APPENDIX E

Emission Summary and Dispersion Modelling Report

DILLON CONSULTING

WASTE CONNECTIONS OF CANADA INC.

Emission Summary and Dispersion Modelling Report - FINAL

Application for an Amendment to Environmental Compliance Approval (Air/Noise) No. 7958-7BMQGT

March 2020 – 19-1859

Ontario

Ministry of the Environment and Climate Change

Emission Summary and Dispersion Modelling Report Checklist

Company Name

Waste Connections of Canada Inc.

Company Address

Unit Number	Street Number	Street Name	PO Box
	20262	Erieau Road	

City/Town	Province	Postal Code
Chatham-Kent	Ontario	N0P 1A0

Location of Facility

Same as company address

The attached Emission Summary and Dispersion Modeling Report was prepared in accordance with s. 26 of O. Reg. 419/05 and the guidance in the MOE document "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009 and "Air Dispersion Modelling Guideline for Ontario" dated March 2009 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact

Company Contact

Company Contact Name

Last Name	First Name	Middle Initial
Smith	Cathy	

Title	Telephone Number
Project Manager	519 358-2860

Signature	Date (yyyy/mm/dd)
CSmith	2020/03/05

Technical Contact

Technical Contact

Technical Contact Name

Last Name	First Name	Middle Initial
Morgan	Rob	

Representing	Telephone Number
Dillon Consulting Limited	519 571-9833

Signature	Date (yyyy/mm/dd)
	2020/03/16

* This checklist is taken from the document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009.

Emission Summary and Dispersion Modelling Report Checklist

	Required Information	Submitted	Explanation/Reference
	Executive Summary and Emission Summary Table		
	1.1 Overview of ESDM Report	☑ Yes	Executive Summary
	1.2 Emission Summary Table	☑ Yes	Executive Summary, Table 4
1.0	**Introduction and Facility Description**		
	1.1 Purpose and Scope of ESDM Report (when report only represents a portion of facility)	☑ Yes	Section 1.1
	1.2 Description of Processes and NAICS code(s)	☑ Yes	Section 1.2
	1.3 Description of Products and Raw Materials	☑ Yes	Section 1.3
	1.4 Process Flow Diagram	☑ Yes	Figure 4
	1.5 Operating Schedule	☑ Yes	Section 1.5
2.0	**Initial Identification of Sources and Contaminants**		
	2.1 Sources and Contaminants Identification Table	☑ Yes	Table 1
3.0	**Assessment of the Significance of Contaminants and Sources**		
	3.1 Identification of Negligible Contaminants and Sources	☑ Yes	Section 3.1
	3.2 Rationale for Assessment	☑ Yes	Appendix D
4.0	**Operating Conditions, Emission Rate Estimating and Data Quality**		
	4.1 Description of operating conditions, for each significant contaminant that results in the maximum POI concentration for that contaminant	☑ Yes	Section 4.1
	4.2 Explanation of Method used to calculate the emission rate for each contaminant	☑ Yes	Section 4.2, Appendix D
	4.3 Sample calculation for each method	☑ Yes	Appendix B
	4.4 Assessment of Data Quality for each emission rate	☑ Yes	Section 4.4, Appendix D
5.0	**Source Summary Table and Property Plan**		
	5.1 Source Summary Table	☑ Yes	Table 2
	5.2 Site Plan (scalable)	☑ Yes	Figure 1
6.0	**Dispersion Modelling**		
	6.1 Dispersion Modelling Input Summary Table	☑ Yes	Table 3
	6.2 Land Use Zoning Designation Plan	☑ Yes	Figures 2a, 2b
	6.3 Dispersion Modelling Input and Output Files	☑ Yes	Appendix E
7.0	**Emission Summary Table and Conclusions**		
	7.1 Emission Summary Table	☑ Yes	Table 4
	7.2 Assessment of Contaminants with no MOE POI Limits	☑ Yes	Section 7.2
	7.3 Conclusions	☑ Yes	Section 7.3
	Appendices (Provide supporting information or details such as...)		
	Current Environmental Compliance Approval	☑ Yes	Appendix A
	Supporting Calculations	☑ Yes	Appendix B
	Fugutive Dust and Odour Best Management Practices Plan	☑ Yes	Appendix C

Version Control

Version	Date	Description	Reviewer Initials
1.0	November 2007	Original ESDM to support application for ECA No. 7958-7BMQGT	AB
2.0	March 2020	Revised ESDM to support application for an amendment to ECA No. 7958-7BMQGT	RJM

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Executive Summary

This Emission Summary and Dispersion Modelling (ESDM) report was prepared to support an application for an amendment to Environmental Compliance Approval (ECA) (Air/Noise) No. 7958-7BMQGT for the expansion of the Waste Connections of Canada Inc. Ridge Landfill site located at 20262 Erieau Road near Blenheim, Ontario (Site).

The ESDM Report was prepared in accordance with s.26 of O.Reg. 419/05 to support the ECA application. In addition, guidance in the Ministry of the Environment, Conservation and Parks (MECP) publication "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018 was followed, as appropriate.

