Public Information Session 3

Twin Creeks Environmental Centre Landfill Optimization Project Environmental Assessment

November 27, 2024

Welcome

Public Information Session 3 is being held to present:

- An **update** on the Environmental Assessment (EA)
- The **Alternative Methods**
- The preliminary results of the **effects assessment** for the Alternative Methods
- The preliminary results of the **comparative evaluation** that was conducted to select a **Preferred Alternative**
- **Next steps** in the EA Process

WM staff and consultants are available to answer your questions

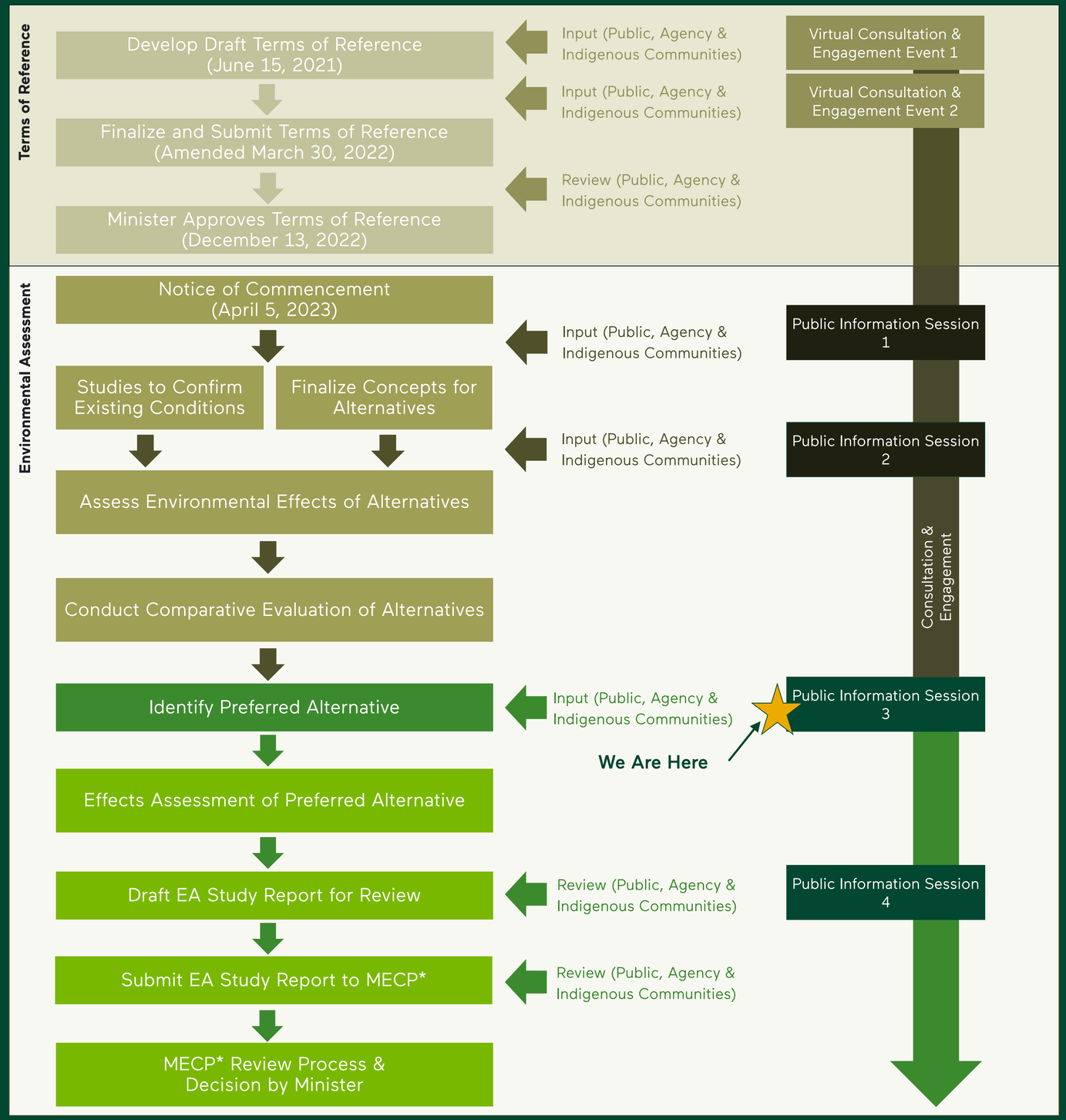
Environmental Assessment Update

The Environmental Assessment (EA) is being carried out according to the approved Terms of Reference and the requirements of the *Ontario Environmental Assessment Act*.

Vertical Alternative Methods have been developed for assessment in the EA.

Studies to assess the effects of the Alternative Methods have been undertaken and documented in draft Effects Assessment Reports. These reports will be available for public review on December 6, 2024.

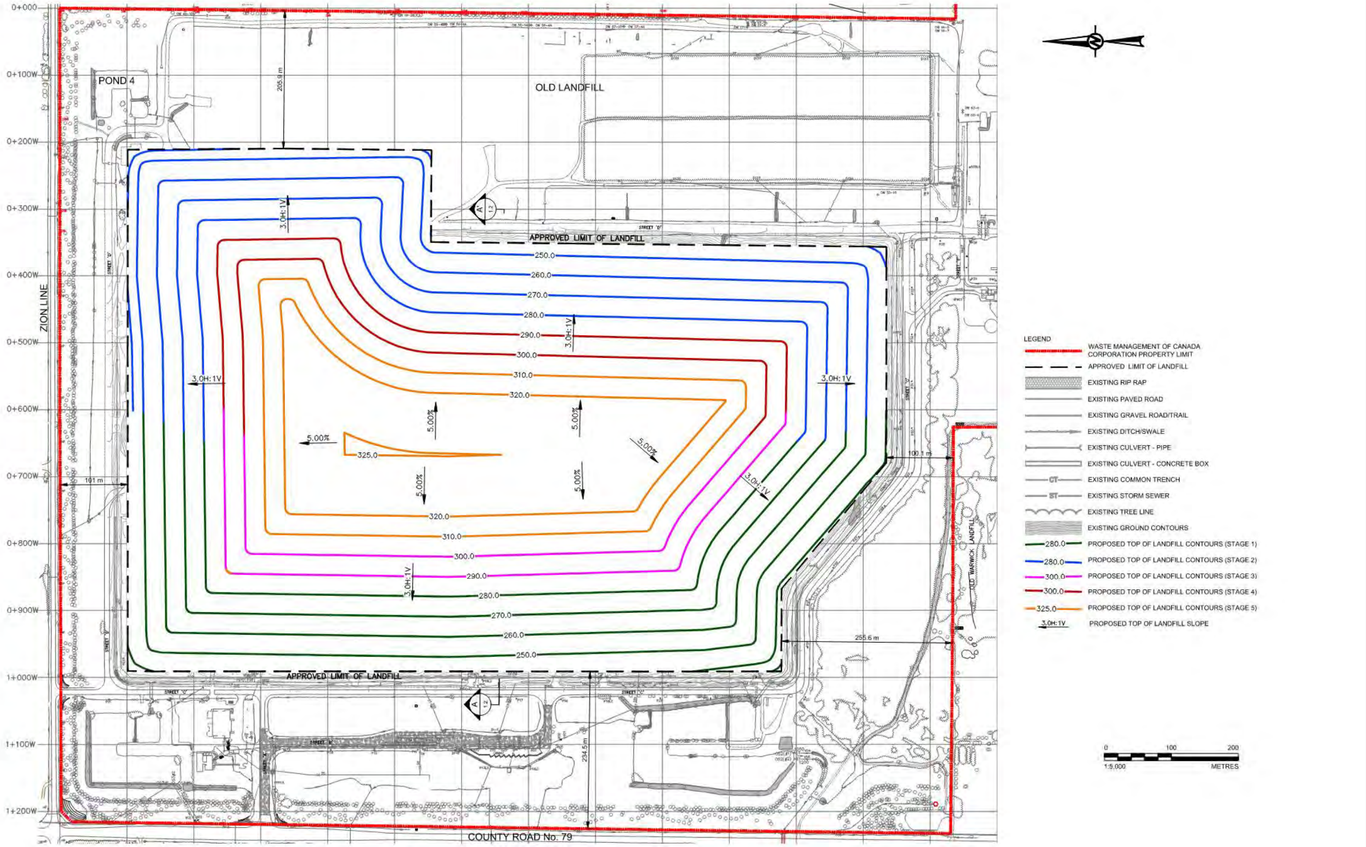
The next step is to review public input on the effects assessment reports, conduct the effects assessment of the Preferred Alternative, and develop the Draft EA Study Report.

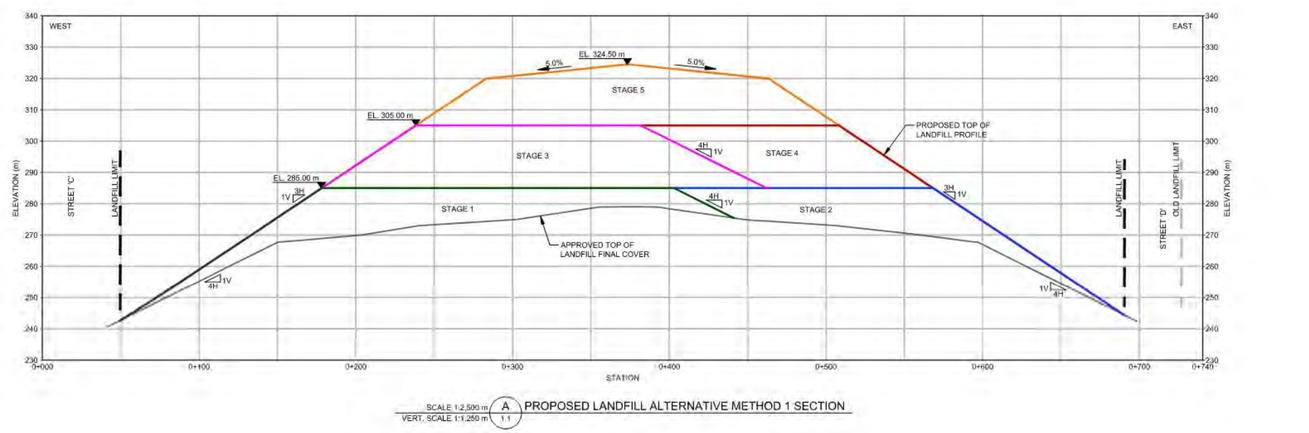


*MECP = Ministry of Environment, Conservation and Parks

Alternative Method 1

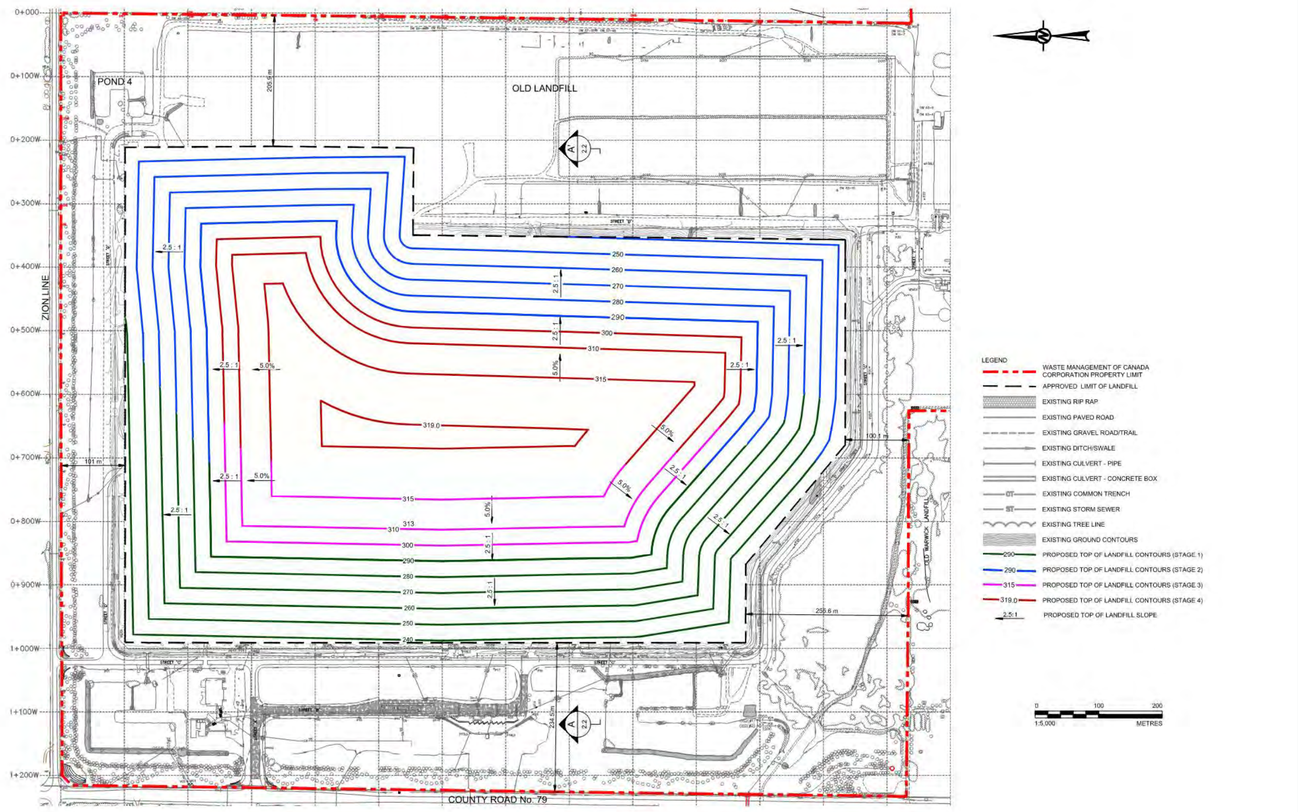
- Capacity of 14.3 million m³
- 12 years of operation
- 5 stages
- Maximum height = 324.5 masl
- 44.5 m higher than approved Expansion Landfill (280 masl)
- Increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl (about 16 m in grade change) transitioning to a 20H:1V upper slope

