DILLON CONSULTING

WASTE CONNECTIONS OF CANADA

Atmospheric Scope of Work for Ridge Landfill Expansion Environmental Assessment (EA) - Final

Ridge Landfill Expansion EA

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1.0 Project and Work Plan Overview

This Atmospheric work plan has been prepared to support the environmental assessment (EA) for the Ridge Landfill expansion and is based on the commitments made in the final amended Terms of Reference (ToR) for the EA that was approved by the Ministry of the Environment, Conservation and Parks (MOECP, formerly the Ministry of the Environment and Climate Change) in May of 2018.

Waste Connections of Canada (Waste Connections) is proposing an expansion of the Ridge Landfill in order to continue to provide long-term residual disposal capacity for the company's large IC&I customer base and as a regional and inter-regional waste management facility to serve the projected increase in population and economic growth in southern and central Ontario.

The Ridge Landfill has been in operation since 1966 and was previously expanded in 1999. Waste Connections owns 340 hectares (ha) of land at the Ridge Landfill. The existing Landfill Site Area, which is permitted by an ECA from the MOECP for waste management and environmental work purposes, is 262 ha. The area within which waste disposal is permitted, called the Waste Fill Area, is 131 ha or half of the Landfill Site Area. As of December 2017, it is estimated that the existing Waste Fill Area at the Ridge Landfill site will provide waste disposal capacity until approximately 2021 at the current fill rate.

The current approved capacity for the Ridge Landfill is 21 million cubic metres (m3). The site is approved to accept a maximum of 1,300,000 tonnes of waste per year (the MOECP approved annual waste disposal rate). The EA does not propose to increase the maximum annual fill rate (this would remain as-is); however, Waste Connections is seeking the EA to increase the life of the facility for a 20 year planning period, from 2022-2041.

The waste being landfilled is approximately 98% IC&I waste and 2% residential waste. As part of the EA approval, Waste Connections would agree to reduce their IC&I service area from all of Ontario to just southern and central Ontario, and their residential service area from Chatham-Kent and the neighbouring counties of Essex, Lambton, Middlesex and Elgin, to just the Municipality of Chatham-Kent.

This Atmospheric work plan outlines the tasks to support the evaluation of alternative methods, and to undertake an impact assessment once the preferred alternative method is determined. The following paragraphs provide a brief summary of the scope of the atmospheric work, including protocols and/or standards to be adhered to while work is undertaken.

The Atmospheric work plan has been developed to address indicator air emissions (see Section 1.1), odour, dust, and litter.

The study areas to be considered for the atmospheric assessment are: on-site (i.e., landfill footprint), off-site (encompasses the area within ten kilometres of the centre of site, which will be used to assess air

quality and odour impacts), and along the haul route. The study areas described above may be adjusted during the EA process to address the requirements of the Air Quality assessment.

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference. These commitments are tabulated below.

Commitment	Reference to applicable section in EA or supporting document
Waste Connections commits to ongoing consultation with the MOECP's Air Quality Specialist to determine the appropriate scope of air, greenhouse gas, and odour assessment during the EA.	Atmospheric work plan.
The EA will include studies related to odour and greenhouse gas emissions when considering the preferred site development alternative.	Atmospheric work plan Tasks 1, 2 and 3 (Section 1.1, 1.2 and 1.3). This will also be incorporated into the EA (section TBD).
The MOECP provides guidance by way of the "D-4 Land Use On or Near Landfills and Dumps" land use guidelines. The guidelines direct that several factors must be considered when land use is proposed near an operating landfill site. These include, but are not limited to, water contamination by leachate, odour, litter, dust, noise, surface runoff and landfill-generated gases. These will be considered as part of the technical studies completed as part of the EA.	Atmospheric work plan Tasks 1, 2 and 3 (Section 1.1, 1.2 and 1.3).
For each alternative method, quantitative/qualitative indicators of air quality, odour, dust and GHGs will be used to evaluate the relative differences between alternative methods. Air Quality will be included as a criteria group as a component of the natural environment.	Atmospheric work plan Task 2 (Section 1.2). This will also be incorporated into the EA (section TBD).