The Site is currently approved to receive waste from the industrial, commercial and institutional (IC&I) sectors in Ontario, and residential waste from the Municipality of Chatham-Kent and the surrounding Counties of Essex, Lambton, Middlesex and Elgin. The future expansion will limit the residential service area to the Municipality of Chatham-Kent and IC&I waste from central and southern Ontario.

The landfill site area of 262 ha, is permitted by an ECA (Waste) No. A021601 and ECA (Air/Noise) No. 7958-7BMQGT. The area within which waste disposal is permitted, called the Approved Waste Disposal Area, is 131 ha or half of the Landfill site area. . The Approved Waste Disposal Area consists of the Old Landfill, West Landfill, and South Landfill footprints. The current approved capacity for the Ridge Landfill is 21 million m^3. As per the current ECA for the Ridge Landfill, the annual fill rate at the Ridge Landfill is 1.3 million tonnes.

As of October 1, 2019, it is estimated that the existing Waste Fill Area at the Ridge Landfill site will provide waste disposal capacity until approximately March 1, 2021 at the current fill rate.

This amendment is being submitted to reflect the expansion of the Site that would increase the lifespan of the Ridge Landfill beyond 2021 to 2041. The landfill expansion will not result in an increase in annual waste volumes disposed at the site (1.3 million tonnes per year). The expansion includes the vertical expansion of the Old Landfill, and horizontal expansion of the South Landfill and West Landfill footprints for a total expansion volume of 28.9 million m^3 including the daily cover material volume.

To accommodate the additional landfill gas (LFG) that will be generated from the increase in total waste received over the lifespan of the landfill, additional LFG flares are proposed to be installed at the Site.

The Site was previously approved for the operation of one (1) LFG fired electricity generation facility consisting of six (6) LFG generators under ECA (Air/Noise) No. 7958-7BMQGT. The LFG generators have not been installed at the Site and are not included in this amendment application.

The North American Industry Classification System (NAICS) Code that applies to this Site is Waste Treatment and Disposal, NAICS Code 562210.

The Site must comply with Schedule 3 standards; therefore, the US EPA AERMOD dispersion model was used to evaluate compliance. In anticipation of the MECP's adoption of the updated AERMOD v.19191 dispersion model in April 2020, a request for notice under s.7(1) of local air quality regulation for use of a specified dispersion model has been submitted to support the use of this model in advance.

The maximum POI concentrations were calculated based on the worst-case operating conditions at the Site, as defined in this report. The maximum emission rates for each significant contaminant emitted from the Site were calculated in accordance with s.11 of O.Reg. 419/05 and the data quality assessment follows the process outlined in the requirements of the MECP Procedure for Preparing an ESDM Report.

A POI concentration for each significant contaminant emitted from the equipment was predicted based on the calculated emission rates using the AERMOD dispersion model; the results are presented in the Emission Summary Table.

The POI concentrations listed in the Emission Summary Table were compared against criteria listed in the MECP Publication "Air Contaminants Benchmarks List - Version 2.0", dated April 2018 (ACB List). Of the contaminants listed in the Emission Summary Table that have limits in the ACB List, all the predicted POI concentrations are below the corresponding limits.

This ESDM Report demonstrates that the site can operate in compliance with O.Reg. 419/05.

This ESDM report was prepared by Dillon for the sole benefit of our client and is based on information provided to, or obtained by Dillon. We have relied on information provided to us by others and are not responsible or liable for inadequate, incomplete or incorrect information. The material in this report reflects Dillon's judgment in light of the information available to us at the time of preparation.

Emission Summary Table

Contaminant Name	CAS No.	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum POI Concentration [µg/m^3]	Averaging Periods [hrs]	MECP POI Limit [µg/m^3](1)	Limiting Effect	Benchmark	Percentage of MECP POI Limit [%]
Nitrogen oxides	10102-44-0	1.83E+00	AERMOD v. 19191	1.69E+01	1	400	Health	B1	4.2%
Nitrogen oxides	10102-44-0	1.83E+00	AERMOD v. 19191	7.25E+00	24	200	Health	B1	3.6%
Sulphur dioxide	7446-09-05	1.98E+00	AERMOD v. 19191	1.67E+01	1	100(2)	Health & Vegetation	B1	16.7%
Sulphur dioxide	7446-09-05	1.98E+00	AERMOD v. 19191	7.18E+00	24	275	Health & Vegetation	B1	2.6%
Sulphur dioxide	7446-09-05	1.98E+00	AERMOD v. 19191	3.54E-01	Annual	10(2)	Health & Vegetation	B1	3.5%
Carbon monoxide	630-08-0	2.48E+00	AERMOD v. 19191	2.40E+01	0.5	6,000	Health	B1	<1%
TSP	N/A - TSP	9.45E-01	AERMOD v. 19191	4.56E+01	24	120	Visibility	B1	38.0%
Methane	74-82-8	8.71E+02	AERMOD v. 19191	5.88E+03	24	37,330	Health	B2	15.8%
Carbon dioxide	124-38-9	1.69E+04	AERMOD v. 19191	6.14E+04	24	255,800	Health	B2	24.0%
Hydrogen chloride	7647-01-0	2.40E+00	AERMOD v. 19191	9.51E+04	24	20	Health	B1	47.6%
1,1,2,2-Tetrachloroethane(3)	79-34-5	1.09E-02	AERMOD v. 19191	9.61E-02	24	0.1	Health	B2	96.1%
1,1-Dichloroethane (ethylidene dichloride)	75-34-3	2.24E-02	AERMOD v. 19191	1.57E-01	24	165	Health	B1	<1%
1,1-Dichloroethene (vinylidene chloride)	75-35-4	1.83E-03	AERMOD v. 19191	1.28E-02	24	10	Health	B1	<1%
1,2-Dichloroethane (ethylene dichloride)	107-06-2	3.82E-03	AERMOD v. 19191	2.69E-02	24	2	Health	B1	1.3%