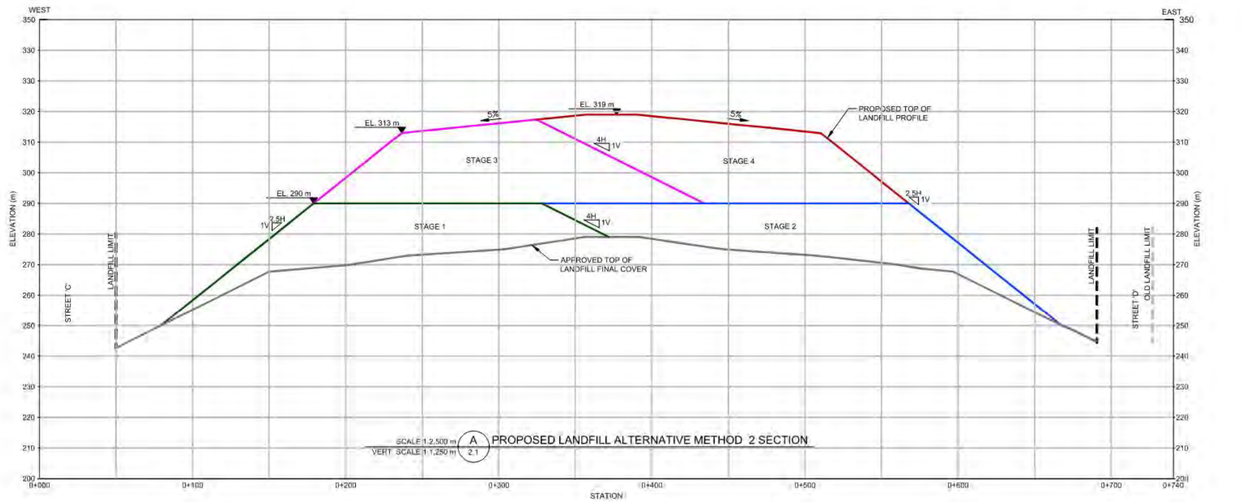




Alternative Method 2

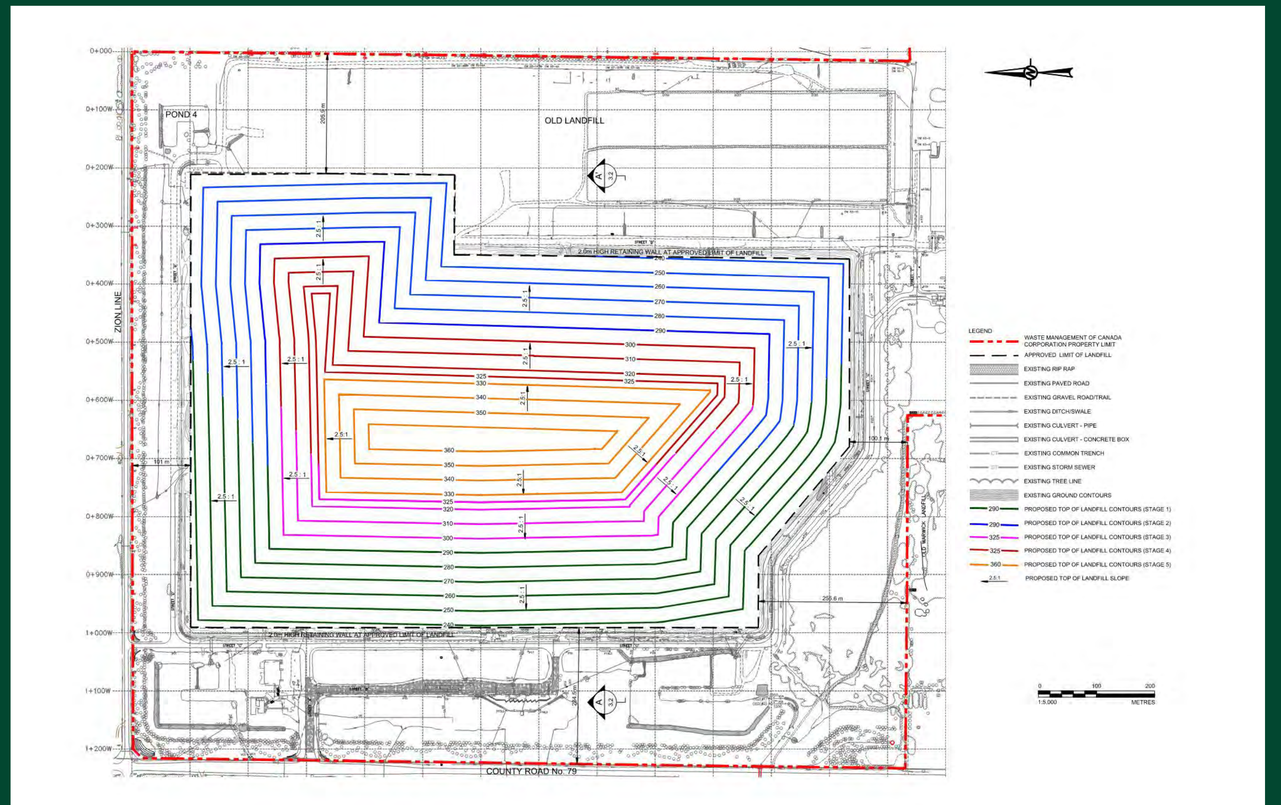
- Capacity of 14.3 million m³
- 12 years of operation
- 4 stages
- Maximum height = 319 masl
- 39 m higher than approved Expansion Landfill (280 masl)
- Increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope

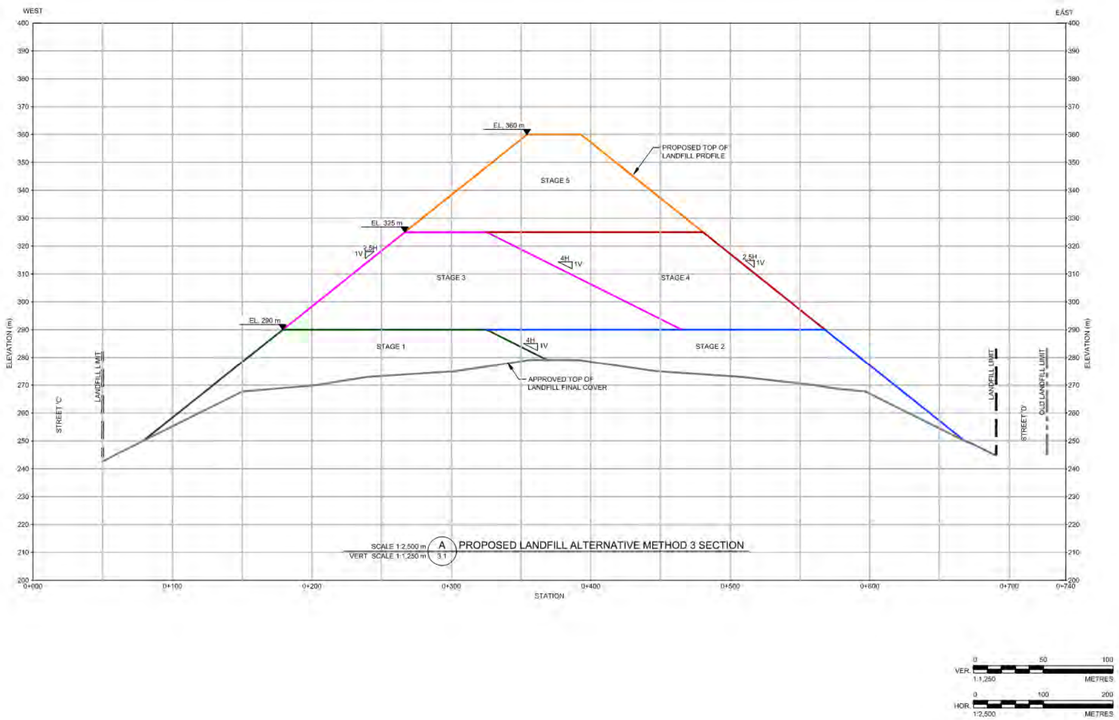




Alternative Method 3

- Capacity of 14.3 million m³
- 12 years of operation
- 5 stages
- Maximum height = 360 masl
- 80 m higher than approved Expansion Landfill (280 masl)
- Increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl, about 100 m in grade change





Air Quality Effects Assessment

Dust

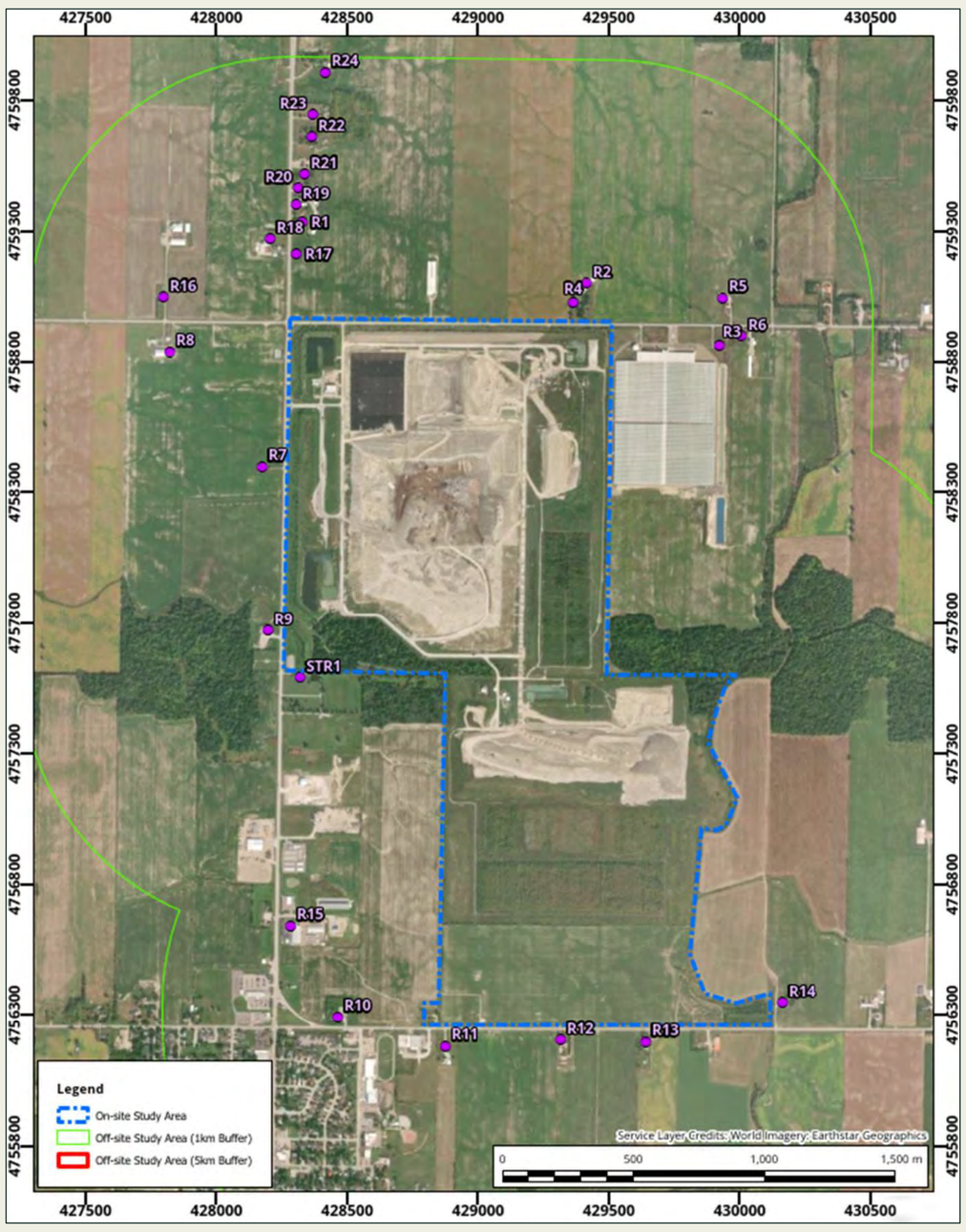
Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Off-site point of impingement air concentrations of particulate matter (dust) compounds at identified receptors in the immediate vicinity of the site, and community. Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors. Number of off-site identified receptors potentially affected (e.g., residential properties, public facilities, businesses/farms, institutions).	**Sources:** • On-site vehicle traffic (on both paved and unpaved roads) • Idling vehicles • Wind erosion of exposed areas • Material handling, including waste soils and daily cover material • Bulldozing • Combustion sources • Landfill gas flares • Proposed RNG Facility flares and thermal oxidizers • Emergency generators **Mitigation:** • Continued implementation of Dust Management Plan. • Replace the existing unpaved south access ramp of the landfill area with a hard surface equivalent to a paved road. • Implementation of enhanced watering practices to achieve 95% control along paved haul routes. With the application of mitigation strategies, concentrations, frequencies of predicted exceedance at discrete receptors, and number of off-site receptors potentially affected are expected to decrease to levels similar to Future Baseline Conditions: • Annual TSP, annual $PM_{2.5}$, and 24-hour $PM_{2.5}$ at all receptors < criteria. • 24-hour TSP > criteria at 11 receptors at some point during the Project, with frequency ranging from 0.1% to 2.2% of the time. • 24-hour PM_{10} > criteria at 5 receptors at some point during the Project, with frequency ranging from 0.1% to 1.3% of the time. **No net effects.** Potential increases in concentrations, frequency and number of receptors resulting from proximity to the working face and supporting infrastructure offset by mitigation resulting in no changes from predicted Future Baseline Conditions for the Expansion Landfill.		

Litter

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Extent of zones potentially impacted by blowing litter. Number of off-site receptors potentially affected (e.g., residential properties, public facilities, businesses/farms odour sensitive area(s), institutions).	**Sources:** • Working face where freshly deposited waste is exposed to the wind. • High winds with potential to blow litter from <2% to 5% of the time for a given wind direction. **Mitigation:** • Continued implementation of Litter Management Plan. • Continued use of permanent litter fencing at the northern property boundary. • Continued use of portable litter fencing at the landfill working face. **No net effects.** No changes from predicted Future Baseline Conditions for the Expansion Landfill.		

Landfill Gas and Combustion By-products

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Off-site point of impingement air concentrations of indicator compounds at identified receptors in the immediate vicinity of the site, and community (within 5 km). Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors. Number of off-site receptors potentially affected (e.g., residential properties, public facilities, businesses/farms, institutions).	**Sources:** • Fugitive emissions of landfill gas (LFG) through the surface of the landfill, through both final cap and interim cover areas • VOCs and ammonia from the leachate collection and treatment system • VOCs from contaminated soils • Uncombusted LFG compounds emitted from the landfill flares • Uncombusted LFG compounds emitted from the RNG Facility thermal oxidizers and flares • Tailpipe emissions from mobile equipment. **Mitigation:** • LFG collection efficiency of 75% for areas without final cover and 90% for areas with final cover. • Continued installation of Early Vertical Gas System wells. **No net effects.** Potential increases in off-site concentrations due to increased production of LFG offset by increased LFG collection efficiency resulting in no changes from predicted Future Baseline Conditions for the Expansion Landfill.		



Air Quality Receptor Locations

Odour Effects Assessment

Sources

- Landfill gas (LFG) and waste odours from the landfill and waste acceptance activities: active face, interim cover areas
- Leachate odours from the leachate collection, storage, and treatment system
- Hydrocarbon odours from contaminated soils

Odour Concentration Levels

1 Detection Threshold

3 Recognition Threshold

5 Annoyance Threshold

- Odour measured in odour units per cubic metre (OU/m³).
- Average odour detection threshold is 1 OU/m³, although odours at this level are not necessarily a nuisance.
- MECP: odour **< 1 OU/m³** acceptable at receptors if frequency is **< 0.5%** of the time.

