Waste Management of Canada Corporation

Environmental Assessment for a New Landfill Footprint at the West Carleton Environmental Centre

ATMOSPHERIC – COMBUSTION HAUL ROUTE DETAILED IMPACT ASSESSMENT

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1. Introduction

This report documents the haul route combustion impact assessment of the Preferred Alternative Landfill Footprint for the Environmental Assessment (EA) for a new landfill footprint at Waste Management of Canada Corporation's (WM) West Carleton Environmental Centre (WCEC). In the preceding Alternative Methods phase of the EA, a net effects analysis and a comparative evaluation of the four alternative landfill footprint options were carried out to identify a Preferred Alternative Landfill Footprint. The Preferred Alternative Landfill Footprint was determined to be Option #2 – the North Footprint Option. The potential environmental effects, mitigation or compensation measures to address the potential adverse environmental effects, and the remaining net effects following the application of the mitigation or compensation measures were identified for the Preferred Alternative Landfill Footprint.

The Preferred Alternative Landfill Footprint was refined based on stakeholder comments received and in order to further avoid or mitigate potential adverse environmental effects, and is illustrated in **Figure 1**.

A Facilities Characteristics Report (FCR) as well as a description of the ancillary facilities associated with the WCEC has been prepared so that potential environmental effects and mitigation or compensation measures identified for the Preferred Alternative Landfill Footprint during the Alternative Methods phase of the EA could be more accurately defined, along with enhancement opportunities and approval requirements.

The discipline-specific work plans developed during the Terms of Reference (ToR) outlined how impacts associated with the Preferred Alternative Landfill Footprint would be assessed. The results of these assessments have been documented in the following 10 standalone Detailed Impact Assessment Reports:

- Atmospheric (Air Quality, Noise, Odour and Landfill Gas (LFG))
- Geology and Hydrogeology
- Surface Water
- Biology
- Archaeology
- Cultural Heritage
- Transportation
- Land Use
- Agriculture
- Socio-Economic (including Visual)

Despite being standalone documents, there are; however, interrelationships between some of the reports, where the information discussed overlaps between similar disciplines. Examples of this include the following:

- Geology and Hydrogeology, Surface Water, and Biology (Aquatic Environment); and
- Land Use, Agricultural, and Socio-Economic.