Contaminant Name	CAS No.	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum POI Concentration [µg/m^3]	Averaging Periods [hrs]	MECP POI Limit [µg/m^3](1)	Limiting Effect	Benchmark	Percentage of MECP POI Limit [%]
Acrylonitrile	107-13-1	3.15E-02	AERMOD v. 19191	2.21E-01	24	0.6	Health	B1	36.9%
Benzene	71-43-2	1.40E-02	AERMOD v. 19191	1.83E-02	Annual	0.45	Health	B1	4.1%
Bromodichloromethane	75-27-4	4.78E-02	AERMOD v. 19191	3.36E-01	24	350	Health	B2	<1%
Carbonyl sulfide	463-58-1	2.77E-03	AERMOD v. 19191	1.95E-02	24	13	Health	B2	<1%
Chloroform	67-66-3	3.37E-04	AERMOD v. 19191	2.37E-03	24	1	Health	B1	<1%
Dichloromethane (methylene chloride)	75-09-2	1.12E-01	AERMOD v. 19191	7.87E-01	24	220	Health	B1	<1%
Dimethyl sulfide (methyl sulfide)	75-18-3	4.56E-02	AERMOD v. 19191	1.59E+00	10-min	30	Odour	B1	5.3%
Ethane	74-84-0	2.52E+00	AERMOD v. 19191	1.77E+01	24	14,500	Health	B2	<1%
Hydrogen sulfide	7783-06-4	1.16E-01	AERMOD v. 19191	4.03E+00	10-min	13	Odour	B1	31.0%
Hydrogen sulfide	7783-06-4	1.16E-01	AERMOD v. 19191	8.12E-01	24	7	Health	B1	11.6%
Perchloroethylene (tetrachloroethylene)	127-18-4	5.78E-02	AERMOD v. 19191	4.06E-01	24	360	Health	B1	<1%
t-1,2-Dichloroethene	156-60-5	2.56E-02	AERMOD v. 19191	1.80E-01	24	105	Health	B1	<1%
Toluene	108-88-3	3.38E-01	AERMOD v. 19191	2.38E+00	24	2,000	Odour	B1	<1%
Trichloroethylene (trichloroethene)	79-01-6	3.47E-02	AERMOD v. 19191	2.43E-01	24	12	Health	B1	2.0%

Contaminant Name	CAS No.	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum POI Concentration [µg/m^3]	Averaging Periods [hrs]	MECP POI Limit [µg/m^3](1)	Limiting Effect	Benchmark	Percentage of MECP POI Limit [%]
Vinyl chloride	75-01-4	4.30E-02	AERMOD v. 19191	3.02E-01	24	1	Health	B1	30.2%
Xylenes	1330-20-7	1.20E-01	AERMOD v. 19191	4.18E+00	10-min	3,000	Odour	B1	<1%
Odour - Sensitive Receptors(4)	N/A - Odour	2.24E+04 OU/s	AERMOD v. 19191	9.06E-01 OU	10-min	1 OU	Odour	--	90.6%
Odour - Sensitive Receptors(5)	N/A - Odour	2.24E+04 OU/s	AERMOD v. 19191	7.36E-01 OU	10-min	1 OU	Odour	--	73.6%

Notes:

(1) *Criteria listed in the MECP Air Contaminants Benchmarks (ACB) List: Standards, Guidelines, and Screening Levels for Assessing POI Concentrations of Air* Contaminants, Version 2.0, dated April 2018.

(2) *MECP proposed POI limit, effective on July 1, 2023. The current SO2 1-hr average MECP limit is less stringent than the proposed limit and has been used for determination of compliance.*

(3) *The emission rate and maximum POI concentration for 1,1,2,2-Tetrachloroethane has been refined to represent the worst-case LFG generation scenario for each* individual landfill footprint. Please refer to Appendix B.

(4) *Maximum odour concentration at sensitive receptors.*

(5) *Maximum odour concentration corresponding to 99.5% frequency occurrence at sensitive receptors.*

OU – Odour unit

1.0 Introduction and Site Description

This section provides a description of the Site as required by sub-paragraph 1 of s.26(1) of O.Reg. 419/05.

Waste Connections of Canada Inc. (Waste Connections) operates the Ridge Landfill site located at 20262 Erieau Road near Blenheim, Ontario (Site). The Site is zoned Landfill, Agriculture or Open Space as per Chatham-Kent's Zoning By-Law.

The Site is currently approved to receive waste from the industrial, commercial and institutional (IC&I) sectors in Ontario, and residential waste from the Municipality of Chatham-Kent and the surrounding Counties of Essex, Lambton, Middlesex and Elgin.