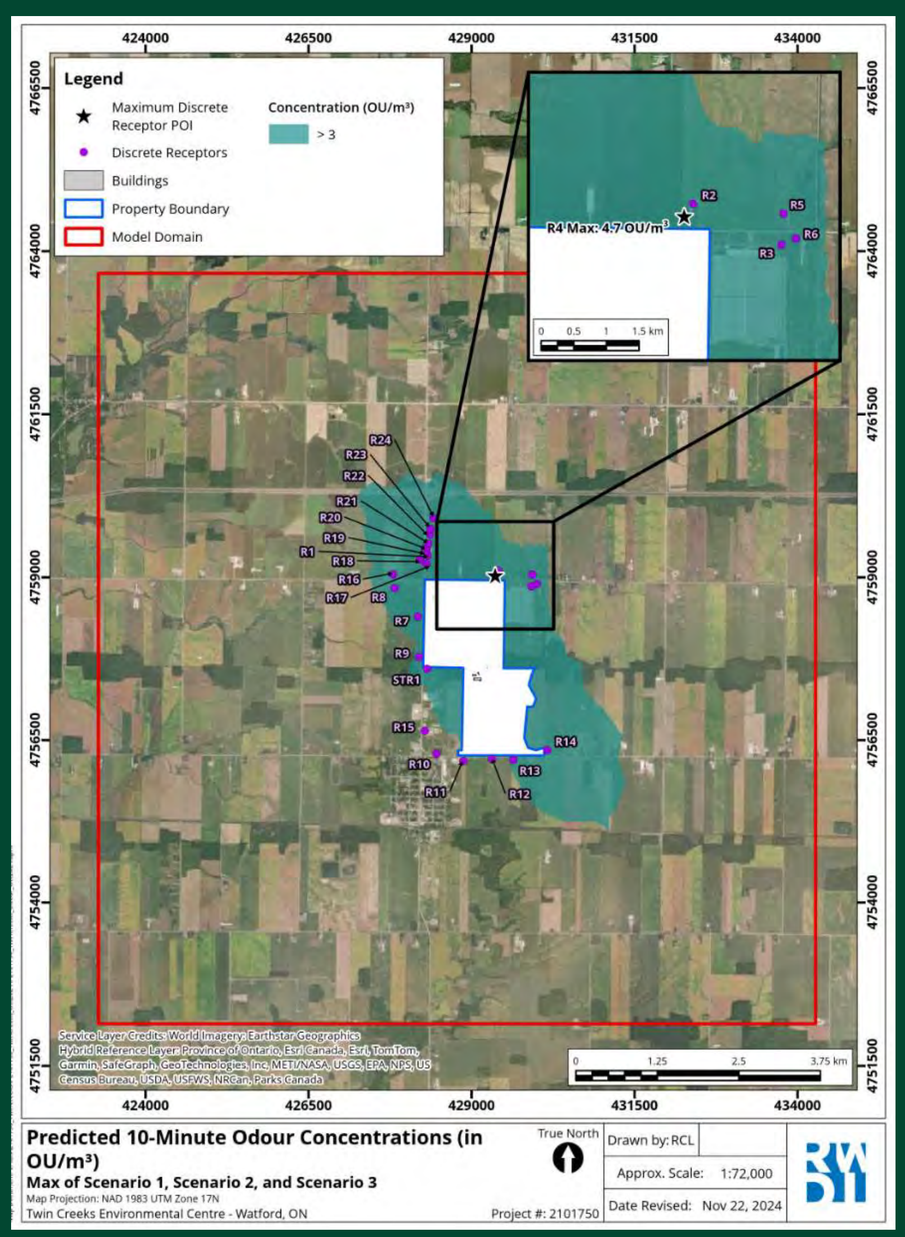
Project

- Operations will move around the landfill site over the life of the landfill
- Working face in closer proximity to receptors in the west, northwest, and northeast at different times
- Three future operational scenarios considered:
  - Scenario 1: **2034** - End of Stage 1, with the working face and extension of the southern access haul route in the northwest corner of the existing landfill footprint.
  - Scenario 2: **2037** - End of Stage 2, with the working face and extension of the southern access haul route in the northeast corner of the existing landfill footprint.
  - Scenario 3: **2042** - End of Stage 4, with the working face and extension of the southern access haul route toward the northeast corner but not as close to the extent of the existing landfill footprint.

- Scenario 1 has the worst-case for odour:
  - Concentrations **> 1 OU/m³** (detection threshold) at 24 receptors, with frequency ranging from 0.3% to 4% of the time.
  - Concentrations **> 3 OU/m³** (recognition threshold) at 17 receptors, with frequency ranging from 0.01% to 0.3% of the time.
  - No concentrations **> 5 OU/m³** (annoyance threshold) at any receptors.

- Odour levels are predicted to decrease over time, as more of the landfill is placed under final cover.

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Off-site odour concentrations (odour units) at identified odour sensitive receptors in the immediate vicinity of the site.	Predicted odour concentrations may exceed criteria at discrete receptor locations.		
Frequency of any odour levels above defined odour benchmarks.	Frequency of odour levels above defined odour benchmarks may increase.		
Number of off-site receptors potentially affected (e.g., residential properties, public facilities, businesses/farms odour sensitive area(s), institutions).	The number of discrete receptors with predicted odour concentrations exceeding criteria may increase.		

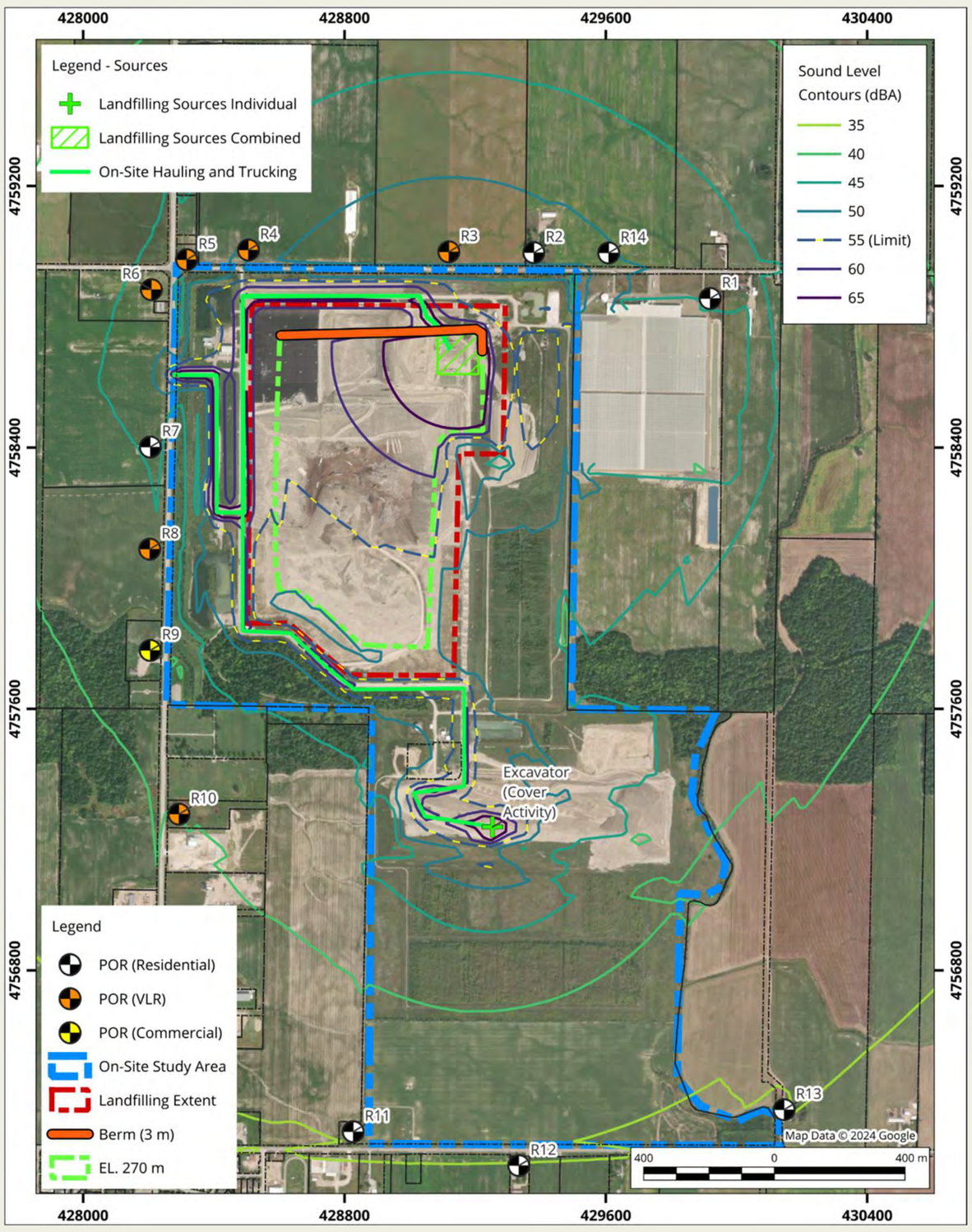


Maximum 10-minute Odour Concentrations: Scenario 1 (2034), Scenario 2 (2037), and Scenario 3 (2042)

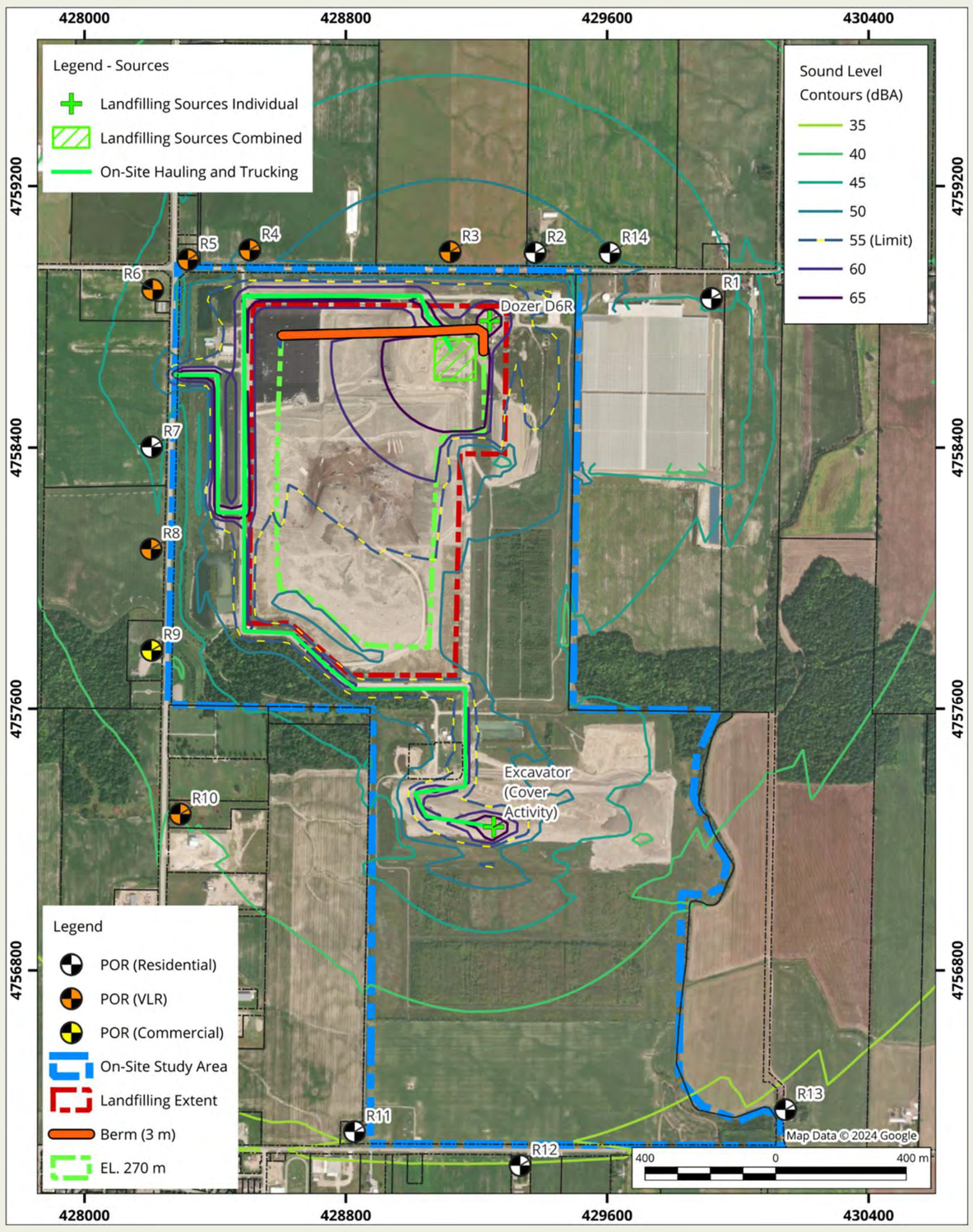
Noise Effects Assessment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Predicted site-related noise levels (measured in dBA or dBAI) Change in sound levels (dB)	**Sources:** • Landfill operations including landfilling equipment working the perimeter of the landfill. • Site-related traffic and background (non-landfill-related) traffic and haul route. • Stationary sources and ancillary equipment. • Emergency sources. • Pest control devices. **Mitigation:** • Setbacks from landfilling activities. • Construction of localized berms along the perimeter of the landfill. • Limit the number of active equipment near the perimeter of the landfill. **No net effects.** • Noise levels meeting applicable landfilling noise guidelines during daytime hours. • Alternative Methods 2 & 3 have greater setbacks than Alternative Method 1 by ~50 metres. • No predicted change in noise levels due to the Project along the haul route; landfill traffic volumes are expected to remain the same.		