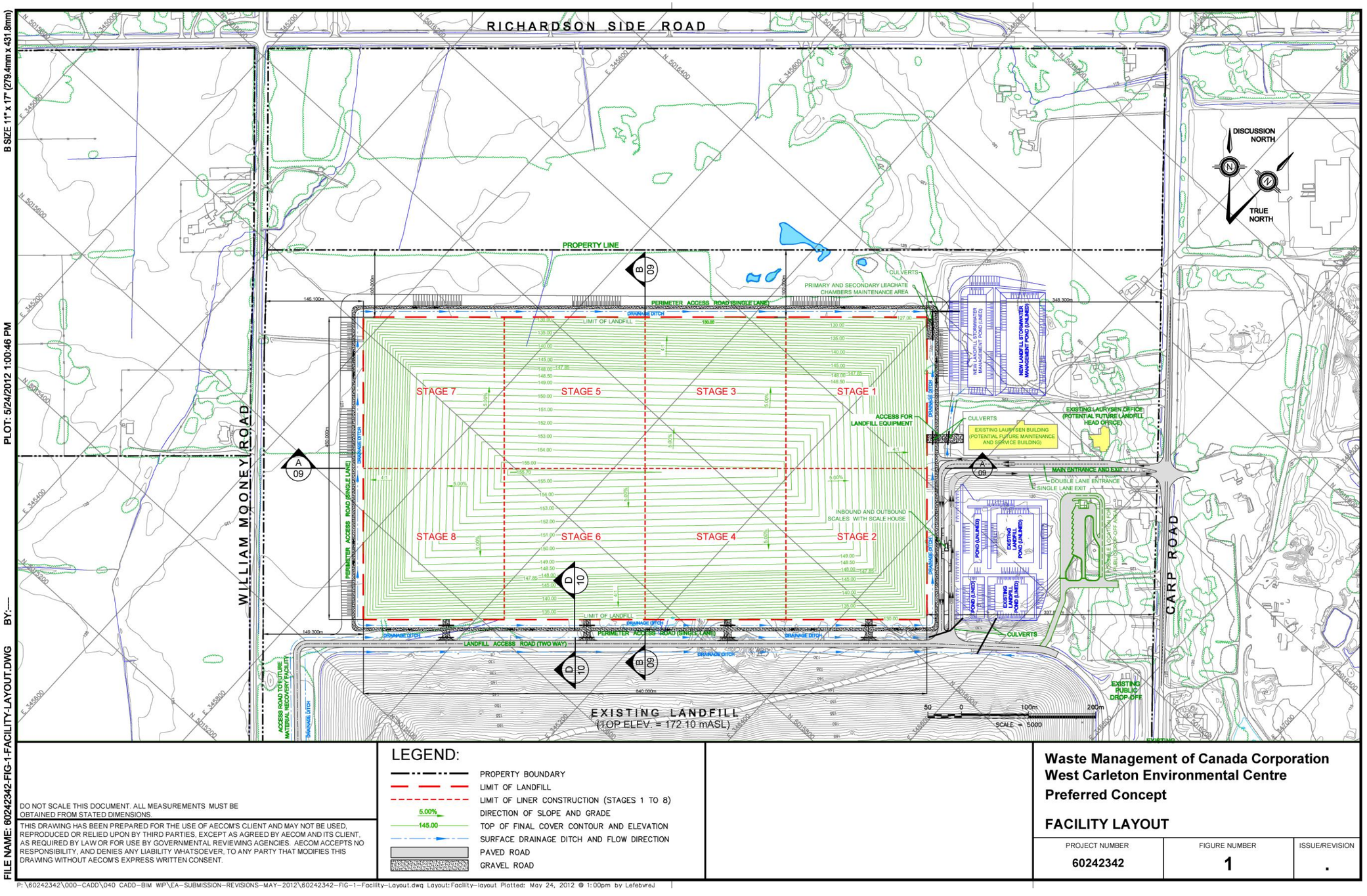


Figure 1. Preferred Alternative Landfill Footprint

1.1 Description of the Preferred Alternative Landfill Footprint

The southern half of the Preferred Alternative Landfill Footprint is located on WM owned lands and the northern half is located on lands that WM has options to purchase. A 100 metre (m) buffer is maintained between the north limit of the Preferred Footprint and the private lands to the north (e.g., lands which front onto Richardson Side Road) in accordance with Ontario Regulation (O. Reg.) 232/98, and an approximate 350 m buffer is maintained between the east limit of the footprint and Carp Road. A light industrial building (e.g., the Laurysen building) is situated in the eastern portion of WM optioned lands, which WM anticipates using for equipment storage/maintenance or waste diversion activities in the future. An approximate 45 to 50 m buffer is maintained between the toe of slope of the existing and new landfill footprints, thus allowing sufficient area for a new waste haul road to the new landfill footprint, and for maintenance and monitoring access. The location of the west limit of the Preferred Alternative Landfill Footprint was determined by maintaining the noted buffers and providing the required 6,500,000 m^3 of disposal capacity, while maintaining landfill elevation below 158 metres above sea level (mASL) (as reported in the Conceptual Design Report (CDR)) and maintaining side slopes required by O. Reg. 232/98 (e.g., varying from 4H to 1V to 5%). This results in an approximate 146 m buffer between the west limit of the Preferred Footprint and William Mooney Road. This buffer preserves a portion of the existing woodlot within the west part of the WM-owned lands.

The final contours of the landfill are shown in Figure 1 and reflect a rectangular landform with a maximum elevation (top of final cover) of 155.7 mASL. This elevation is approximately 30.7 m above the surrounding existing grade. By comparison, the maximum elevation of the existing Ottawa WM landfill is approximately 172 mASL or approximately 47 m above the surrounding existing grade. The contours reflect maximum side slopes of 4H to 1V, and a minimum slope of 5%. The total footprint area of the new landfill is 37.8 ha.