The landfill site area of 262 ha, is permitted by an ECA (Waste) No. A021601. The area within which waste disposal is permitted, called the Approved Waste Disposal Area, is 131 ha or half of the Landfill site area. The Approved Waste Disposal Area consists of the Old Landfill, West Landfill, and South Landfill footprints. The current approved capacity for the Ridge Landfill is 21 million m^3. As per the current ECA for the Ridge Landfill, the annual fill rate at the Ridge Landfill is 1.3 million tonnes.

As of October 1, 2019, it is estimated that the existing Waste Fill Area at the Ridge Landfill site will provide waste disposal capacity until approximately March 1, 2021 at the current fill rate.

The location of the site is presented in Figure 1 and the existing and proposed land use zoning designations of the site and surrounding area are presented in Figures 2a and 2b, respectively. The site layout and source locations used in this assessment are presented in Figure 3a, Figure 3b, and Figure 3c.

1.1 Purpose and Scope of the ESDM Report

This Emission Summary and Dispersion Modelling (ESDM) report was prepared to support an application for an amendment to Environmental Compliance Approval (ECA) (Air/Noise) No. 7958-7BMQGT. A copy of the ECA (Air/Noise) No. 7958-7BMQGT is provided in Appendix A.

This amendment is being submitted to reflect the expansion of the Site that would increase the lifespan of the Ridge Landfill from 2021 to 2041. The landfill expansion will not result in an increase in annual waste volumes disposed at the site (1.3 million tonnes per year).

The expansion includes the vertical expansion of the Old Landfill, and horizontal expansion of the South Landfill and West Landfill footprints. The expansion will add 28.9 million m^3 of waste disposal capacity to the landfill over the projected 20 year expansion period. This total volume includes the daily cover

material used at the landfill, but does not include the volume of the final cover. The additional area to be landfilled at the site is 55 ha.

To accommodate the additional landfill gas (LFG) that will be generated from the increase in total waste received over the lifespan of the landfill, additional LFG flares are proposed to be installed at the Site.

The Site was previously approved for the operation of one (1) LFG fired electricity generation facility consisting of six (6) LFG generators under ECA (Air/Noise) No. 7958-7BMQGT. The LFG generators were never installed at the Site and are not included in this amendment application.

This ESDM Report was prepared in accordance with s.26 of Ontario Regulation 419/05 (O.Reg. 419/05). In addition, guidance documented in the Ministry of the Environment, Conservation and Parks (MECP) publication "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018 was followed as appropriate.

For ease of review and to promote clarity, this ESDM Report is structured to correspond to each of the items listed in the Ministry publication "Emission Summary and Dispersion Modelling Checklist".

1.2 Description of Processes and NAICS Code

Non-hazardous waste is transported to the Site where it is disposed of in cells that make up the landfill.

Soil and recycled aggregate are transferred at storage piles and the active working face during normal operations. Concrete crushing and wood grinding operations occur infrequently at the Site.

The North American Industry Classification System (NAICS) Code that applies to this Site is Waste Treatment and Disposal, NAICS Code 562210.

Process information pertaining to air emissions is provided in greater detail in Appendix B. Table 1 presents the individual sources of emissions at the Site.

1.3 Description of Products and Raw Material

Through the development of the landfill cells, the waste that is received generates LFG. The Site is equipped with a LFG collection system that captures the gas and transports it to LFG flares for destruction.

Soil and recycled aggregate are transferred at storage piles and the active working face during normal operations. Concrete crushing and wood grinding operations occur infrequently at the Site.

1.4 Process Flow Diagram

The following subsections provide further details pertaining to each process/unit within the Site. A process flow is provided in Figure 4.

1.5 Operating Schedule

The Site can receive waste from 7:00 a.m. to 5:00 p.m. Monday to Saturday.

Selective heavy equipment may operate at the Site between 6:30 a.m. to 6:00 p.m. Monday to Saturday to allow for preparation and soil covering activities.

Operations associated with LFG collection and flaring occur 24 hours a day, 365 days a year.

2.0 Initial Identification of Sources and Contaminants

This section provides an initial identification of all of the sources and contaminants associated with this application, as required by sub-paragraphs 2 to 4 of s.26(1) of O.Reg. 419/05.

Land*fi*ll Gas Flares (Sources S1, S2, S3a, S3b, and S3c)
The Site currently operates two (2) LFG enclosed flares and will be installing a third enclosed flare in the near future to accommodate the LFG collection efficiency being proposed by the Site. The three (3) flares are approved under the Site's ECA No. 7958-7BMQGT.

The Site is proposing the installation of two (2) additional LFG enclosed flares to accommodate the increased LFG generation that would result from the landfill expansion.

The expected contaminants emitted from these sources are products of combustion and LFG constituents.

Material Transfers at Active Working Face and Storage Piles (Sources S4, S5, and S6)
Soil and recycled aggregate are transferred at storage piles and the active working face during normal operations. The expected contaminant emitted from these sources is total suspended particulate matter (TSP).

Given the transient nature of these operations, the active working face (S4), storage pile 1 (S5), and storage pile 2 (S6) are not in fixed locations. The sources have been assessed at four (4) worst-case locations on-site (locations a, b, c, and d as identified on Figure 3b) during different phases of landfill development. During development phases c and d, sources S5 and S6 will occur at the same location and are represented as one source (S5&S6).