Alternative Method 2
Stage 2, Contour Height 1.5 metres
Typical Landfilling Lower Elevation with Berm Mitigation



Alternative Method 2
Stage 2, Contour Height 1.5 metres
Side Slope Redevelopment with Equipment Restriction Mitigation



Hydrogeology Effects Assessment

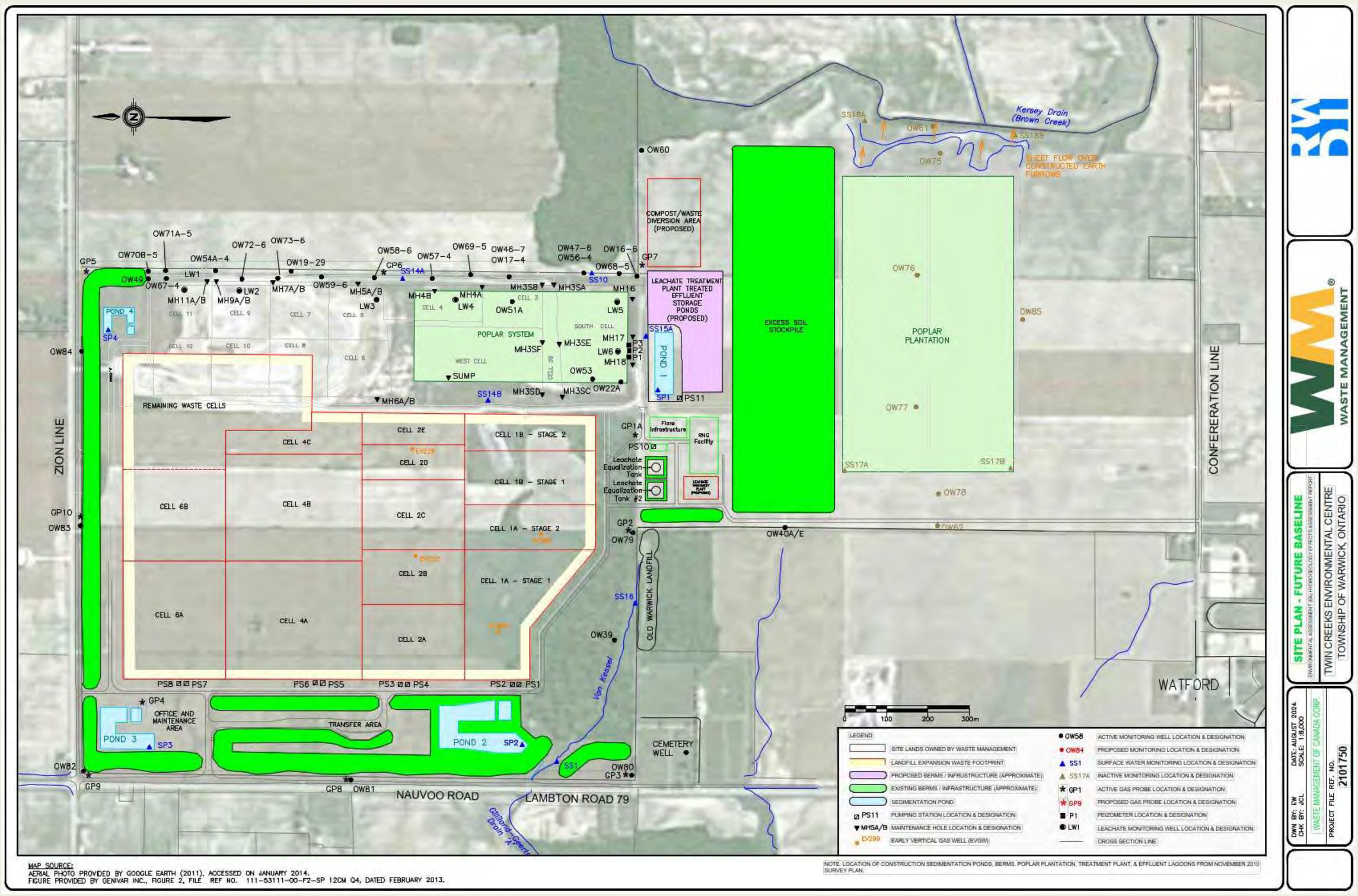
Groundwater Quantity

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Predicted effects of the landfill optimization on groundwater flow and quantity both on-site and off-site	**Sources:** • Groundwater potentiometric pressures could be affected by the additional waste mass, thus influencing the hydraulic trap condition of the Expansion Landfill. • Increase in landfill cap surface area is expected to generate a greater volume of leachate. • Primary leachate source is from precipitation infiltrating into and percolating through the waste; groundwater contribution is negligible. **Mitigation:** • Expansion Landfill designed for hydraulic containment (groundwater flow towards the landfill footprint), which prevents the outward movement of leachate. • Continue operation of Leachate Management System to effectively capture, contain, and treat leachate. • Continue leachate monitoring program. • Continue groundwater level monitoring. • Continue operation under Waste and Sewage Environmental Compliance Approvals (ECAs). **No net effects.** No effects to groundwater quantity as the hydraulic trap design is maintained as required under the Waste and Sewage ECAs.		

Groundwater Quality

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Predicted effects, from increased waste quantities disposed within the Expansion Landfill, on the groundwater quality both on-site and off-site	**Sources:** • Increase in landfill cap surface area is expected to generate a greater volume of leachate, thus potentially increasing the probability for impacts to groundwater quality. **Mitigation:** • No change to Expansion Landfill footprint. • Expansion Landfill designed for hydraulic containment (groundwater flow towards the landfill footprint), which prevents the outward movement of leachate. • Continued operation of Leachate Management System to effectively capture, contain, and treat leachate. • Continued leachate monitoring program. • Continued operation under Waste and Sewage Environmental Compliance Approvals (ECAs). **No net effects.** No effects to groundwater quality as the hydraulic trap design is maintained as required under the Waste and Sewage ECAs.		
Predicted Contaminating Lifespan of the Expansion Landfill under the Alternative	**Sources:** • Increase in waste volume will increase the contaminating lifespan (CLS). **Mitigation:** • Continue groundwater monitoring programs. **Net Effect:** CLS increase by 61 years from 102 years for Expansion Landfill to 163 years post-closure.		

On-site Study Area

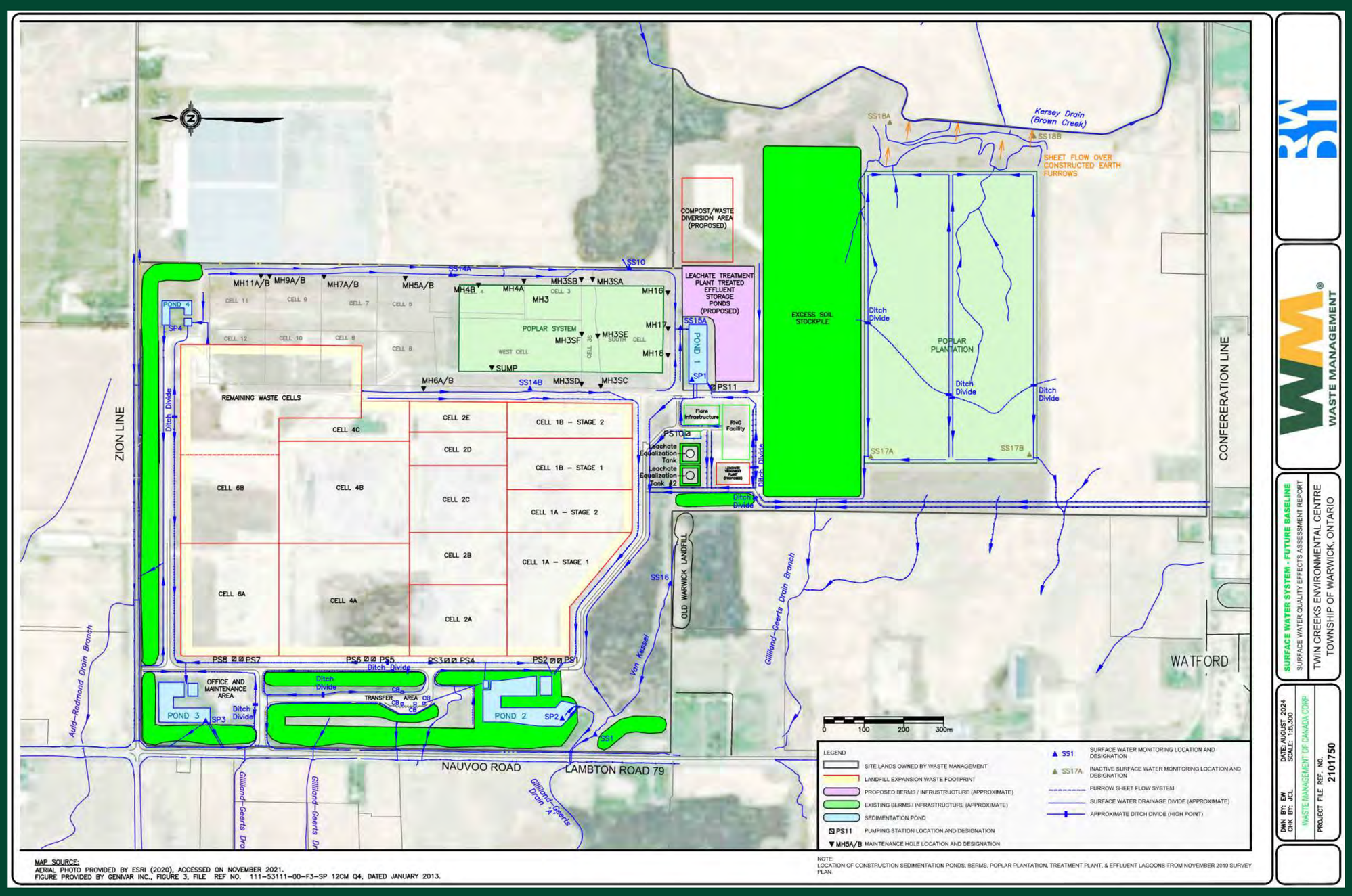


Surface Water Quality Effects Assessment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3

Predicted effects on Surface Water Quality on-site prior to off-site discharge: *Erosional Effects on Total Suspended Solids (TSS) and heavy metal concentrations in surface water*	**Sources:**
	• Precipitation-induced erosion of exposed clayey soil on-site:
	  • Steeper sideslopes
	  • Exposed sideslopes during construction
	  • Larger surface area of the finished landfill cap
	
	Mitigation:
	• Continue to operate and monitor Surface Water Quality in accordance with the Waste and Sewage ECAs.
	• Install/maintain sediment control measures (e.g., straw bale/rock check dams, silt fencing, add vegetative controls, etc.) at various locations within the surface water drainage network.
	• Supplement the northern component of the drainage network with erosion control measures as the landfill expands north prior to initiating the Project.
	• Complete as-required sediment removal where sediment builds up in the surface water drainage network (e.g., at check dams, silt fencing, retention ponds, etc.).
	• Place topsoil and seed over areas of the Expansion Landfill side slopes completed with interim cover, where appropriate (e.g., 2 years).
	• Inspect areas of soil stockpiling for erosion. Where necessary, install erosion control measures (e.g., silt fencing, straw bales, rock check dams, add vegetative controls, etc.) to protect the drainage network from unacceptable sediment loading.
	
	No net effects. Presuming the mitigation measures are implemented and maintained as required, the risk for impacts to Surface Water Quality due to erosional effects will be effectively managed.		

Predicted effects on Surface Water Quality on-site prior to off-site discharge: *Leachate seep impacts to Surface Water Quality*	**Sources:** • Perched leachate conditions may be encountered during interim cap stripping. • Probability of leachate seepage is proportional to the increase in cap surface area and landfill height (e.g., more cap/height, more chances of leachate seepage). **Mitigation:** • Continue to operate and monitor Surface Water Quality in accordance with the Waste and Sewage ECAs. • Seep repairs, when identified, should be implemented immediately and if possible, prior to seepage entering and/or running off landfill sideslopes and into the surface water drainage network. • Routine inspections (e.g., monthly during post-closure) of the landfill surface are expected to provide sufficient frequency to identify and, if necessary, address leachate seepage. **No net effects.** There is no expected net effect to Surface Water Quality from leachate impacts with the implementation of a seepage monitoring and repair program.		
Predicted effects from polyaromatic hydrocarbons (PAHs) in Automobile Shredder Residue (ASR) on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area	**Sources:** • Increased duration of ASR disposal and management at the TCEC. **Mitigation:** • Continue rigorous routine inspection and cleanup of track out ASR. **No net effects.** There is no expected net effect to off-site Surface Water Quality from ASR track out with the continued mitigation.		



Surface Water Drainage Network and Monitoring Stations

Surface Water Quantity Effects Assessment

Sources

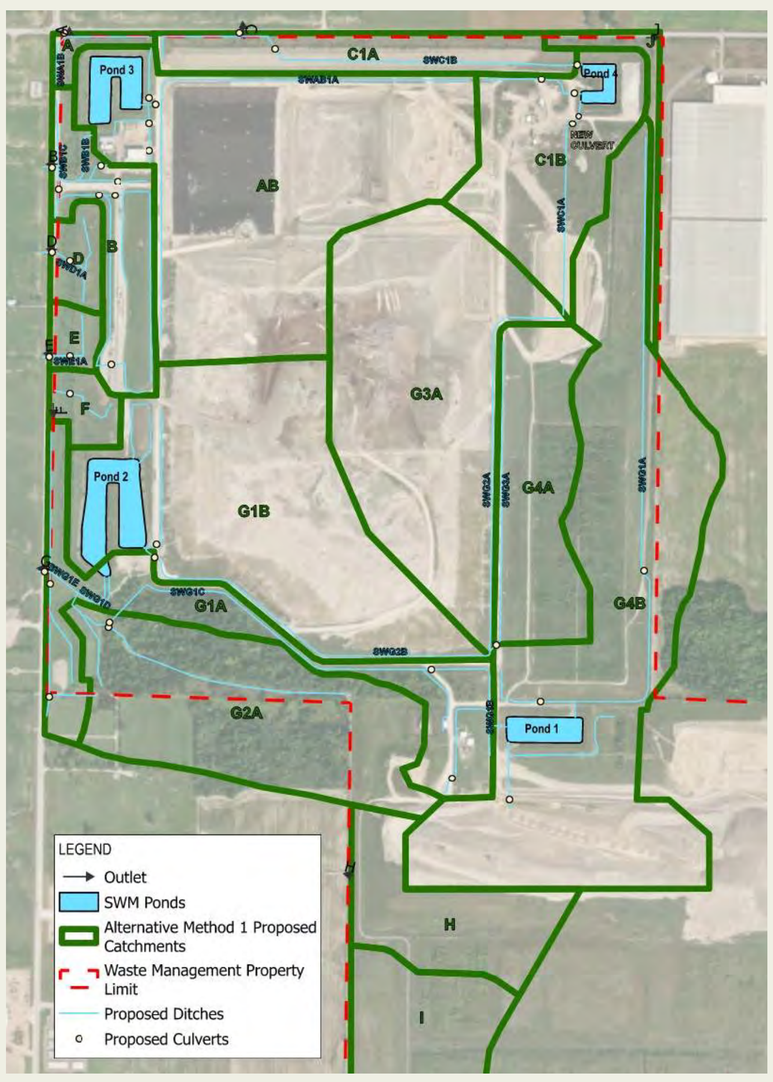
- Changes in catchment areas within the landfill site resulting from new grading for the alternative methods.
- Decrease in time of concentration.
- Timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the site outlets.

