORT APPROVAL (EA PHASE) - CLIENT REVIEW	FRG	FC	FRG	FSB
A	2019-01-31	ISSUED FOR CLIENT REVIEW	FRG	FC	FRG	FSB

SEAL

CLIENT
WASTE CONNECTIONS OF CANADA INC.

CONSULTANT
GOLDER
GOLDER ASSOCIATES LTD.
6925 CENTURY AVENUE, SUITE #100
MISSISSAUGA, ONTARIO, L5N 7K2
CANADA
[+1] (905) 567-4444
www.golder.com

PROJECT
PRELIMINARY DESIGN
RIDGE LANDFILL EXPANSION
BLENHEIM, ONTARIO

TITLE
OVERALL PHASING PLAN
FIGURE 5-4

PROJECT NO.	CONTROL	REV.		DRAWING
18111331	0001	C	5 of 29	5

Page intentionally left blank