Concrete Crushing (Source S6)
Concrete crushing operations occur infrequently at the Site. The expected contaminant emitted from this sources is TSP.

Given the transient nature of this operation, S6 is not in a fixed location. The source has been assessed at worst-case locations on-site. The sources have been assessed at four (4) worst-case locations on-site (locations a, b, c, and d) during different phases of landfill development. During development phases c and d, sources S5 and S6 will occur at the same location and are represented as one source (S5&S6).

The impacts from concrete crushing and wood grinding would not occur simultaneously as both operations occur approximately 10 days a year and on separate days. The TSP emissions from concrete

crushing operations produce higher estimated TSP emissions than wood grinding. Therefore, the assessment of concrete crushing emissions only from these sources is considered to represent the worst-case emissions scenario.

Landfill Gas Fugitive Emissions (Sources S9, S10, S11, S12, and S13)

The LFG not collected by the LFG collection system will be fugitively emitted across the landfill footprints. The Site development has been divided into the following footprints: Old Landfill, West Landfill, South Landfill, South Landfill expansion, and West Landfill expansion.

The expected contaminants emitted from these sources are LFG constituents and odour.

Odour Generation at the Active Working Face (Source S14)

Odorous emissions are anticipated from agitation of waste materials at the active working face. Given the transient nature of this operation, S14 is not in a fixed location. The source has been assessed at worst-case locations on-site. The sources have been assessed at four (4) worst-case locations on-site (locations a, b, c, and d) during different phases of landfill development.

Sources of Fugitive Dust

Fugitive dust emissions from roadways, storage piles, or other fugitive sources may be deemed significant by the MECP for sites that are listed in Table 7-3 of the ESDM Procedure Document. As the Site's NAICS code (5622 Waste Treatment and Disposal [landfills only]) is listed on Table 7-3, fugitive dust must be included in the assessment of compliance with MECP POI limits unless the Site develops and implements a fugitive dust Best Management Practices Plan (BMPP).

A copy of the Site's odour and fugitive dust BMPP is included as Appendix C.

2.1 Sources and Contaminants Identification Table

Table 1 tabulates all the emission sources associated with the Site as required in sub-paragraphs 2 to 4 of s.26(1) of O.Reg. 419/05.

The location of the discharges from each of the sources is presented in Figures 3a, 3b, and 3c. The location of each of the sources is specified with the source reference number.

3.0 Assessment of the Significance of Contaminants and Sources

This section provides an explanation for each source and contaminant identified as negligible in Table 1, as required by sub-paragraph 5 of s.26(1) of O.Reg. 419/05.

As required by paragraph 2 of subsection 26(1) of O.Reg. 419/05, Table 1 contains a list of all contaminants that are discharged from the Site and a list of sources associated with those contaminants.

In accordance with s.8 of O.Reg. 419/05, emission rate calculations and dispersion modelling do not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

3.1 Identification of Significant Contaminants and Sources

Each negligible source is identified in in Table 1. The remaining sources are significant. These sources are included in the dispersion modelling for the Site.

3.2 Rationale for Assessment

For each negligible source identified in in Table 1 as being negligible there is an accompanying documented rationale. The technical information required to substantiate the argument that each of the identified sources is negligible is presented in Appendix D.

4.0 Operating Conditions, Emission Estimating and Data Quality

This section provides a description of the operating conditions used in the calculation of the emission estimates and an assessment of the data quality of the emission estimates for each significant contaminant from the Site as required by sub-paragraphs 6 and 7 of s.26(1) of O.Reg. 419/05. In accordance with s.8 of O.Reg. 419/05, emission rate calculations and dispersion modelling do not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

4.1 Description of Operation Conditions

As noted in Section 1.2, the primary NAICS code for the site is 562210 Waste Treatment and Disposal.

Section 20 of O.Reg. 419/05 (Schedule 3) currently applies to the Site. The averaging period for the operating condition is dependent on the contaminant POI limit averaging period. Averaging periods of 10-min, 1-hr, 24-hr, and annual have been modelled.

Section 10 of O.Reg. 419/05 states that an acceptable operating condition is a scenario that assumes operating conditions for the site that would result, for the relevant contaminant, in the highest concentration of the contaminant at the POI.

The LFG generation rates were determined for each individual landfill footprint. The peak LFG generation year for each individual landfill footprint was identified and modelled simultaneously. This emissions scenario presents a maximum theoretical worst-case LFG emission rate for the entire landfill. The location of the individual landfill footprints are presented in Figure 3a.

Given the transient nature of landfill operations, multiple phases of landfill development (a, b, c, and d) have been assessed to determine the worst-case impacted POI for particulate matter and odour emissions from the landfill expansion.