Mitigation

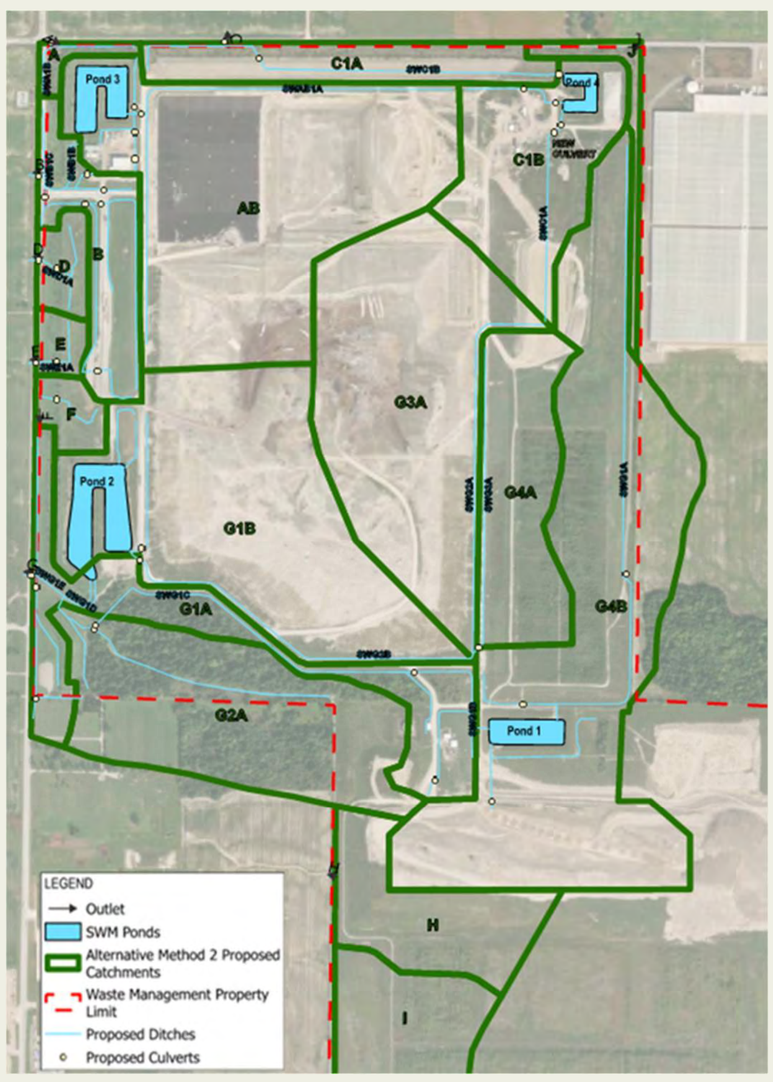
- None required.

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Change in runoff volumes and peak flows resulting from steeper and longer side slopes	• No change in total runoff volume from the landfill site. • Timing of peak flows and redistribution of catchment areas will affect peak flows leaving the outlets. • All four stormwater management ponds on the landfill site have enough capacity to store the 100-year flows and do not require alteration or enlargement. • Changes in peak flows only predicted at four of ten outlets.		
	• Peaking elevation of 324.5 masl. • Increase in peak flows at Outlets A (11%) and G (7%). • Decrease in peak flows at Outlets B (-4%) and C (-18%).	• Lowest peaking elevation at 319 masl. • Increase in peak flows at Outlets A (12%) and G (6%). • Decrease in peak flows at Outlets B (-4%) and C (-17%).	• Highest peaking elevation at 360 masl • Increase in peak flows at Outlets A (10%) and G (6%). • Decrease in peak flows at Outlets B (-4%) and C (-18%).
Changes in drainage areas on-site and off-site	• As a result of the new grading for this alternative method, the catchment delineation within the optimization area on the landfill site will change. • The existing swales around the landfill site are also able to safely convey the 25-year design storm without overtopping. • The relocated swales (SWC1A and SWG2A) and new culvert will also be able to convey the flows appropriately when constructed. • No changes to off-site drainage areas are anticipated because existing off-site drainage areas can accommodate the changes in peak flows from the site outlets.		
	• Changes in catchment areas within the landfill area is between -23% and 37% when compared to existing conditions.	• Changes in catchment areas within the landfill area is between -22% and 34% when compared to existing conditions.	• Changes in catchment areas within the landfill area is between -24% and 36% when compared to existing conditions.
Predicted occurrence and degree of off-site effects to surface water flows	• Downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. • Mitigation is not required as the peak flows are less than 1 m^3/s for Outlets A, B and C and 1.6 m^3/s for Outlet G.		

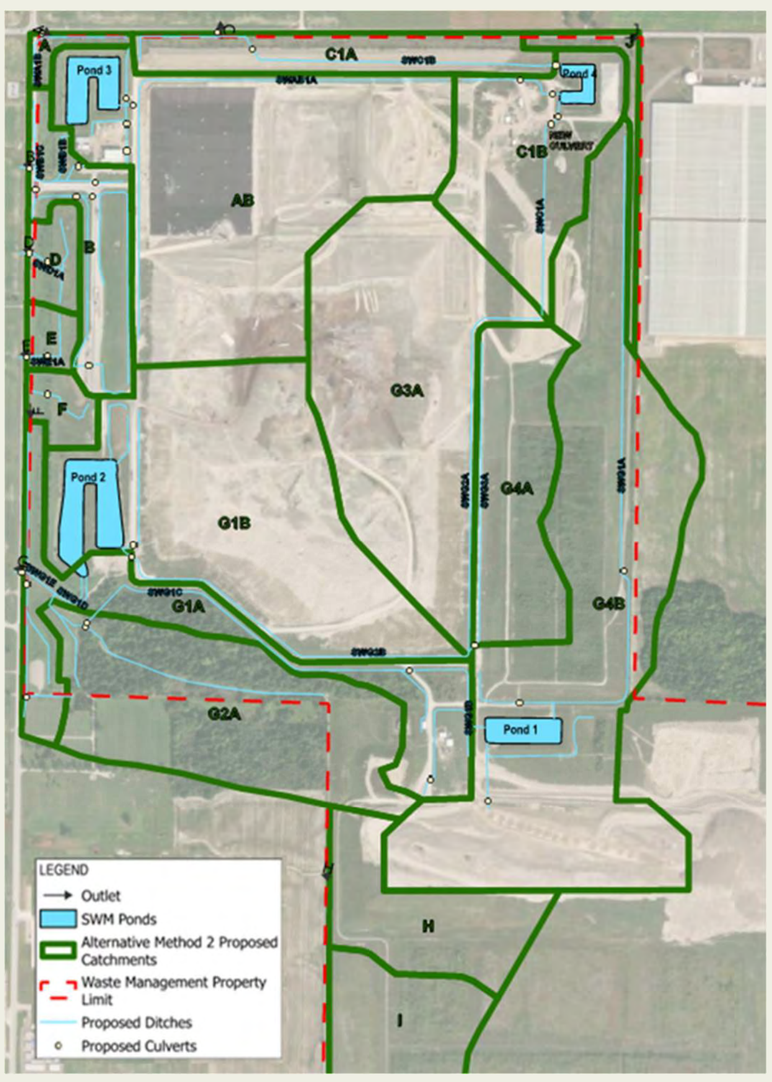
Alternative Method 1



Alternative Method 2



Alternative Method 3



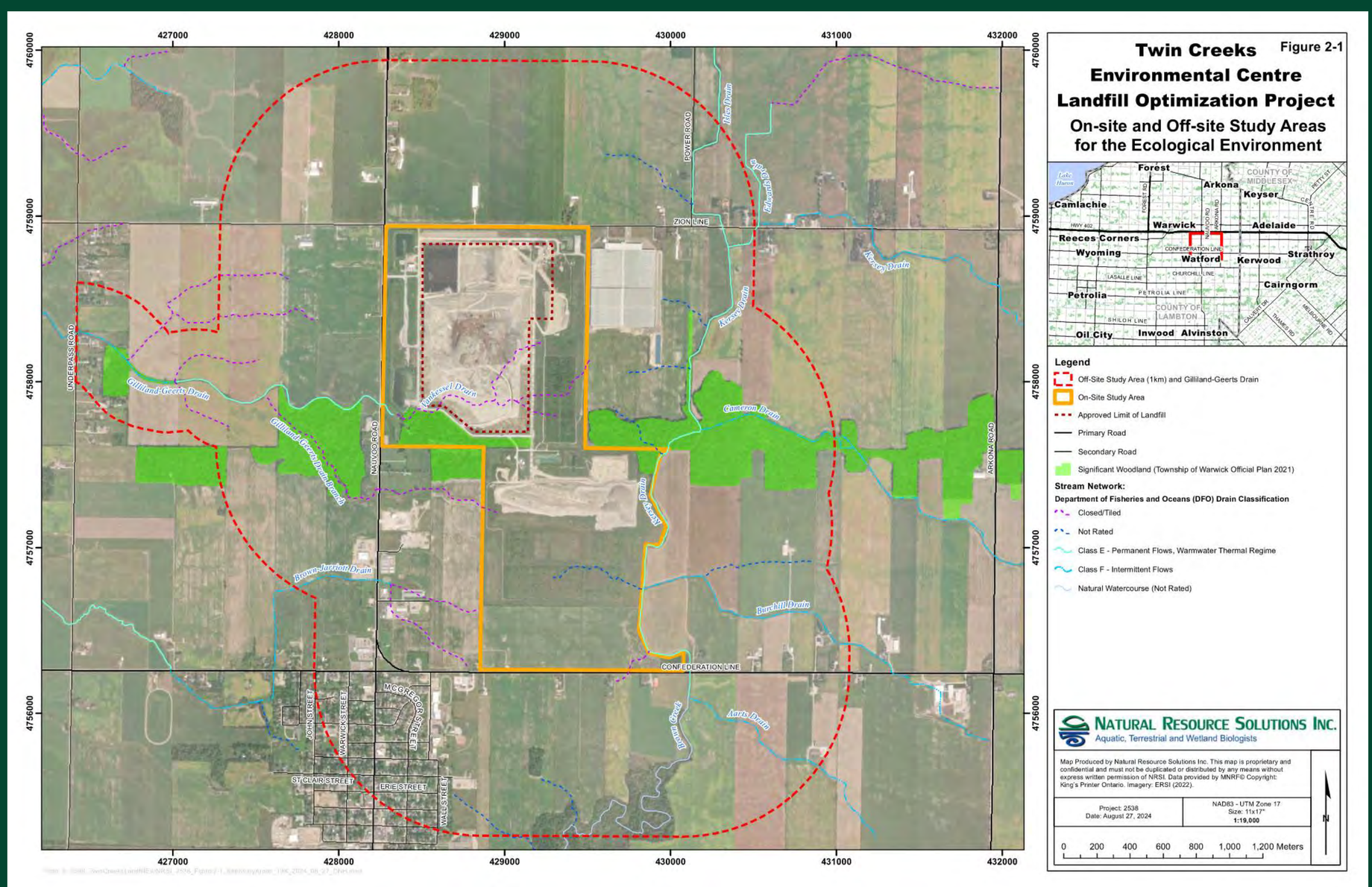
Ecological Environment Effects Assessment

Terrestrial Ecosystems

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Predicted effects on vegetation communities and species including rare, threatened, or endangered species	**Sources:** • Vegetation communities and species can be directly affected through removal. • Vegetation communities and species can be indirectly affected by leachate runoff, landfill gas production, increase in surface water quantity (i.e., flooding), and stormwater runoff (e.g., erosion and sedimentation). **Mitigation:** • No direct disturbance outside of Expansion Landfill footprint. • No changes to the functionality of the management systems in place for leachate runoff, landfill gas production, and stormwater runoff. **No net effects:** • No vegetation communities (including woodlands and wetlands) or rare, threatened or endangered species were identified in the approved limit of the Expansion Landfill. • No indirect effects due to no changes to the functionality of the management systems in place for leachate runoff, landfill gas production, and stormwater runoff.		
Predicted effects on wildlife and wildlife habitat including rare, threatened, or endangered species	**Sources:** • Wildlife and wildlife habitat can be directly affected through habitat removal. • Wildlife and wildlife habitat can be indirectly affected by leachate runoff, landfill gas production, increase in surface water quantity (i.e., flooding), and stormwater runoff (e.g., erosion and sedimentation). **Mitigation:** • No direct disturbance outside of Expansion Landfill footprint. • No changes to the functionality of the management systems in place for leachate runoff, landfill gas production, and stormwater runoff. • Continue implementation of gull management using acoustic deterrent devices and birds of prey. • Implement noise mitigation. **No direct net effects.** No wildlife habitat (including significant wildlife habitat) or rare, threatened or endangered species were identified in the approved limit of the Expansion Landfill. **Indirect net effects:** • Minimal indirect effect to wildlife due to increased noise. • Prolonged attractiveness of the area for avifaunal scavengers, although overall use of landfill by avifaunal scavengers is low.		

Aquatic Ecosystems

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Predicted effects on aquatic habitat, including fish habitat	**Sources:** • Aquatic habitat and biota can be directly affected through removal. • Aquatic habitat and biota can be indirectly affected by leachate runoff, landfill gas production, increase in surface water quantity (i.e., flooding), and stormwater runoff (e.g., erosion and sedimentation). **Mitigation:** • No direct disturbance outside of Expansion Landfill footprint. • No changes to the functionality of the management systems in place for leachate runoff, landfill gas production, and stormwater runoff. **No net effects:** • No aquatic habitat and biota, including rare, threatened, or endangered species were identified within the approved limit of the Expansion Landfill. • No indirect effects due to no changes to the functionality of the management systems in place for leachate runoff, landfill gas production, and stormwater runoff.		
Predicted effects on aquatic biota including rare, threatened, or endangered species			



Visual Effects Assessment

Magnitude of Visual Change

1. Visible landfill area
2. Distance to the Landfill Optimization site
3. Horizontal angle of view
4. Visual Absorption Capacity Factor (VACF)

Combined Effect Value (CEV) = ∑ 4 Factors

Combined Effect Values and Relative Visual Effect Levels

Combined Effect Value Scale	Visual Effect
13 – 20	High Effect
9 – 12	Moderate Effect
4 - 8	Low Effect
0 - 4	No Effect

1. Perceived Visible Area and Relative Effect Levels

Perceived Area Index	Effect Level	Value
>23.0	Very high	5
18.1 – 23.0	High	4
13.1 – 18.0	Moderate	3
7.51 – 13.0	Low	2
0 – 7.5	Very low	1

2. Distance in Relation to Relative Effect Levels

Distance in Metres	Effect Level	Value
0 – 600	Very high	5
601 – 800	High	4
801 – 1500	Moderate	3
1501 – 2200	Low	2
2201 - 3500	Very low	1