1.2 Facilities Characteristics Report

The FCR presents preliminary design and operations information for the Preferred Alternative Landfill Footprint (Option #2) and provides information on all main aspects of landfill design and operations including:

- Site layout design;
- Surface water management
- Leachate management;
- Gas management; and,
- Landfill development sequence and daily operations.

The FCR also provides estimates of parameters relevant to the Detailed Impact Assessment including estimates of leachate generation, contaminant flux through the liner system, LFG generation, LFG collection, and traffic levels associated with waste and construction materials haulage.

1.3 Other WCEC Facilities

In addition to the new landfill footprint, the WCEC will also include other ancillary facilities not subject to EA approval. These include:

- A material recycling facility;
- A construction and demolition material recycling facility;
- An organics processing facility;
- Residential diversion facility;
- Community lands for parks and recreation;
- A landfill-gas-to-energy facility (LGTE); and
- Greenhouses.

Some of the proposed WCEC facilities, such as the material and recycling facility, the residential diversion facility and the organic processing facility, have the potential to emit emissions associated with the activities which they house. The proposed facilities are at the initial stages of conception and no design details, including operation (i.e., waste volumes handled) or building details, exist at present. These facilities do not require EA approval and were not included in the Combustion Haul Route Detailed Impact Assessment.

These proposed facilities will be designed with the intent of minimizing combustion emissions discharged to the atmosphere. An assessment of their emissions, including combustion emissions, will be completed to ensure compliance with applicable requirements prior to construction as part of the MOE's Environmental Compliance Approval (ECA) process or any other applicable environmental approvals processes.

1.4 Atmospheric – Air Quality Study Team

The atmospheric study team consists of RWDI AIR Inc. staff. The actual individuals and their specific roles are provided as follows:

- **John DeYoe**, B.A., d.E.T., Project Director, John.DeYoe@rwdi.com
- **Brad Bergeron**, A.Sc.T.,d.E.T., Senior Project Manager, Brad.Bergeron@rwdi.com

- **Sarah Pellatt**, B.Sc., Senior Scientist, Sarah.Pellatt@rwdi.com
- **Claire Finoro**, B.Sc. (Eng), E.I.T., Project Co-ordinator, Claire.Finoro@rwdi.com

1.5 Contaminants of Interest

On-site stationary combustion sources and vehicular traffic produces a variety of air contaminants as a result of fuel combustion inside the engine. There are typically three main contaminants of interest related to combustion emissions: carbon monoxide (CO), nitrogen oxides (NO_X), and respirable particulate matter ($PM_{2.5}$). For the purposes of this Haul Route Detailed Impact Assessment, the air contaminants include carbon monoxide (CO), nitrogen oxide (NO_X). In addition, impacts from dioxins and furans (D&F) were assessed based on emissions from the on-site stationary combustion sources.

Impacts from the combustion emissions of particulate matter fractions (TSP, PM_{10}, and $PM_{2.5}$) were included in the Particulate Matter Detailed Impact Assessment; therefore, they were not considered within this Haul Route Detailed Impact Assessment.

1.6 Applicable Guidelines

The Province of Ontario has a regulation under the Environmental Protection Act that deals with local air quality (O. Reg. 419/05). This regulation sets out standards for various contaminants and procedures for assessing and reporting whether or not a proposed emission source is expected to meet the standards or cause them to be exceeded. However, O. Reg. 419/05 does not apply to discharges of contaminants from motor vehicles and, as such, is not applicable to this air quality assessment. Predicted concentrations of CO, NO_X and D&F were compared against O. Reg. 337 Ambient Air Quality Criteria (AAQC) or O. Reg. 419 Schedule 3 air quality standards. As O. Reg. 419/05 D&F future Schedule 3 standards are more stringent than Schedule 2 standards, only the Schedule 3 standard was used to determine compliance in this Combustion Haul Route Detailed Impact Assessment.