Throughout the landfill expansion, storage piles, concrete crushing, and wood grinding operations will change location based on the working face location. The following sources of particulate matter have been assessed:

- Development Phase A - South Landfill operations
    - Active working face material transfer (source S4a)
    - Storage pile 1 (source 5a)
    - Concrete crushing and storage pile 2 (source 6a)
- Development Phase B – Old Landfill vertical expansion development

  - Active working face material transfer (source 4b)
  - Storage pile 1 (source 5b)
  - Concrete crushing and storage pile 2 (source 6b)
- Development Phase C –South Landfill expansion area development
  - Active working face material transfer (source 4c)
  - Storage pile 1 and concrete crushing (source 5c and 6c occur at the same location)
- Development Phase D – West Landfill expansion area development
  - Active working face material transfer (source 4d)
  - Storage pile 1 and concrete crushing (source 5d and 6d occur at the same location)

A summary of the particulate matter source locations is provided in Figure 3b-1 through Figure 3b-4.

Throughout the landfill expansion, the active working face will vary in location. The following sources of odour emissions have been assessed:

- Development Phase A – South Landfill operations
  - Active working face (source 14a)
- Development Phase B – Old Landfill vertical expansion development
  - Active working face (source 14b)
- Development Phase C – South Landfill expansion area development
  - Active working face (source 14c)
- Development Phase D – West Landfill expansion area development
  - Active working face (source 14d)

A summary of the odour source locations is provided in Figure 3c.

The operating condition described in this ESDM Report represent a scenario that assumes operating conditions for the Site that would result, for the relevant contaminant, in the highest concentration of the contaminant at the POI.

The operating condition for this equipment that results in the maximum concentration at a POI is the scenario where all significant sources are operational at their maximum production rates. The individual maximum emission rates corresponding to continuous Site operations has been assessed. The modelled emission rate for each contaminant is described in Appendix B.

4.2 Explanation of the Methods Used to Calculate Emission Rates

The maximum emission rates from the Site were calculated in accordance with the requirements of the MECP Procedure for Preparing an ESDM Report.

The emission rate for each significant contaminant emitted was estimated and the methodology for the calculation is documented in Table 2.

4.3 Sample Calculations

The technical rationale, including sample calculations, required to substantiate the emission rates presented in Table 2 are documented in Appendix B.

4.4 Assessment of Data Quality

The assessment of the data quality of the emission rate estimates for each significant contaminant emitted from the significant sources was performed in accordance with the requirements of sub-paragraph 7iii of s.26(1) of the O.Reg. 419/05.

For each contaminant the emission rate was estimated and the data quality is documented in Table 2. The assessment of data quality for each source listed in Table 2 is documented in Appendix B. All emission rate estimates presented in Table 2 present the highest available data quality.

5.0 Source Summary Table and Site Plan

This section provides the table required by sub-paragraph 8 and the site plan required by sub-paragraph 9 of s.26(1) of O.Reg. 419/05.

5.1 Source Summary Table

The emission rate estimates for each source of significant contaminants are documented in Table 2 in accordance with the requirements of sub-paragraph 8 of s.26(1) of O.Reg. 419/05.

For each source of significant contaminants the following parameters are referenced:

- Source identifier;
- Source description;
- Stack parameters (flow rate, diameter, exhaust temperature, height above grade, height above roof);
- UTM coordinates;
- Contaminant;
- CAS#;
- Maximum emission rate;
- Averaging period;
- Estimation of data quality;
- Emission estimating technique; and
- Percentage of site-wide emissions.

5.2 Site Plan

The locations of the emission sources listed in Table 2 are presented in Figures 3a, 3b, and 3c with the source identifiers. The location of the property line is indicated on Figures 3a and 3b, with the end points of each section of the property line clearly referenced to a UTM coordinate system. The location of each source is referenced to this UTM coordinate system in Table 2.

6.0 Dispersion Modelling

This section provides a description of how the dispersion modelling was conducted at the Site to determine the maximum concentration at a POI.

The dispersion modelling was conducted in accordance with the MECP Publication "Air Dispersion Modelling Guideline for Ontario (ADMGO)", dated February 2017. A general description of the input data used in the dispersion model is provided below and summarized in Table 3.

The AERMOD modelling system has been identified by the MECP as one of the approved dispersion models under O.Reg. 419/05. The use of more refined model, such as AERMOD, is necessary when assessing air quality against Schedule 3 Standards. The AERMOD modelling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor and the AERMAP terrain pre-processor. In anticipation of the MECP's adoption of the updated AERMOD v.19191 dispersion model in April 2020, a request for notice under s.7(1) of local air quality regulation for use of a specified dispersion model has been submitted to support the use of this model in advance. A copy of the notice provided by the MECP is presented in Appendix E.

The emission rates used in the dispersion model meet the requirements of Section 11(1)1 of O.Reg. 419/05, which requires that the emission rate used in the dispersion model is at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant. These emission rates are further described in Appendix B.

Fugitive sources of particulate matter emissions such as: construction activities, cell excavation, active working face operations, and concrete crushing were modelled as volume sources. The sources at the landfill that fit the physical parameters associated with a well-mixed plume provided by a volume source include areas with material transfer. Multiple scenarios of cell development have been assessed to determine the worst-case impacted POI from the landfill expansion. Volume source dimensions have been estimated based on satellite imagery of existing working areas and release heights of equipment operating within the volume source. The dimensions of the volume source representing the equipment activity at the active working face during the development of the West Landfill expansion area have been increased to account for the increased initial dispersion due to the proximity of the berm along the southwest site boundary.