2.0 Study Purpose and Objectives

The proposed expansion of the landfill has the potential to increase air emissions from the site and from increased transportation activity along the haul route. The Atmospheric Scope of Work has been developed to characterize the changes in air emissions, odour, and litter, and will be completed in accordance with the approved amended ToR (May 2018), including the additional commitments made by Waste Connections throughout the stakeholder consultation process.

3.0 Study Area

For the purposes of the Atmospheric Scope of Work, three impact study areas have been defined as follows:

- On-Site Study Area ("on-site") – includes the property on which the current Ridge Landfill and proposed expansion is situated.
- Off-Site Study Area ("off-site") – encompasses the area within ten kilometres of the centre of site, which will be used to assess air quality and odour impacts (as shown in **Figure 1**) The Off-Site Study Area encompasses the area within ten kilometres of the centre of the site. Impacts from site operations are anticipated to be localized and within close proximity to the site's property line, as most sources of emissions are fugitive sources that are emitted at or close to ground level. Within this area, receptors for use within atmospheric dispersion modeling will be placed as follows:
  - For all indicator compounds except odour: multi-tier grid of receptors to be developed in accordance with Section 14 of O.Reg. 419/05. Receptors will not be placed over Lake Erie.
  - For odour: the nearest sensitive receptors will be identified in all directions around the site. In developing the sensitive receptor grid consideration will also be given to historical odour complaints and also houses that may be owned by WCC and leased to local community members.
- Haul Route Study Area ("haul route") – encompasses lands immediately adjacent to Communication Road, Drury Line and Erieau Road which are identified as the designated haul routes for the site.

The extents proposed are based on good practice and anticipated impacts, as discussed above.

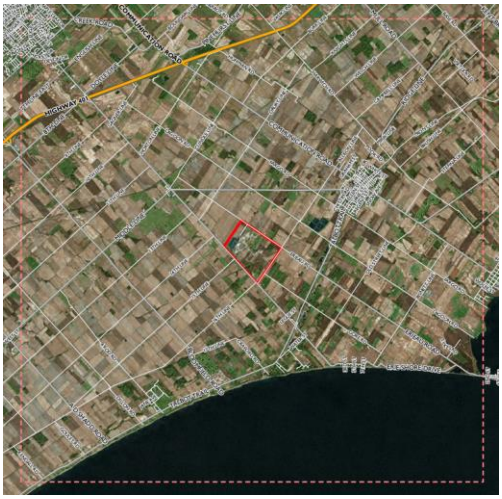

Figure 1: Offsite Study Area

4.0 Scope of Work

In order to characterize the changes in air emissions, odour, and litter, the tasks documented in the following sections will be completed.

NOTE: As part of the development of the atmospheric assessment, there will be ongoing engagement of the MOECC's technical reviewer on details of emissions quantification, modeling and results analysis.

4.1 Task 1: Baseline Conditions

Indicator compounds will be selected for the air quality assessments within the EA. Changes in these compounds will be assessed (qualitatively and/or quantitatively) and the anticipated magnitude of these changes used as indicators of impacts to air quality. Ten (10) indicator compounds will be selected for the air emissions assessment, as follows:

1. Total Suspended Particulate (TSP);
2. Particulate Matter with aerodynamic diameter <10µm (PM10);
3. Particulate Matter with aerodynamic diameter <2.5µm (PM2.5);
4. Nitrogen Oxides;
5. Hydrogen Sulphide;
6. Vinyl Chloride;
7. Chloroform;
8. Carbon Monoxide;
9. Sulphur Dioxide; and
10. Odour.