The term POI is taken to be in the natural environment outside the boundaries of the property. Table 1 presents the air quality standards and criteria used in the haul route assessment for the selected list of compounds. The basis for the limiting effect and averaging period for each individual contaminant is included in Table 1.

Table 1. Summary of Applicable Criteria for Compounds of Interest

CAS #	Compound	Averaging Period (hours)	MOE POI Limit (µg/m³)	Limiting Effect	Regulation Schedule #
630-08-0	Carbon Monoxide (CO)	1	36,200	Health	AAQC
		8	15,700	Health	AAQC
10102-44-0	Oxides of Nitrogen	1	400	Health	AAQC
		24	200	Health	AAQC
N/A	**Dioxins, Furans and Dioxin-like PCBs**	24	1.00E-07 TEQ µg/m³ [2]	Health	AAQC
		24	1.00E-07 TEQ µg/m³ [3]	Health	O. Reg. 419 Sch.3

Notes: [1] The dioxin-like PCBs were not included in the assessment of emissions as dioxin-like PCBs are not formed as by-products of combustion and are not constituents of landfill gas.
[2] This standard applies to a group of Dioxins, Furans and Dioxin-like PCBs. The most potent compound of the group of chemicals is 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD). The toxic potency of these dioxins, furans and dioxin-like PCBs is expressed relative to that of TCDD in units of TCDD equivalents (TEQs).
[3] The Phase in Date for the updated Dioxins, Furans and Dioxin-like PCBs O. Reg. 419, Schedule 3 standard is July 1, 2016.

1.7 Emission Sources

The sources of CO, NO_X and D&F considered in this Detailed Impact Assessment include:

- vehicles travelling along the on-site haul routes;
- idling vehicles;
- the landfill gas-fired engines;
- the LFG flares;
- the sequencing batch reactor (SBR) emergency diesel-fired generator;
- the leachate evaporator;
- the impact crusher engine; and
- vehicles travelling along the adjacent off-site roadways.

A source summary table including each source of emission is provided in the Table Section. The Source Summary Table provides a summary of each source, the type of modelled source, and the overall emission rate or emission flux rate per source of emission. Each of these sources is discussed in the following sections.

1.7.1 Hours of Operation

The hours of operation used in the Haul Route Detailed Impact Assessment for the various facilities on the WCEC site were as follows:

- Landfill: .....7:00 to 16:30
- Waste Transfer and Processing Facility (WTPF):.....6:30 to 20:00

Although the WCEC facility hours of operation start or end on the half hour, the modelling only has the capacity to consider whole hours. Therefore, for the purposes of this Detailed Impact Assessment the hours of operation for the landfill and WTPF were extended to be 7:00 to 17:00 and 6:00 to 20:00, respectively.

The landfill and the WTPF facility were assumed to operate year-round. The LFG flares, the landfill gas-fired generators, the leachate management system's leachate evaporator and the emergency diesel-fired generator were assumed to operate continuously as worst-case assumptions.

1.7.2 On-Site Roadway Source

A network of paved and unpaved roadways, as shown in Figure 3, allows trucks to travel from the entrance of the WCEC site to the Stage 1 - landfill active stage, Stage 3 - the construction stage, to the WTPF, and to the overburden pile and the contaminated soil stockpile. Combustion emissions are generated by the vehicles traveling along these roadways surfaces.

WM has provided traffic volume estimates for three optional construction periods of 6 months, 9 months or 12 months, as shown below in Table 2. The worst case future build scenario assessed in this Haul Route Detailed Impact Assessment is the Routine Phase 1 Operations with a 6 month construction period, as it has largest traffic volumes and movements.

Table 2. WM On-Site Traffic Predictions (trips per hour)

Scenario	Duration of Construction Period								
	6 Months			9 Months			12 Months		
	Waste Haulage	Soil Import	Movement on-site soil	Waste Haulage	Soil Import	Movement on-site soil	Waste Haulage	Soil Import	Movement on-site soil
1) Site Preparation Prior to Landfilling	0	68	12	0	46	8	0	34	6
2) Routine Phase 1 Operations	50	34	2	50	24	0	50	18	0
3) Routine Phase 2 Operations	50	0	0	50	0	0	50	0	0
4) Phase 2 Operations Approaching Closure	50	20	0	50	14	0	50	9	0

Notes: [1] One truck per hour is the equivalent of 2 trips (inbound and outbound); therefore uneven trip/hour values were increased to an even value.