Fugitive emissions from the landfill footprints and active working face are best represented by area sources which are used to model low level or ground releases from flat surfaces. For each landfill footprint (Old Landfill, West Landfill, South Landfill, South Landfill expansion area, and West Landfill expansion area), odour emissions from the active working face were modelled as a separate area

source. The release elevation of the emissions of these sources was conservatively estimated as half of the final landfill height.

Emissions from the LFG enclosed flare stacks were modelled as point sources.

All source configurations and locations are presented on Table 2 and Figures 3a, 3b, and 3c.

There is no child care facility, health care facility, senior's residence, long-term care facility, or an education facility located within the Site boundary. Therefore, same structure contamination was not considered.

6.1 Dispersion Modelling Input Summary Table

A description of the way in which the approved dispersion model was performed is included as Table 3. This table meets both the requirements of s.26(1)11 and sections 8-17 of O.Reg. 419/05 and follows the format provided in the MECP Procedure for Preparing an ESDM Report.

6.2 Coordinate System

A UTM coordinate system used for the property line, building and emission sources, is presented in Figures 3a, 3b, and 3c.

6.3 Meteorology and Land Use Data

Sub-paragraph 10 of s.26(1) of O. Reg. 419/05 requires a description of the local land use conditions if meteorological data described in paragraph 2 of s.13(1) of O.Reg. 419/05 was used. The dispersion model required a frequency assessment at sensitive receptors and therefore pre-processed local meteorological data from the Ridgetown monitoring station was provided by the Air Modelling and Emissions Unit of the MECP.

Under the existing Zoning By-law for the site, the Approved Waste Disposal Area is zoned "Landfill" and permits disposal of solid non-hazardous waste. The Site is required to maintain minimum setbacks of 100 m and a minimum open space of 20%. In addition, there are three (3) woodlots on the site designated as Open Space Recreational Zone OS1-105, which permits open space (e.g., parkland, green space), private recreational uses, forestry and fisheries, conservation, and preservation of wildlife and fisheries. Figure 2a shows the existing land use zoning designations for the Site.

The southeast corner of the site is currently zoned as Holding Landfill, which is a provision of Section 36 of the government of Ontario Planning Act and the Holding Zones policies of the Official Plan. This designation provides the Municipality and MECP an opportunity to determine whether an expansion application meets the criteria outlined within the Official Plan. The Official Plan stipulates that an expansion will only be permitted if the landfill operator can satisfactorily demonstrate that the capacity

of the current landfill will be reached within a 10-year period or less, and whether the expansion meets the environmental, social and economic criteria outlined in the Official Plan, including Environmental Assessment approval from the MECP. An Environmental Assessment has been prepared for final submission to the MECP. In order for the landfill expansion to occur, an Official Plan and Zoning By-law Amendment is required to change the Agricultural Zone, allowing for an expansion of the landfill area on the site. The surrounding off-Site area is designated Agricultural, which permits typical agricultural and farming-related uses.

The height of the development will not exceed the restricted elevation of 241.3 m above sea level as dictated by the Chatham Airport Zoning Regulation and will be built no higher than the current highest elevation of the existing landfill.

Amendments to the Chatham-Kent Official Plan and Zoning By-law are required. Waste Connections has worked with Chatham-Kent planners to identify simplified Site zoning designations that would provide flexibility for the landfill operations. The Official Plan Amendment and Zoning By-law Amendment will also identify steps to be taken once landfill operation ceases. Waste Connections has submitted a complete application to the Municipality of Chatham-Kent to amend the Official Plan and Zoning By-law for approval by Municipal Council. Figure 2b shows the proposed land use zoning designations for the Site.

6.4 Terrain

Terrain data was incorporated into the model using MECP provided digital elevation data (MECP, 2015). The following DEM Tiles were used in the dispersion model for UTM Zone 17:

- 0683_3
- 0683_4
- 0684_3
- 0684_4
- 0685_3
- 0685_4

6.5 Receptors

Receptors were chosen based on recommendations provided in Section 7.1 of the ADMGO, which is in accordance with s.14 of O.Reg. 419/05. Specifically, a nested receptor grid, centered around the emission sources at the site, were placed as follows:

a) 20 m spacing, within an area of 200 m by 200 m;
b) 50 m spacing, within an area surrounding the area described in (a) with a boundary at 500 m by 500 m outside of the boundary described in (a);

c) 100 m spacing, within an area surrounding the area described in (b) with a boundary at 1,000 m by 1,000 m outside of the boundary described in (a);
d) 200 m spacing, within an area surrounding the area described in (c) with a boundary at 2,000 m by 2,000 m outside of the boundary described in (a); and
e) 500 m spacing, within an area surrounding the area described in (d) with a boundary at 5,000 m by 5,000 m outside of the boundary described in (a).

In addition to using the nested receptor grid, receptors were also placed every 10 m along the property line.

Odour was modelled to predict impacts at sensitive receptors identified using satellite imagery. Sensitive receptors were modelled to represent residences and commercial and institutional buildings located in the vicinity of the landfill. The sensitive receptors were used to determine compliance with the MECP 1 Odour Unit threshold on a 99.5% frequency basis for all development scenarios.