Baseline air quality will be characterized through use of air quality data from the closest Environment Canada NAPS or MOECP air quality monitoring stations. Data will be collected for the indicator compounds identified for the project, for the most recent complete 2 to 3 years of data. Data from these sources will be supplemented by site-specific monitoring that was conducted in 2014. Data for each indicator compound will be sourced as follows (*subject to refinement based on data availability and completeness of datasets*):

- Particulate (TSP, PM_{10} and $PM_{2.5}$) - Ambient data from MOECP Chatham Station with PM_{10} estimated based on typical ratios of PM_{10} to $PM_{2.5}$ in ambient air.
- NOx - Ambient data from MOECP Chatham Station
- CO, SO_2 - NAPS Windsor Station data
- Chloroform, Vinyl Chloride – NAPS London Station data with historical site specific monitoring used to contextualize the NAPS data
- H_2S - MOECP data if available, otherwise average concentration from natural sources or in urban areas for Southwestern Ontario (TABLE A4) from Environment Canada's Draft Screening Assessment for H_2S

- Odour - the environment surrounding the site consists of primarily agricultural land uses. It is expected that the ambient odour would be characteristic of a rural agricultural setting. There have been no odour studies within the local area and therefore no baseline value will be defined for odour.

It is important to note that in some cases the nearest NAPS station may be London or Windsor. Both of these locations represent urban environments and would be anticipated to provide a conservative representation of baseline conditions within the Off-Site Study Area.

4.2 Task 2: Evaluation of Site Development Alternative Methods

An analysis of potential odours and changes in indicator compound emissions will be completed using metrics that would be indicative of differences between each alternative method. The metrics to be used will include:

- Odour: number of potential odour sources, relative significance of odour sources (if such characterization is possible), distance of odour sources to sensitive receptors;
- Particulate matter: relative levels of material movement and vehicular activity (indicator for dust and combustion emissions);
- Nitrogen oxides, sulphur dioxide and carbon monoxide: relative levels of vehicular activity as an indicator for amount of fuel combusted; and
- Hydrogen sulphide, vinyl chloride, chloroform: anticipated differences in landfill gas emissions.

The site development alternative methods all relate to the alternative development options for the landfill. The landfill will accept post-diversion residual waste, and therefore the site development alternative methods will not affect the diversion rate of the regional system (i.e. alternatives that enhance diversion within Waste Connection's system are not being considered as standalone alternative methods as part of the EA). The site's waste acceptance rate will remain the same with the possibility of changes in composition as improvements in diversion is achieved. These composition changes would equally affect all alternative methods, and would represent an improvement on current baseline conditions through enhanced diversion of waste and therefore potential reductions in landfill gas emissions. These improvements in diversion would be driven by provincial policy or regional scale activities, as opposed to the alternative site development methods proposed. As a result, there will not be any waste diversion related changes in GHGs between the site development alternative methods.

4.3 Task 3: Assessment of Preferred Alternative

Based on the fact that the daily waste acceptance rate of the landfill will not be increased, the greatest potential impact to air quality for the landfill expansion will be associated with on-site operations. However, there may be an increase in export soil truck traffic or changes to background traffic levels along the haul route. Therefore the assessment of the preferred alternative will focus on the landfill operations itself, but will also consider changes to haul route traffic. The key steps in the assessment of the preferred alternative are as follows:

1. Quantification of emissions. This will generally be done as documented below (subject to refinement):

Indicator Compound	Emission Source	Emission Estimation Approach
Odour	Active Area	Odour emission factor for landfills found in MOECP Interim Guide to Estimate and Assess Landfill Air Impacts
Particulate (TSP, PM10, PM2.5)	Material Handling Road Dust Tailpipe Emissions	US EPA AP42 Emission Factors (e.g., Aggregate Handling and Storage Piles, Unpaved Roads) Site specific silt sampling from unpaved road surfaces US EPA Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling Compression-Ignition US EPA MOBILE6.2 guidance
SO2, CO, NOx	Tailpipe Emissions LFG Control System (Flare)	US EPA Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling Compression-Ignition US EPA MOBILE6.2 guidance US EPA LandGEM model coupled with capture rate of system and destruction efficiency of flare
H2S, Vinyl Chloride, Chloroform	LFG Control System (Flare) Fugitive Landfill Emissions	US EPA LandGEM model coupled with capture rate of system and destruction efficiency of flare

2. Incorporation of the emission estimates of indicator compounds for current operations into the AERMOD dispersion model to predict the current contributions of the site's operations to local air quality. Results of the current operations model will be compared to baseline monitored air quality to characterize the conservatism of the modeling.