A breakdown of the 50 landfill truck trips to and from various WCEC on-site locations was based on past landfilling activities at the existing landfill. The breakdown of truck trips to various locations is as follows:

- 38 trips/hour from off-site to the landfill active stage;
- 4 trips/hour from off-site to contaminated soil stockpiles; and

- 8 trips/hour on-site between the working face of the landfill active stage and the contaminated soil stockpile.

A breakdown of the 36 construction truck trips to and from various WCEC on-site locations was based on the estimated duration time of construction activities. The breakdown of truck trips to various locations is as follows:

- 34 truck trips per hour (for soil importation) from off-site to the construction working face; and
- 2 truck trips per hour (movement of on-site soil) between the construction working face and the stockpiles.

In addition, traffic associated with the WTPF is present on-site. The breakdown of the WTPF traffic is as follows:

- 25 truck trips per hour of inbound material from off-site to the WTPF; and,
- 10 truck trips per hour of outbound material from the WTPF to off-site locations.

The on-site haul road and WTPF road sources are included in the dispersion model. The same parameters used in the Particulate Matter Detailed Impact Assessment, in accordance with the "Modelling Fugitive Dust Sources", 2004, National Stone, Sand and Gravel Association (NSSGA), were applied to the on-site haul road and WTPF, as follows:

- Assumed width of haul route per lane = 3.75 m
- Initial lateral dimension = (Haul Route Width + 9.75 m)/4.3
- Release Height = height of haul truck in m (assumed to be 3.5 m)
- Initial vertical dimension = (2 x height of haul truck in m)/4.3

The traffic generated due to ancillary operations and landfill maintenance operations was not considered in the Detailed Impact Assessment because the traffic volumes are small; the generation of combustion emissions would therefore be insignificant relative to the generation of combustion emission from the traffic volumes traveling on the on-site main haul routes.

1.7.2.1 Idling Source

The FCR proposes to construct a new scale facility near the northeast corner of the proposed alternative landfill footprint. This is expected to incorporate two scale decks for inbound and outbound waste trucks. The scale operator will be located in a scale house situated between

the scale decks. By-pass lanes will be situated on both sides of the facility. To estimate the idling emissions, it was assumed that all trucks entering the WCEC facility would spend five minutes at the proposed scale facility.

The idling vehicle emission source is included in the dispersion model. The same parameters used in the Particulate Matter Detailed Impact Assessment, in accordance with the "Modelling Fugitive Dust Sources", 2004, National Stone, Sand and Gravel Association (NSSGA), were applied to the idling source, as follows:

- Initial lateral dimension = (Haul Route Width + 9.75 m)/4.3
- Release Height = height of haul truck in m (assumed to be 3.5 m)
- Initial vertical dimension = (2 x height of haul truck in m)/4.3

1.7.3 Landfill Gas-Fired Generators and Flares

The LFG collection systems, serving the existing landfill mound and the preferred alternative landfill mound, will supply LFG to the on-site electricity generation system at the LGTE facility. The LGTE facility consists of five reciprocating engine-generator sets, all located inside a building near the southeast corner of the property boundary, along Carp Road. The engine-generators are used to combust the landfill gases and the energy generated through the combustion reaction is used to supply up to 8 megawatts (MW) of electricity to the municipal grid.

Each engine-generator set exhausts into the atmosphere through its own stack, having an exit diameter of 0.4 m and extending 5.5 m above the roof of the building and 13.4 m above grade. Currently, two types of engine-generator sets are in place at the LGTE facility. In effort to conservatively assess the landfill gas-fired generators and in anticipation of the increased LFG generation due to the construction and operation of the preferred alternative landfill footprint, the smaller engine-generator sets with a power rating of 800 kilowatts (KW), are assumed to be replaced with the larger engine-generator sets with a power rating of 1,600 KW during the landfill expansion years. There have not been any formal applications submitted to the MOE for approval of the larger engine-generator sets as the larger engine-generator sets were used as a conservative assessment of potential future emissions. Each large engine-generator set has a maximum LFG firing rate of 0.28 m^3 per second, resulting in an exhaust flow rate of 6.48 m^3 per second.