6.6 Building Downwash

The buildings on Site include the scale house, office, and maintenance garage, which are not within the immediate area of the flare point sources. Therefore, building wake effects were not considered in this assessment using the USEPA's Building Profile Input Program (BPIP-PRIME), another pre-processor to AERMOD. The inputs into this pre-processor include the coordinates and heights of the buildings and stacks.

Dispersion modelling files have been provided electronically as Appendix F.

6.7 Deposition

AERMOD has the capability to account for wet and dry deposition of substances that would reduce ground level concentrations at POIs. However, the deposition algorithm has not been implemented as only regulatory defaults have been used.

6.8 Averaging Time and Conversions

The shortest time scale that AERMOD predicts is a 1-hr average value. 10-minute odour concentrations were determined by using a x1.65 scaling factor applied to the modelled 1-hour concentrations. The x1.65 scaling factor was implemented directly within the AERMOD modelling system. The x1.65 scaling factor represents the MECP recommended conversion factors as per the ESDM Procedure Document.

6.9 Dispersion Modelling Options

The regulatory default options for AERMOD were used for this assessment. Some of the options used are summarized below:

Modelling Parameter	Description	Used in the Assessment?
DFAULT	Specifies the regulatory default options will be used	Yes
CONC	Specifies that concentration values will be calculated	Yes
NODRYDPLT	Specifies that no dry deposition will be calculated	Dry deposition was not considered.
NOWETDPLT	Specifies that no wet deposition will be calculated	Wet deposition was not considered.
FLAT	Specifies that the non-default option of assuming flat terrain will be used	No – elevated terrain used
NOSTD	Specifies that the non-default option of no-stack tip downwash will be used	No
AVERTIME	Averaging periods used	10-min, 1-hr, 24-hr, annual
URBANOPT	Specifies that the urban dispersion coefficients will be used	Yes
URBANROUGHNESS	Specifies the urban roughness (m) if URBANOPT is used	Default
FLAGPOLE	Specifies that receptor heights above local ground level are allowed on the receptors	Yes

6.10 Dispersion Modelling Input and Output Files

The dispersion model input data are summarized in Table 3. Electronic copies of all input and output files are also provided in Appendix F.

7.0 Emission Summary Table and Conclusions

This section provides the table required by sub-paragraph 14 of s.26(1) of O.Reg. 419/05 and provides an interpretation of the results as required by the MECP Procedure for Preparing an ESDM Report.

7.1 Emission Summary Table

A POI concentration for each significant contaminant emitted from the Site was calculated based on the emission rates listed in Table 2 and the output from the approved dispersion model presented in Appendix F. The results are presented in Table 4. This table follows the format provided in the MECP Procedure for Preparing an ESDM Report. For each source of significant contaminants, the following parameters are referenced:

- Contaminant name;
- CAS#;
- Total Site emission rate;
- Approved dispersion model used;
- Maximum POI concentration;
- Averaging period for the dispersion modelling;
- MECP POI limit;
- Jurisdictional Screening Level (JSL);
- Indication of the limiting effect;
- Schedule in O.Reg. 419/05; and
- The percentage of the Standard or screening level.

The POI concentrations listed in Table 4 were compared against criteria listed in the MECP Publication "Air Contaminants Benchmarks List (ACB List) Version 2.0", dated April, 2018 (MECP POI Limits).

Of the contaminants listed in Table 4 that have limits in the list of MECP POI Limits, all the predicted POI concentrations are below the corresponding limits.

7.2 Assessment of Contaminants with no MECP POI Limits

Sub-paragraph 14 sub-section viii of s.26(1) of O.Reg. 419/05 requires an indication of the likelihood, nature, and location of any adverse effect if the contaminant is not listed in any of Schedules 1, 2, and 3.

There are no significant contaminants released by the Site that are considered to be 'Contaminants with no MECP POI Limits.

7.3 Conclusions

This ESDM Report was prepared in accordance with s.26 of O.Reg. 419/05. In addition, guidance in the MECP Procedure for Preparing an ESDM Report was followed as appropriate.

Section 20 of O.Reg. 419/05 (Schedule 3) currently applies to the Site. Therefore the MECP approved AERMOD (v. 19191) dispersion model was used to assess compliance with Schedule 3 standards.

The emission rate estimates for the Site are documented in Table 2. All the emission rates listed in Table 2 are documented as having the highest available data quality and correspond to the operating scenario where all significant sources are operating simultaneously at their individual maximum rates of production. Use of these emission rates will result in a calculated concentration at the POI greater than the actual concentrations that would be expected.

A POI concentration for each significant contaminant emitted from the Site was calculated based on the calculated emission rates and the output from the AERMOD dispersion model; the results are presented in the Emission Summary Table. The POI concentrations listed in Table 4 were compared against criteria listed in the MECP POI Limits.

For all of the contaminants listed in Table 4 that have MECP POI Limits, all the predicted POI concentrations are below the corresponding limits. Therefore, this ESDM Report demonstrates that the Site can operate in compliance with O.Reg. 419/05.

8.0 Limitations

This ESDM report was prepared by Dillon for the sole benefit of our client and is based on information provided to, or obtained by Dillon. We have relied on information provided to us by others and are not responsible or liable for inadequate, incomplete or incorrect information. The material in this report reflects Dillon's judgment in light of the information available to us at the time of preparation.