3. Horizontal Angle of View and Relative Effect Levels

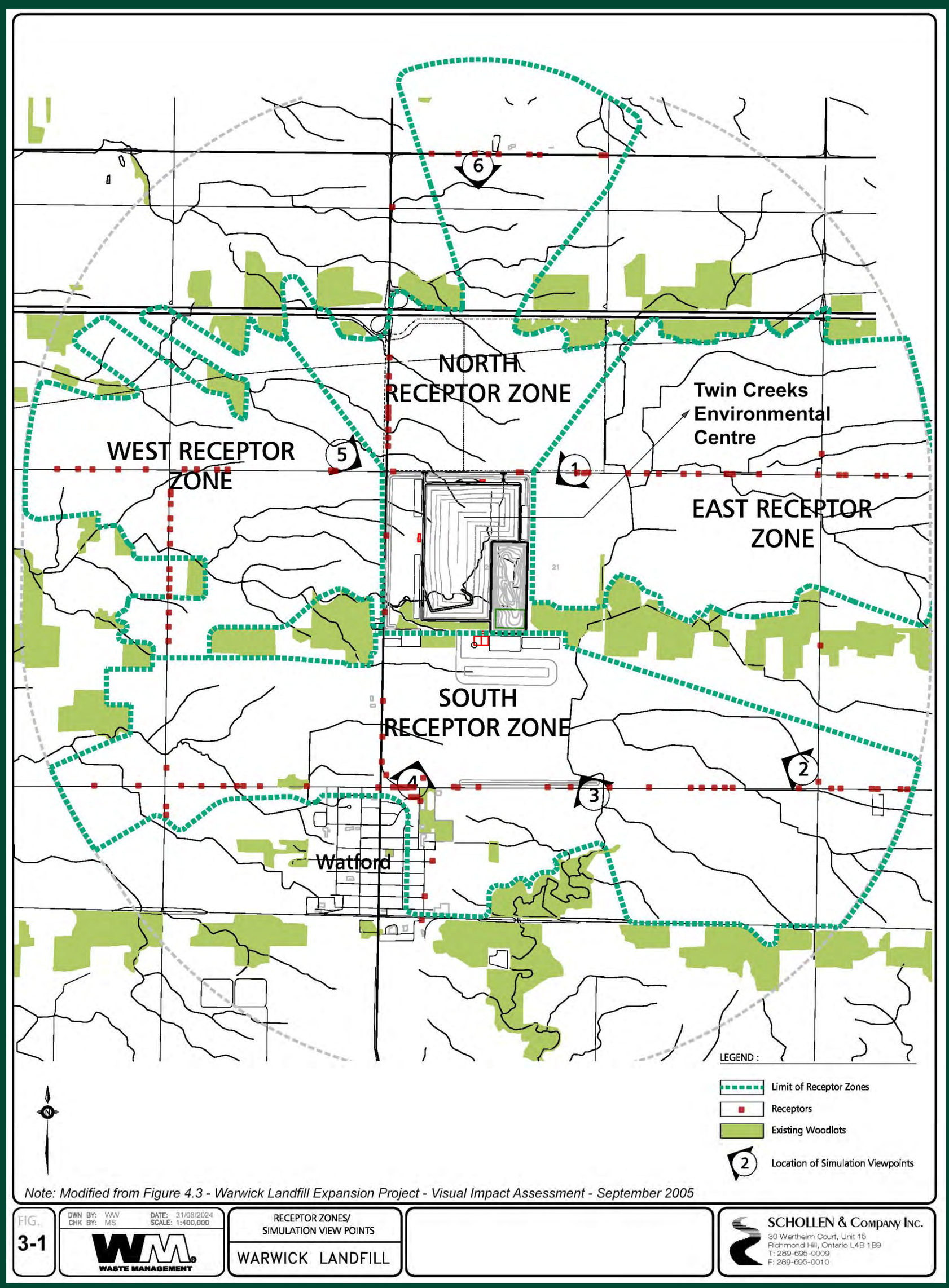
Horizontal Angle of View	Effect Level	Value
>90°	Very high	5
50° - 90°	High	4
31° - 50°	Moderate	3
16° - 30°	Low	2
0° - 15°	Very low	1

4. VACF and Relative Effect Levels

Range	Description	Effect Level	Value
≤ 1.2	Very low VACF	Very high	5
1.21 – 2.4	Low VACF	High	4
2.41 – 3.6	Moderate VACF	Moderate	3
3.61 – 4.8	High VACF	Low	2
4.81 – 6.0	Very high VACF	Very low	1

Viewpoint Locations

- Six (6) viewpoint locations in four receptor zones
- Limit of Receptor Zone corresponds to the viewshed of the approved Expansion Landfill



Visual Effects – Alternative Method 1

Viewpoint 1
Visible Landfill Area = 41,688 m², index 59.6; effect value = 5.
Distance = 700 m; effect value = 4.
Horizontal Angle of View = 40°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 2
Visible Landfill Area = 40,413 m², index 13.6; effect value = 3.
Distance = 2,972 m; effect value = 1.
Horizontal Angle of View = 15°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 10; moderate effect.

Viewpoint 3
Visible Landfill Area = 41,215 m², index 25.4; effect value = 5.
Distance = 1,621 m; effect value = 2.
Horizontal Angle of View = 20°; effect value = 2.
VACF = 1; effect value = 5.
CEV = 14; high effect.

Viewpoint 4
Visible Landfill Area = 20,949 m², index 15.1; effect value = 3.
Distance = 1,387 m; effect value = 3.
Horizontal Angle of View = 14°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 12; moderate effect.

Viewpoint 5
Visible Landfill Area = 39,471 m², index 55.8; effect value = 5.
Distance = 707 m; effect value = 4.
Horizontal Angle of View = 40°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 6
Visible Landfill Area = 19,259 m², index 6.8; effect value = 1.
Distance = 2,820 m; effect value = 1.
Horizontal Angle of View = 11°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 8; low effect.

Total Effect:

- 3 high
- 2 moderate
- 1 low

Total CEV by Effect:

- High = 48
- Moderate = 22
- Low = 8

Total CEV = 78

Visual Effects – Alternative Method 2

Viewpoint 1
Visible Landfill Area = 41,722 m², index 59.6; effect value = 5.
Distance = 700 m; effect value = 4.
Horizontal Angle of View = 41°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 2
Visible Landfill Area = 37,097 m², index 12.5; effect value = 2.
Distance = 2,972 m; effect value = 1.
Horizontal Angle of View = 15°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 9; moderate effect.

Viewpoint 3
Visible Landfill Area = 40,586 m², index 25.0; effect value = 5.
Distance = 1,621 m; effect value = 2.
Horizontal Angle of View = 21°; effect value = 2.
VACF = 1; effect value = 5.
CEV = 14; high effect.

Viewpoint 4
Visible Landfill Area = 21,000 m², index 15.1; effect value = 3.
Distance = 1,387 m; effect value = 3.
Horizontal Angle of View = 15°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 12; moderate effect.

Viewpoint 5
Visible Landfill Area = 40,051 m², index 56.6; effect value = 5.
Distance = 707 m; effect value = 4.
Horizontal Angle of View = 41°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 6
Visible Landfill Area = 19,228 m², index 6.8; effect value = 1.
Distance = 2,820 m; effect value = 1.
Horizontal Angle of View = 11°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 8; low effect.

Total Effect:

- 3 high
- 2 moderate
- 1 low

Total CEV by Effect:

- High = 48
- Moderate = 21
- Low = 8

Total CEV = 77

Visual Effects – Alternative Method 3

Viewpoint 1
Visible Landfill Area = 63,950 m², index 91.4; effect value = 5.
Distance = 700 m; effect value = 4.
Horizontal Angle of View = 41°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 2
Visible Landfill Area = 57,893 m², index 19.5; effect value = 4.
Distance = 2,972 m; effect value = 1.
Horizontal Angle of View = 15°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 11; moderate effect.

Viewpoint 3
Visible Landfill Area = 61,476 m², index 37.9; effect value = 5.
Distance = 1,621 m; effect value = 2.
Horizontal Angle of View = 21°; effect value = 2.
VACF = 1; effect value = 5.
CEV = 14; high effect.

Viewpoint 4
Visible Landfill Area = 29,546 m², index 21.3; effect value = 4.
Distance = 1,387 m; effect value = 3.
Horizontal Angle of View = 15°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 13; high effect.

Viewpoint 5
Visible Landfill Area = 60,574 m², index 85.7; effect value = 5.
Distance = 707 m; effect value = 4.
Horizontal Angle of View = 41°; effect value = 3.
VACF = 1; effect value = 5.
CEV = 17; high effect.

Viewpoint 6
Visible Landfill Area = 26,943 m², index 9.6; effect value = 2.
Distance = 2,820 m; effect value = 1.
Horizontal Angle of View = 11°; effect value = 1.
VACF = 1; effect value = 5.
CEV = 9; moderate effect.

Total Effect:

- 4 high
- 2 moderate
- 0 low

Total CEV by Effect:

- High = 61
- Moderate = 20
- Low = 0

Total CEV = 81

Socio-Economic Environment Effects Assessment

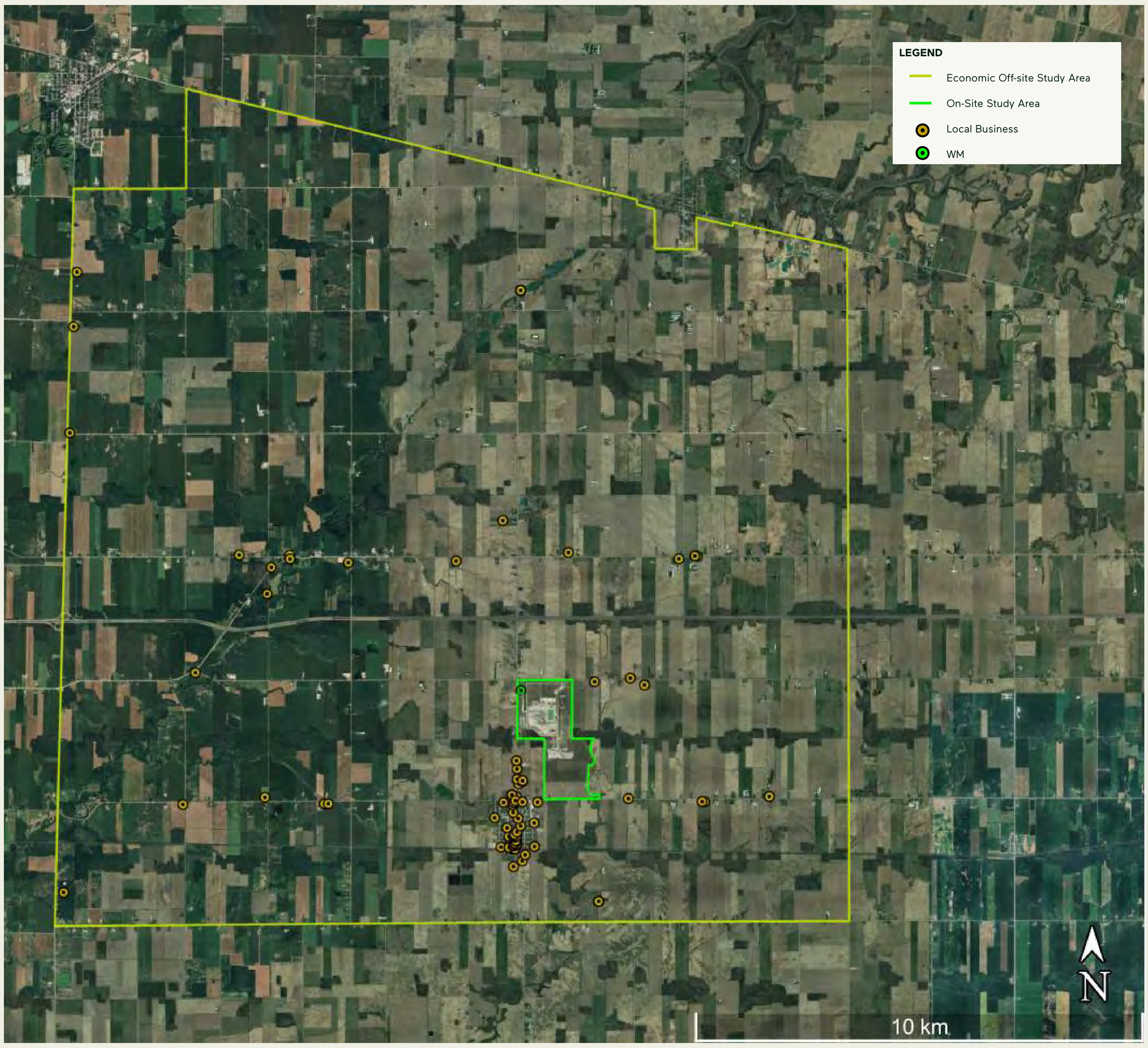
Social Environment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Number of Residents and Residences (e.g., receptors)	**Sources:** • Changes to employment at site. • Land acquisition. **Mitigation:** • None required. **No net effects:** • No changes to number of site employees. • Landfill optimization will occur within the Expansion Landfill footprint on the TCEC site.		
Number and Type of Local Businesses	**Sources:** • Displacement of business operations. • Changes to procurement. **Mitigation:** • Landfill optimization will occur within the Expansion Landfill footprint on the TCEC site. **No net effects:** • No displacement of business operations. • No anticipated changes to procurement other than increased duration.		
Nuisance Effects (litter, dust, noise, odour, traffic, visual)	**Sources:** • Disturbance from noise, dust, odour, litter, changes in traffic, and changes to the visual landscape. **Mitigation:** • Odour Best Management Practices Plan (BMPP); Litter BMPP; Dust BMPP; visual screening, Property Value Protection plan. **Net effects:** • **No net effects** from litter, dust, noise, and traffic. • Predicted odour concentrations may exceed criteria at discrete receptor locations and the frequency of odour levels above defined odour benchmarks may increase.		
	• Visual CEV of 78, with 3 high CEV viewpoints, 2 moderate CEV viewpoints, and 1 low CEV viewpoint.	• Visual CEV of 77, with 3 high CEV viewpoints, 2 moderate CEV viewpoints, and 1 low CEV viewpoint.	• Visual CEV of 81, with 4 high CEV viewpoints and 2 moderate CEV viewpoints.
Predicted Changes to Use and Enjoyment of Property	**Sources:** • Changes to buffer zones. • Restrictions on current and planned land uses. • Nuisance effects. **Mitigation:** • Odour BMPP. • No changes to buffer zones; no restrictions on currently existing and planned land uses. **Net effects:** • Minor changes to use and enjoyment of property are anticipated due to increased odour at recreational areas located south of the landfill.		
Level of Satisfaction with Living/Working in the Community	**Sources:** • Nuisance effects. **Mitigation:** • Odour Best Management Practices Plan (BMPP); Litter BMPP; Dust BMPP; visual screening. **Net effects:** • Minor changes in the level of satisfaction with living and working in the community due to increased odour and changes to the visual landscape.		
Confidence in TCEC Operations	**Sources:** • Nuisance effects. **Mitigation:** • Odour Best Management Practices Plan (BMPP); Litter BMPP; Dust BMPP; visual screening. • No changes to operating hours, haul routes, or equipment. • Warwick Public Liaison Committee (WPLC), the Township's Technical Review Team (TRT), and the MECP will continue their activities. **No net effects.**		

Socio-Economic Environment Effects Assessment

Economic Environment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Employment at site (number, type, duration)	**Sources:** • Change in number of employment positions at the TCEC. **Mitigation:** • None required. **Net Effects:** • Existing 33 stable employment positions will continue for an additional 12 years.		
Contributions to the host community	**Sources:** • Changes to host community contributions. **Mitigation:** • None required. **Net Effects:** • Based on the average annual contributions, estimated at approximately $4.1M (39% of Township's total annual revenue), host community payments to the Township of Warwick for the duration of the Project are estimated to amount to approximately $49M.		
Opportunities for the provision and procurement of products and/or services	**Sources:** • Changes to provision and procurement of products and/or services. **Mitigation:** • None required. **Net Effects:** • Based on a conservative annual average of $2.2M in local expenditures, an estimated $27M will be contributed to the local economy (Watford and Township of Warwick) over the duration of the Project. • Operation of the RNG Facility at the TCEC to supply renewable natural gas to the gas network during landfill operations.		