During the worst case future build scenario, the LGTE facility will be operating five 1,600 KW engines for a total power rating of 8.0 KW and a maximum LFG firing rate of 1.4 m^3 per second. This configuration of generators (in combination with the flare configuration, the recommended LFG collection efficiency and expected LFG potential) is expected to have the capacity to

handle the LFG collected by the LFG collections systems from both the existing and proposed preferred alternative landfills.

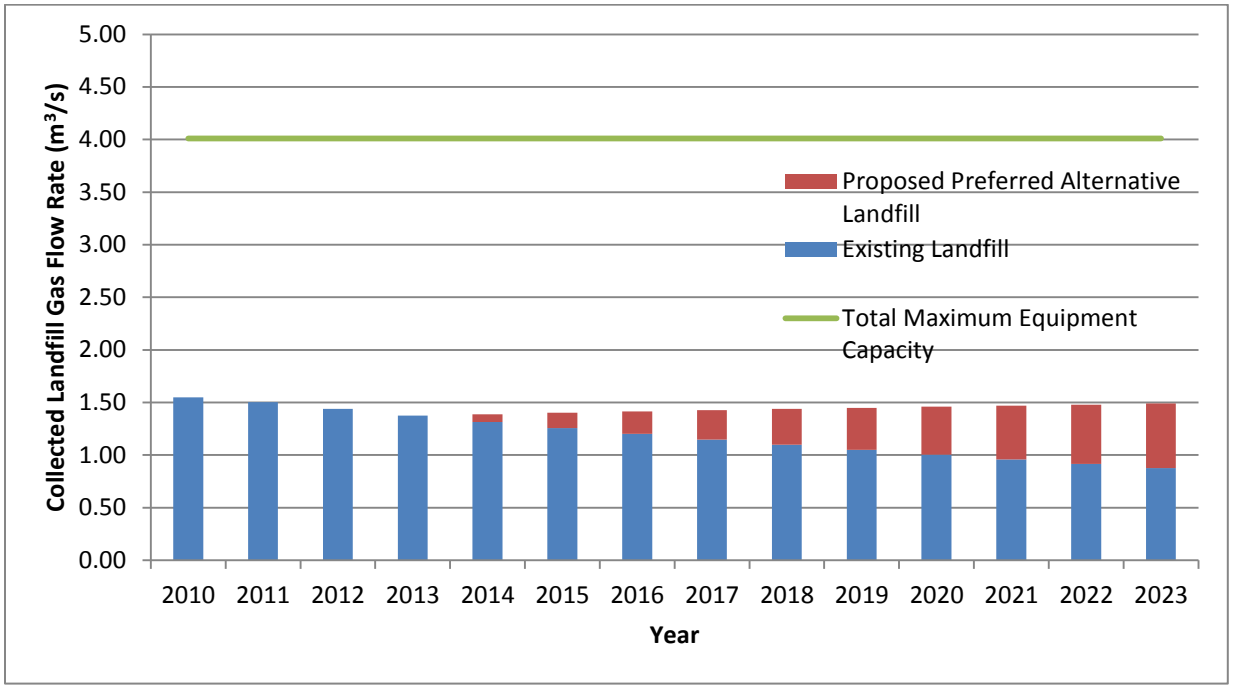
In addition to the landfill gas-fired engine-generator sets, the WCEC LFG collection system, serving the existing landfill and the preferred alternative landfill, also supplies three flares. The flares are utilized to combust and destroy the LFG that was not sent to the generators.