   A separate model will be developed to assess the change in air quality and odour concentrations resulting from the preferred alternative. This model will assess up to three future scenarios for the preferred alternative to capture worst-case emissions. The definition of these scenarios will consider the peak vehicular activity on the site and the peak landfill gas generation period.

   Key dispersion modeling considerations are as follows:

   - Use of the MOECP regulatory version of AERMOD (currently 16216r)
   - Terrain data from the MOECP
   - MOECP processed site specific 5 year meteorological data set

- Emissions represented as volume sources (e.g. material handling, road dust), area sources (e.g. fugitive odour), point sources (e.g. flare)
- Deposition algorithms to be used within particulate modeling

3. Combination of the preferred alternative impacts on air quality with baseline conditions to estimate cumulative air quality. In doing so the following air quality criteria will be used:

Indicator Compound	Criterion (ug/m3)	Averaging Period
Total Suspended Particulate (TSP)	120 (O.Reg. 419/05) 60 (AAQC)	24 hr Annual
Particulate Matter with aerodynamic diameter <10µm (PM10)	50 (AAQC)	24 hr
Particulate Matter with aerodynamic diameter <2.5µm (PM2.5)	30 (AAQC) 28 (CAAQS) 27 (CAAQS future) 10 (CAAQS) 8.8 (CAAQS future)	24 hr 24 hr 24 hr Annual Annual
Nitrogen Oxides	200 (O.Reg. 419/05) 400 (O.Reg. 419/05)	24 hr 1 hr
Hydrogen Sulphide	7 (O.Reg. 419/05); 13 (O.Reg. 419/05)	24 hr 10 minute
Vinyl Chloride	1 (O.Reg. 419/05)	24 hr
Chloroform	1 (O.Reg. 419/05)	24 hr
Carbon Monoxide	6,000 (O.Reg. 419/05)	½ hr
Sulphur Dioxide	690 (O.Reg. 419/05) 100 (O.Reg. 419/05 future) 275 (O.Reg. 419/05) 55 (O.Reg. 419/05) 10 (O.Reg. 419/05 future)	1 hr 1 hr 24 hr Annual Annual
Odour.	1 OU/m3 3 OU/m3 5OU/m3	MOECP Guideline

4. Estimation of emissions of applicable indicator compounds from the haul route traffic sources associated with potential changes to soil truck or background traffic levels, and use of an appropriate transportation dispersion model (e.g. CAL3QHCR) to predict concentrations of indicator compounds at sensitive receptors.

5. Use of 1 year of local meteorological data, combined with the distance of receptors from the working face (for 2 reasonable worst-case future design scenarios) to assess the potential for

blowing litter impacts. This will be completed using the blowing litter threshold wind speed criteria previously defined for the site (1996).

4.4 Task 4: EA Impact Assessment

- Using the data derived from the Tasks above, analysis of the magnitude of the potential changes in air quality (i.e., changes in concentrations of indicator compounds) will be completed for the preferred alternative. The overall impact will be designated as high, medium or low on the sensitive receptors, in accordance with the EA impact assessment approach.
- The results of the blowing litter assessment will be used to characterize the potential impact of the preferred alternative as high, medium or low on the sensitive receptors, in accordance with the EA impact assessment approach.
- The results of the odour assessment will be used to characterize the potential impact of the preferred alternative as high, medium or low on the sensitive receptors, in accordance with the EA impact assessment approach.
- The results of the GHG analysis will be used to characterize the project's contribution to the GHG profile of the region or the province, in accordance with the EA impact assessment approach.
- Where necessary, operations mitigative measures (that are above and beyond the proposed design of the landfill) will be defined to reduce any potential impacts (air quality, odour, and litter).