Economic Off-site Study Area (Township of Warwick) and Local Businesses

Human Health Effects Assessment

Sources

- Landfill gas (LFG) as a result of naturally decaying waste.
- Combustion gases and products of incomplete combustion (PIC) from flaring LFG.
- Dust, including total suspended particulate (TSP) and fine particulate matter (i.e., PM_{10} and $PM_{2.5}$) from truck traffic on paved and unpaved roads and earthworks activities.
- Metals and PICs from the leachate incineration treatment option.

Changes from 2005 Human Health Risk Assessment

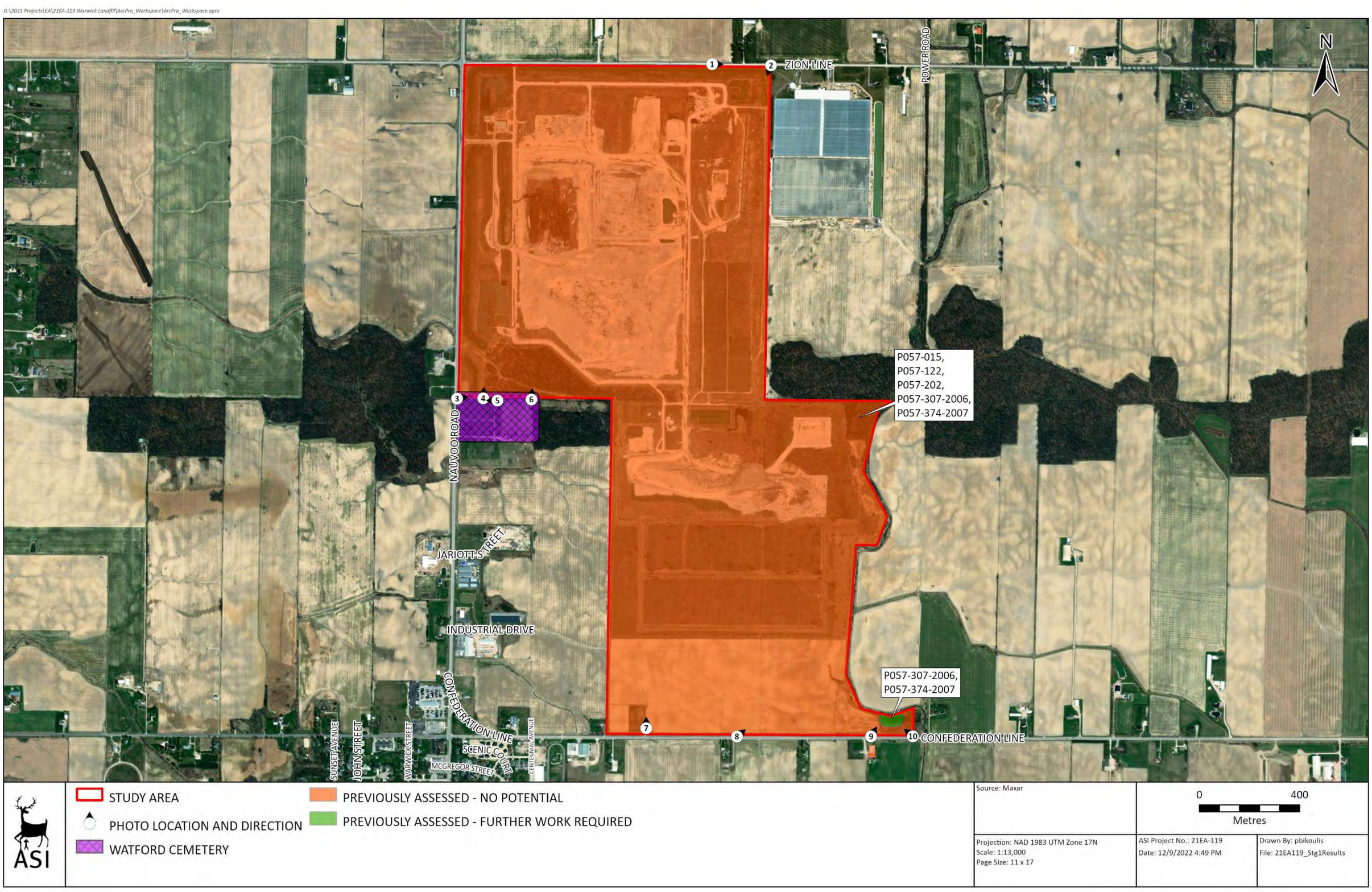
- The predicted concentrations of Contaminants of Concern (COCs) for the year 2020 from the 2005 HHRA were compared to the data from the 2019, 2020, 2021, 2022, and 2023 Annual Monitoring Reports and the Preferred Alternative.
- Several COCs were not listed in the Annual Monitoring datasets as many are not included in standard monitoring programs and were therefore modelled.
- Scaling factors were applied to modelling results for contaminants that were not VOCs or tailpipe contaminants to estimate potential concentrations.
- A toxicological literature review of exposure limits for COCs in the 2005 HHRA and exposure limits for new COCs was completed.
- Exposure limits used in the 2005 HHRA were compared to current exposure limits to determine if there was a reduction in risk, an increase in risk, or no change in risk.
- Current risks were predicted using the current exposure limits and determine the impact on previous risk estimations.
- The only new COC to be flagged as a potential risk based on the modelled emissions for the 2005 HHRA was H_2S due to an increase in inhalation risk estimate. The regulatory value (24-hour AAQC) changed from 150 µg/m³ to 7 µg/m³.

Indicator	Alternative Method 2 (Preferred Alternative)
• Predicted acute and chronic health-based concentration ratios arising from air concentrations of **particulate matter (dust) and related metals** at identified sensitive receptor locations within the Study Area. • Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors.	• Measured concentrations of cadmium, lead, and nickel from the Annual Monitoring Reports were greater than predicted emissions for ground-level air from the 2005 HHRA. • Predicted concentrations of PM_{10} for the Preferred Alternative were greater than predicted emissions for ground-level air from the 2005 HHRA. • However, when these chemicals were evaluated regarding these higher concentrations with respect to the margin of safety, the predicted risk for all of the chemicals were still orders of magnitude below the health-based benchmark. • No exceedances were predicted on an annual average basis for either PM_{10} or $PM_{2.5}$. The degree of, and frequency of exceedance over the PM guidelines for 24-hr time frames for $PM_{2.5}$ were predicted to be extremely small (less than 1.3x the guidelines for <1 day/year in Year 6) and were restricted to only a very small area near the facility. The degree of, and frequency of, exceedance over guidelines for 24-hr time frames for PM_{10} was slightly greater than those predicted for $PM_{2.5}$, but still not considered to represent a health concern due to the characteristics of the PM present at the TCEC. **Mitigation:** • The TCEC has a Dust Best Management Practices Plan (BMPP) that is implemented at the site and will be in effect during Alternative Method 2. • Through the combined efforts of the mitigation measures and implementation of the Dust BMPP, the number of TSP exceedances will be limited during the periods of heavy construction and beyond. **No net effects.**
• Predicted acute and chronic health-based concentration ratios arising from air concentrations of **gaseous contaminants** at identified sensitive receptor locations within the Study Area. • Frequency of any exceedance of applicable standards, limits, or guidelines at identified receptors.	• Predicted concentrations of 1,1-dichloroethane, butan-2-ol, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,1-dichloroethylene, mercuric chloride, methyl mercury, methyl mercaptan, bromodichloromethane, octane, dimethyl sulphide, ethyl mercaptan, chloroethane, hydrogen chloride, benzo(a)pyrene, carbon dioxide, and carbon monoxide for the Preferred Alternative were greater than the predicted emissions for ground-level air from the 2005 HHRA. • Additionally, measured concentrations of benzene, 1,2-dichloroethane, trichloroethylene, and vinyl chloride from the Annual Monitoring Reports were greater than the predicted emissions for ground-level air from the 2005 HHRA. • However, when these chemicals were evaluated as to what these higher concentrations may mean with respect to the margin of safety indicated in the 2005 HHRA, the predicted risk for all chemicals under the Preferred Alternative was still orders of magnitude below the health-based benchmarks. • H_2S was flagged as a potential risk based on the modelled emissions for the 2005 HHRA due to an increase in inhalation risk estimate of about 21-fold. This resulted in a worst-case predicted concentration that is slightly higher than 3x above the 24-hour AAQC (regulatory value changed from 150 to 7 µg/m³). **Mitigation:** • Recommended that polycyclic aromatic hydrocarbons, using benzo(a)pyrene as a surrogate, be added to the suite of chemicals being monitored in future air quality sampling events. • Emissions of LFG should continue to be managed by routine maintenance of the final cap and interim cover areas. **Net Effects:** • Risks associated with bromodichloromethane, 1,1,2,2-trichloroethane and vinyl chloride are anticipated to be minimal. • No measurable long-term or short-term adverse health impacts were predicted to occur as a result of exposure to LFG combustion emissions, with the exception of worst-case H_2S concentrations.

Archaeological Resources Effects Assessment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Archaeological resources on-site and predicted impacts on them	**Sources:** • Archaeological resources can be affected through direct disturbance from construction and operations. **Mitigation:** • Landfill expansion will only be occurring within the approved Expansion Landfill footprint within the On-site Study Area. • Archaeological Site AfHl-14 has further cultural heritage value or interest and has been protected in perpetuity with the establishment of a protective 10 metre buffer and surrounding conservation area. **No net effects.** There is no potential for the disturbance of unassessed or documented archaeological resources.		
Cemetery property within approximately 10 metres of the proposed impacts	**Sources:** • Cemetery properties can be affected through direct disturbance from construction and operations. **Mitigation:** • Landfill expansion will only be occurring within the approved Expansion Landfill footprint within the On-site Study Area. **No net effects.** There is no potential for the disturbance of the adjacent Watford Cemetery property.		

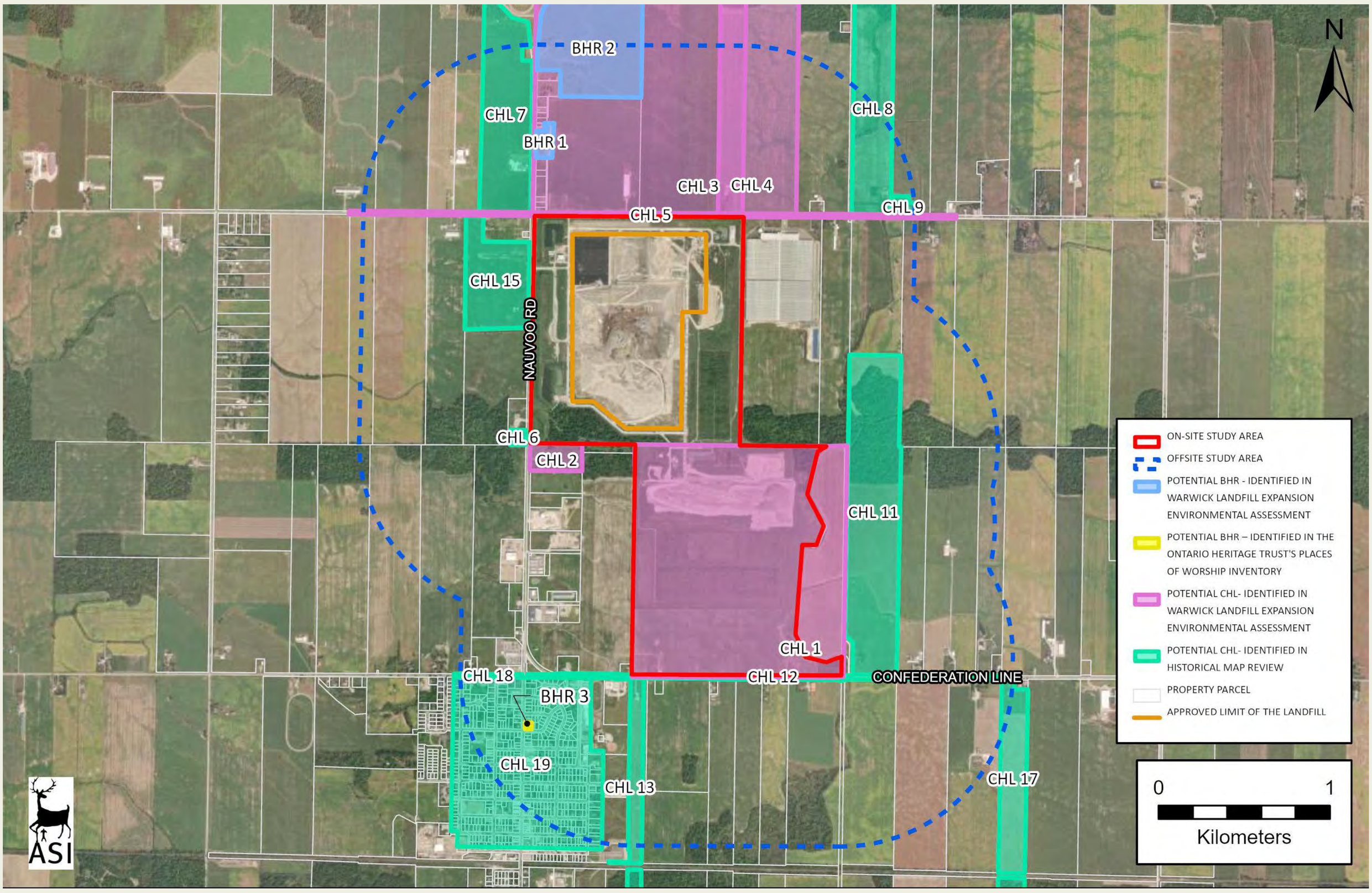
Archaeological Resources Existing Conditions



Cultural Heritage Resources Effects Assessment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Proximity of known or potential cultural heritage resources to the landfill (known/potential built heritage resources and cultural heritage landscapes): *Direct Impacts*	**Sources:** • Direct impacts may include: the destruction of any, or part of any, significant heritage attributes or features; and alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance. **Mitigation:** • The landfill expansion will occur within the existing approved Expansion Landfill footprint. **No net effects.** No direct net effects to the heritage attributes of identified Built Heritage Resources (BHRs) and Cultural Heritage Landscapes (CHLs). CHL 1 has already undergone considerable alterations and is no longer representative of the historical agricultural use.		
Proximity of known or potential cultural heritage resources to the landfill (known/potential built heritage resources and cultural heritage landscapes): *Indirect Impacts*	**Sources:** • Indirect impacts may include: shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden; and isolation of a heritage attribute from its surrounding environment, context or a significant relationship; direct or indirect obstruction of significant views or vistas within, from, or of built and natural features; a change in land use such as rezoning to allow new development or site alteration to fill in the formerly open spaces; and land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a resource. **Mitigation:** • None required. **No net effects.** Indirect impacts to CHL 5 (Zion Line) include changes to the viewscapes over agricultural fields from the roadway; however, these indirect impacts are not anticipated to adversely affect the heritage attributes of the CHL.		