The flare sources are included in the dispersion model with the following parameters:

- One (1) enclosed flare system, used to incinerate the landfill gases from a LFG collection system at a maximum volumetric gas flow rate of 0.57 standard m^3 per second based on a methane content of 50 percent by volume. The landfill flare has a maximum heat input of 41.7 gigajoules per hour, exhausting into the atmosphere through a stack, having an exit diameter of 2.1 m, extending 12.2 m above grade;
- One (1) enclosed flare system, used to incinerate the landfill gases from an expanded LFG collection system at a maximum volumetric gas flow rate of 1.04 standard m^3 per second based on a methane content of 50 percent by volume. The landfill flare has a maximum heat input of 70.7 gigajoules per hour, exhausting into the atmosphere through a stack, having an exit diameter of 2.7 m, extending 12.2 m above grade; and,
- One (1) candlestick flare system, used to incinerate the landfill gases from a LFG collection system at a maximum volumetric gas flow rate of 1.0 standard m^3 per second based on a methane content of 50 percent by volume. The landfill flare exhausts into the atmosphere through a stack, having an exit diameter of 0.2 m, extending 10.4 m above grade.

The three flares at the WCEC facility have a maximum combined LFG firing rate of 2.61 m^3 per second. This configuration of flares in combination with the five generators having a maximum gas firing rate of 1.4 m^3 per second, the recommended LFG collection efficiency and expected LFG potential is expected to have the capacity to handle the LFG collected by the LFG collections systems from both the existing and proposed preferred alternative landfills.

Graph 1. Summary of Landfill Gas Collected from Existing Landfill and Proposed Preferred Alternative Landfill and Maximum Equipment Capacity



1.7.4 Leachate Management System

WM has proposed two methods to treat the leachate generated at the WCEC: the preferred leachate treatment method and a contingency leachate treatment method.

As referred to in the FCR, the preferred leachate management system consists of disposal of leachate through pre-treatment and discharge to the City of Ottawa sanitary system, in tandem with disposal through irrigation of trees. The leachate will be pre-treated on-site using a SBR system, similar to the one proposed for the existing landfill with a pending Environmental Compliance Approval. The SBR system is not a source of particulate matter; however, it includes an emergency diesel-fired generator to provide emergency power to the leachate treatment facility.

The SBR emergency diesel-fired generator was included in the dispersion model with the following parameters:

- One (1) 320-kilowatt emergency diesel-fired generator. This generator will be used to provide back-up power for the leachate treatment facility. Emissions from this generator vent to the atmosphere through a 0.2 m diameter stack, at

a flow rate of 1.23 m^3 per second. The generator exhaust is positioned at a height of 3.1 m above grade, which is equivalent to 0.1 m above the roof height of the generator enclosure.

The contingency method of leachate disposal would also involve pre-treatment of the leachate using the SBR system with the addition of a leachate evaporator system. For the leachate evaporator, the current technology selected to be evaluated in the Detailed Impact Assessment is the E-Vap® Leachate Evaporator System, which has the capacity to treat 20,000 gallons of leachate per day.

The evaporator system will use LFG as the primary fuel for the combustion process. The hot combustion gases are injected into the leachate reservoir generating water vapour. Prior to being discharged, the water vapour is sent through spin vane separators (mist eliminators) in line with the exhausts and then discharged to the atmosphere.

Fresh leachate is fed into the evaporator continuously and the residual is drawn off and sent to a clarifier tank for further concentration. The concentrate is collected and used at other locations within the facility or shipped off-site. For the 20,000 gallons per day operation, LFG is fed into the burner at a rate of 0.16 standard m^3 per second. The feed rate of the leachate would be approximately 14 gallons per minute. The leachate evaporator stack was modelled with the following parameters:

- One (1) leachate evaporator system, used to evaporate leachate collected by the leachate collection system, exhausting to the atmosphere at a maximum combined flow rate 13.3 standard m^3 per second through two stacks modelled as one stack, having an equivalent exit diameter of 0.9 m and extending 22 m above grade.

1.7.5 Impact Crusher Engine

WM has proposed to operate an impact crusher powered by a 300 hp diesel engine. The impact crusher diesel-fired engine was included in the dispersion model with the following parameters:

- One (1) 300 hp diesel-fired engine. This engine will be used to provide power to the impact crusher. Emissions from this engine vent to the atmosphere through a 0.12 m diameter stack, at a flow rate of 0.56 m^3 per second. The generator exhaust is positioned at a height of 2.0 m above grade.