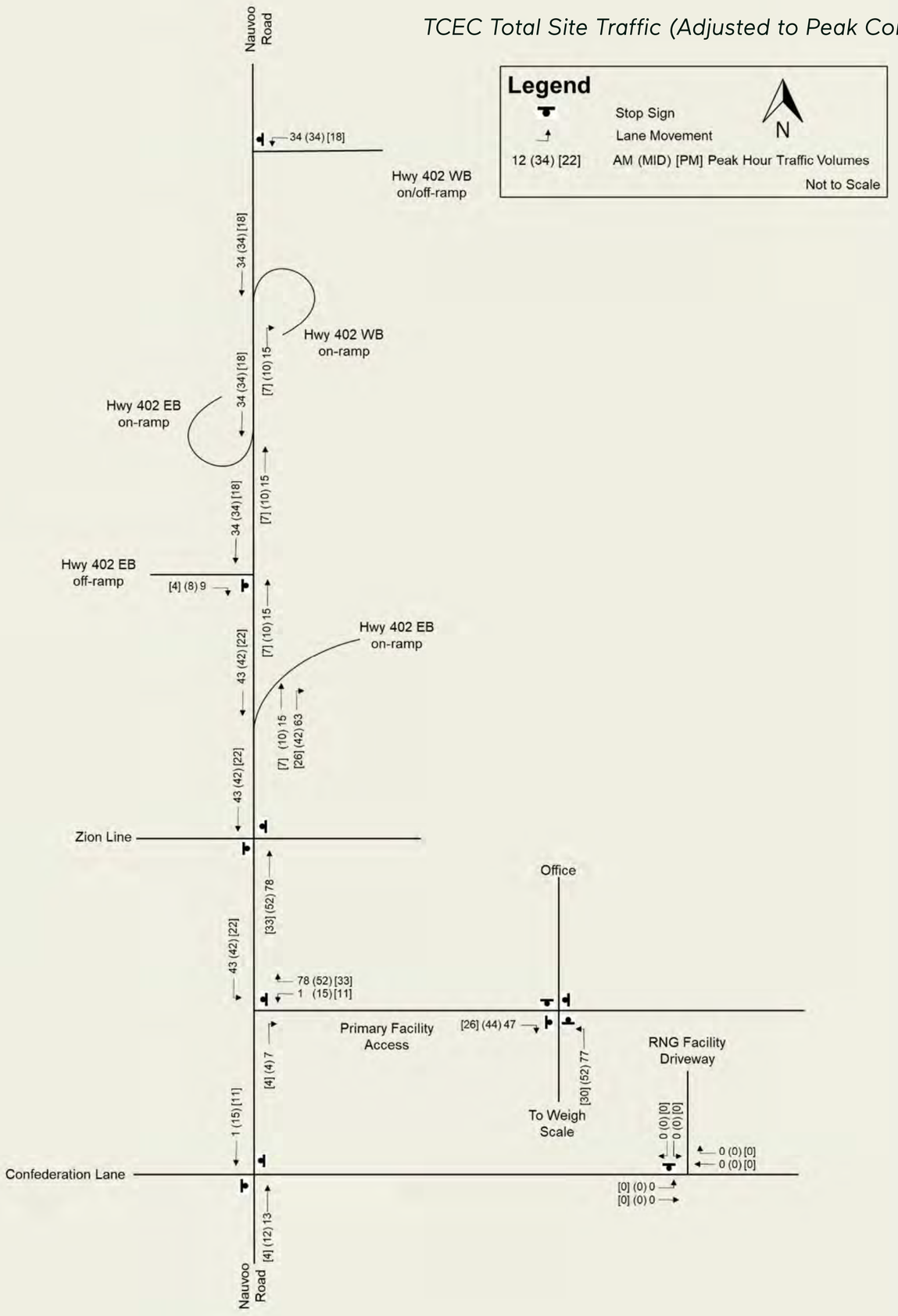
Study Areas for Cultural Heritage Resources



Transportation Effects Assessment

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Change in peak hour and daily truck traffic volume and Average Annual Daily Traffic (AADT) along the Off-site Study Area road segments	**No net effects.** • The TCEC site traffic will not change under 2032 and 2043 future conditions and thus will have no additional effect to the surrounding transportation network traffic volumes. • The growth of traffic volume within the Off-site Study Area is attributed to background growth and background developments.		
Intersection performance for the Off-site Study Area intersections	**No net effects.** • Compared with background conditions, total traffic operations demonstrate that there will be minimal impacts to operations as a result of site traffic during the weekday AM, mid-day, and PM peak hours. • There are nominal increases to the volume to capacity ratios, however, these increases are small, and all movements are expected to continue operating within acceptable thresholds. • TCEC site traffic is anticipated to have a negligible impact on queues at all Off-site Study Area intersections except at the TCEC site entrance. Inbound queues are expected to be accommodated within the site, and southbound left-turn queues are expected to remain within the available storage even under peak conditions.		
Road safety • Collisions per million vehicles at all Off-site Study Area intersections (severity, involving pedestrians, cyclists, autos, trucks, school buses, and agricultural vehicles) • Collisions per million vehicle-km along all Off-site Study Area road segments (severity, involving pedestrians, cyclists, autos, trucks, school buses, and agricultural vehicles) • Collisions by environmental conditions for segments and intersections	**No net effects.** • Collision rates are not expected to change as a result of the TCEC site optimization, compared with existing conditions. • No relationship identified between truck traffic generated by the TCEC and collisions occurring within the Off-site Study Area. • Background traffic volumes are expected to increase, which may affect collision rates, but this is not expected to be related to the TCEC optimization.		
Sight distance at the primary site entrance	**No net effects.** • The TCEC site entrance on Nauvoo Road is expected to remain unchanged from existing conditions. • Sight distances at the driveway are adequate and there are no apparent concerns with the driveway function, and this will remain the same under future conditions.		

TCEC Total Site Traffic (Adjusted to Peak Conditions)



TCEC Driveway at Nauvoo Road Looking North

TCEC Driveway at Nauvoo Road Looking South

Land Use Effects Assessment

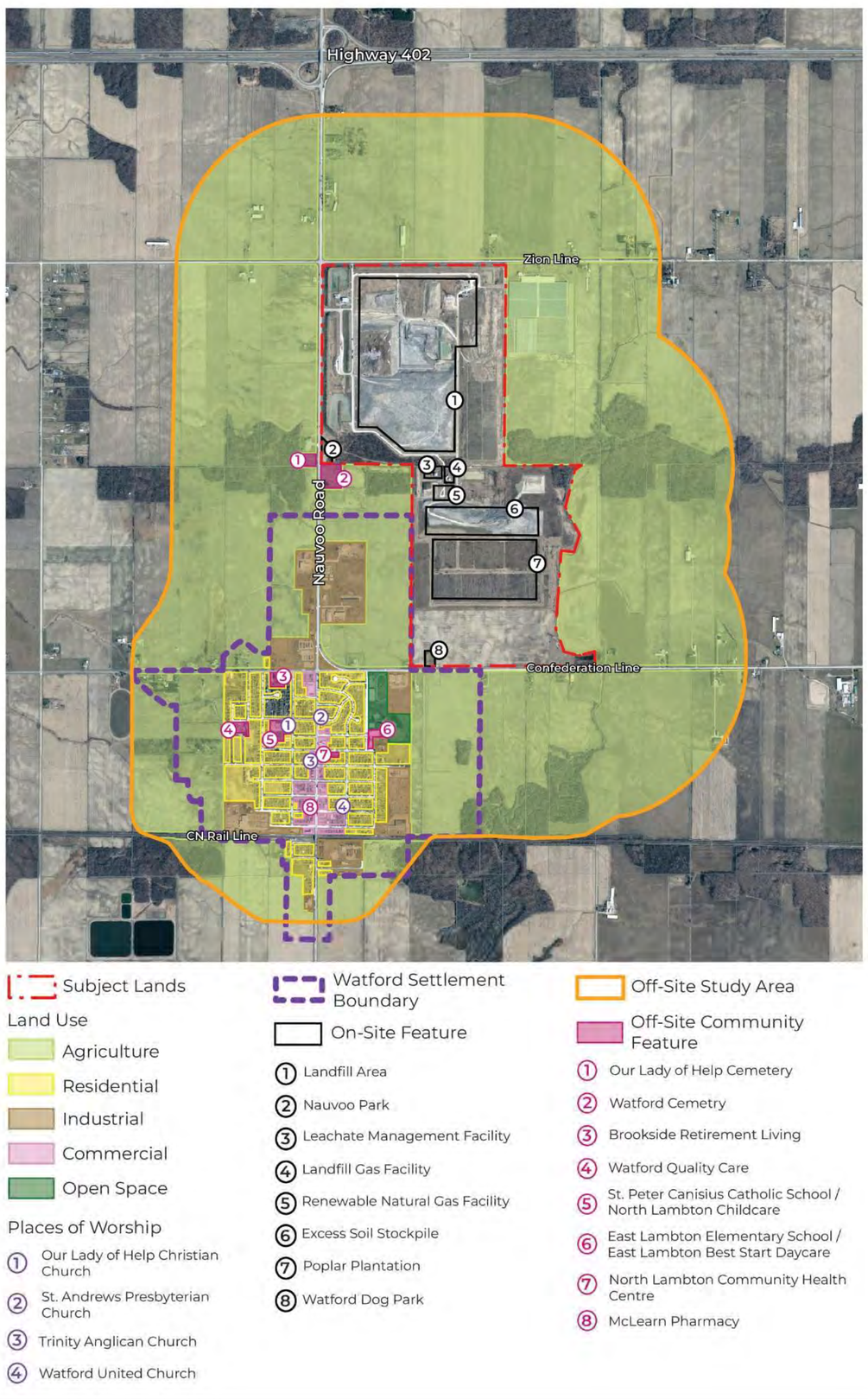
Sources

- Land uses within 500 m of a landfill fill area are subject to consultation with the Province before a *Planning Act* approval is granted.
- The Ministry of Environment, Conservation and Parks (MECP) considers the most significant contaminant discharges and visual problems to be normally within 500 m of the perimeter of a landfill fill area.

Mitigation

- TCEC footprint will not change, so existing setback distances between the landfill and residences will be maintained.
- Proactive nuisance controls will continue to be employed by WM to minimize nuisance effects related to odour, litter, dust, noise, and birds on the surrounding environment.

Indicator	Alternative Method 1	Alternative Method 2	Alternative Method 3
Current land use	• **No significant net effects** anticipated between the TCEC operation and any current land uses; setback distances are maintained. Legally established existing land uses (considered sensitive) within 500 m of the landfill site are permitted to exist (pursuant to Section 34(9) of the *Planning Act*) • **No net effects** anticipated with respect to nuisance effects associated with the TCEC operation with employed nuisance controls.		
Planned land use	• **No significant net effects** anticipated between the TCEC operation and any planned land uses; setback distances are maintained. • **No net effects** anticipated with respect to nuisance effects associated with the TCEC operation with employed nuisance controls.		
Type(s) and proximity of off-site recreational resources within 1 km of a landfill footprint potentially affected	• **No significant net effects** anticipated between the TCEC operation and any off-site recreational resources; setback distances are maintained. Legally established existing off-site recreational resources (considered sensitive) within 500 m of the landfill site are permitted to exist (pursuant to Section 34(9) of the *Planning Act*) • **No net effects** anticipated with respect to nuisance effects associated with the TCEC operation with employed nuisance controls.		
Type(s) and proximity of off-site sensitive land uses as defined by the Provincial Policy Statement and the MECP D-1 Guidelines within 1 km of a landfill footprint potentially affected	• **No significant net effects** anticipated between the TCEC operation and any sensitive land use; setback distances are maintained. Existing sensitive land use (considered sensitive) within 500 m of the landfill site are permitted to exist (pursuant to Section 34(9) of the *Planning Act*) • **No net effects** anticipated with respect to nuisance effects associated with the TCEC operation with employed nuisance controls.		
Type(s) and proximity of agricultural land use/operations	• **No significant net effects** anticipated between the TCEC operation and any existing and operating agricultural land use; setback distances are maintained. Legally established existing operating agricultural land uses within 500 m of the landfill site are permitted to exist (pursuant to Section 34(9) of the *Planning Act*) • **No net effects** anticipated with respect to nuisance effects associated with the TCEC operation with employed nuisance controls.		



Existing On-site and Off-site Land Uses

Comparative Evaluation of Alternative Methods

Environmental Aspect/Component	Evaluation Criteria	Alternative Method 1	Alternative Method 2	Alternative Method 3
Natural Environment				
Atmospheric Environment		**Alternative Method 1 is not preferred**		
	Air Quality	No substantial difference	No substantial difference	No substantial difference
	Odour	No substantial difference	No substantial difference	No substantial difference
	Noise	✘ Not Preferred. Alternative Method 1 may have greater potential offsite noise impacts as landfill operations will be nearer PORs.	No substantial difference	No substantial difference
Geology & Hydrogeology		**No substantial difference**		
	Groundwater Quality	No substantial difference	No substantial difference	No substantial difference
	Groundwater Quantity	No substantial difference	No substantial difference	No substantial difference
Surface Water Environment		**Alternative Method 2 is preferred**		
	Surface Water Quality	No substantial difference	No substantial difference	No substantial difference
	Surface Water Quantity	✘ Not Preferred	✓ Preferred Lowest peaking elevation when compared to other alternatives.	✘ Not Preferred
Ecological Environment		**No substantial difference**		
	Terrestrial Ecosystems	No substantial difference	No substantial difference	No substantial difference
	Aquatic Ecosystems	No substantial difference	No substantial difference	No substantial difference
Socio-Economic Environment				
Economic Environment		**No substantial difference**		
	Economic Effects on/Benefits to Local Community	No substantial difference	No substantial difference	No substantial difference
Social Environment		**Alternative Method 2 is preferred**		
	Effects on Local Community	✘ Not Preferred	✓ Preferred Alternative Method 2 will result in lower visual impact.	✘ Not Preferred
	Visual Impact of Facility	✘ Not Preferred	✓ Preferred Alternative Method 2 is preferred over Alternative Methods 1 and 3 for since the CEV for the six viewpoints is lower than the CEV for Alternative Methods 1 and 3.	✘ Not Preferred
Human Health		**No substantial difference**		
	Human Health	No substantial difference	No substantial difference	No substantial difference
Cultural Environment				
Cultural Environment		**No substantial difference**		
	Cultural Heritage Resources	No substantial difference	No substantial difference	No substantial difference
	Archaeological Resources	No substantial difference	No substantial difference	No substantial difference
Built Environment				
Transportation		**No substantial difference**		
	Transportation	No substantial difference	No substantial difference	No substantial difference
Current and Planned Future Land Use		**No substantial difference**		
	Land Use	No substantial difference	No substantial difference	No substantial difference

Alternative Method 2 is identified as the Preferred Alternative.

Next Steps

- Information received through this Public Information Session and other comments received will be considered in the EA.
- **Draft Effects Assessment Reports will be available on the Project website for review from December 6, 2024 through January 31, 2025.**
- Notification will be provided for Public Information Session 4 by direct mail, mail drop, email, newspapers (digital and/or print), and via the Project website.
- Public Information Session 4 will focus on the Draft EA Study Report.

https://www.wm.com/ca/en/twin-creeks-landfill/landfill-optimization-project

If you would like to be added to the project mailing list or have project-related questions, please contact:

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Thank you for your attendance and comments on the Project.