1.7.6 Off-Site Sources

The local roadway network surrounding the WCEC site was included in the Haul Route Detailed Impact Assessment. These roadways consist of the local roads that may carry WCEC-related traffic. Roadways are a major source of ambient CO and NO_X concentrations in the area. Therefore, emissions from WCEC and non-WCEC traffic on the local roadways were included in the Detailed Impact Assessment to provide an estimate of the cumulative concentration levels in the vicinity of the site. The roadways included in the assessment correspond with the roadways for which traffic data was provided by AECOM.

The main roadways surrounding the WCEC include:

- Richardson Side Road;
- Carp Road;
- William Mooney Road;
- Highway 7; and
- Highway 417.

Traffic volumes and hourly traffic distributions for existing conditions were provided by AECOM. As assumed traffic growth factor of 1% increase per year was assumed to estimate future traffic volumes. Traffic volumes for William Mooney Road were unavailable (due to the low volumes); therefore this road is not included in the analysis. The off-site and on-site roadway segments are presented in Table 3, below.

Table 3. Roadway Segments Considered in the Haul Route Assessment

Segment ID	Segment Name	Segment Length (m)
CARP_N	Carp Road - North of Hwy 417	1,790
CARP_S	Carp Road - South of Hwy 417	990
RSROAD	Richardson Side Road from Carp to 417	2,540
417_W7	Highway 417 - West of Highway 7	2,050
417WCARP	Highway 417 - West of Carp Road	1,600
417ECARP	Highway 417 - East of Carp	1,060

The length of each roadway segment was estimated based on aerial images. For roadway segments positioned between two other segments (for example, Carp Road North extends from Highway 417 to Richardson Side Road), the segment length was based on the distance between the two other segments. For segments that are not positioned between two other segments (for example, Carp Road South), the segment was assumed to extend approximately one kilometre (km), for the purposes of this assessment. The roadway segments, as modelled, are illustrated in **Figure 3**.

2. Landfill Footprint Study Areas

The specific On-Site, Site-Vicinity, and Regional study areas for the Preferred Alternative Landfill Footprint at the WCEC are listed below:

On-Site ..... the lands owned or optioned by WM and required for the Preferred Alternative Landfill Footprint. The Site is bounded by Highway 417, Carp Road and Richardson Side Road;

Site-Vicinity..... the lands in the vicinity of the site including the Preferred Alternative Landfill Footprint, extending about 500 m in all directions; and,

Regional ..... the lands within approximately 3 to 5 km of the Site and the Preferred Alternative Landfill Footprint for those discipline that require a larger analysis area (i.e., socio-economic, odour, etc.).

The evaluation considered the potential impacts from the Site sources (see **Figure 3**) including the preferred alternative landfill footprint at 24 discrete receptor locations (see **Figure 2**), representing receptors of interest in the Site-Vicinity and the Regional study areas. The discrete receptor locations, considered in the dispersion model, include nearby residences, schools, businesses, and other sensitive receptor locations. These sensitive receptors are considered to be representative of any current or future developments in the area. For all cases, humans were assumed to be present at these receptors for 24 hours per day.

It should be noted that there are other receptors within the On-Site, Site-Vicinity and Regional study areas. However, for the purposes of evaluation, the closest/worst-case receptors in each direction were analyzed to determine potential effects. It is assumed that mitigation applicable to the closest/worst-case receptors would also apply to all other receptors as well.

In addition, the modelling was performed using a receptor grid covering the Site-Vicinity and Regional study areas. The receptor grid covers the lands within approximately 3 to 5 km of the WCEC sources.

It should be noted that since the Draft EA was issued in March 2012, WM obtained an agreement to purchase a parcel of land located south of Richardson Side Road, east of William Mooney Road, west of Carp Road in July 2012. Given this recent property acquisition, receptor R1 no longer applies to this impact assessment.

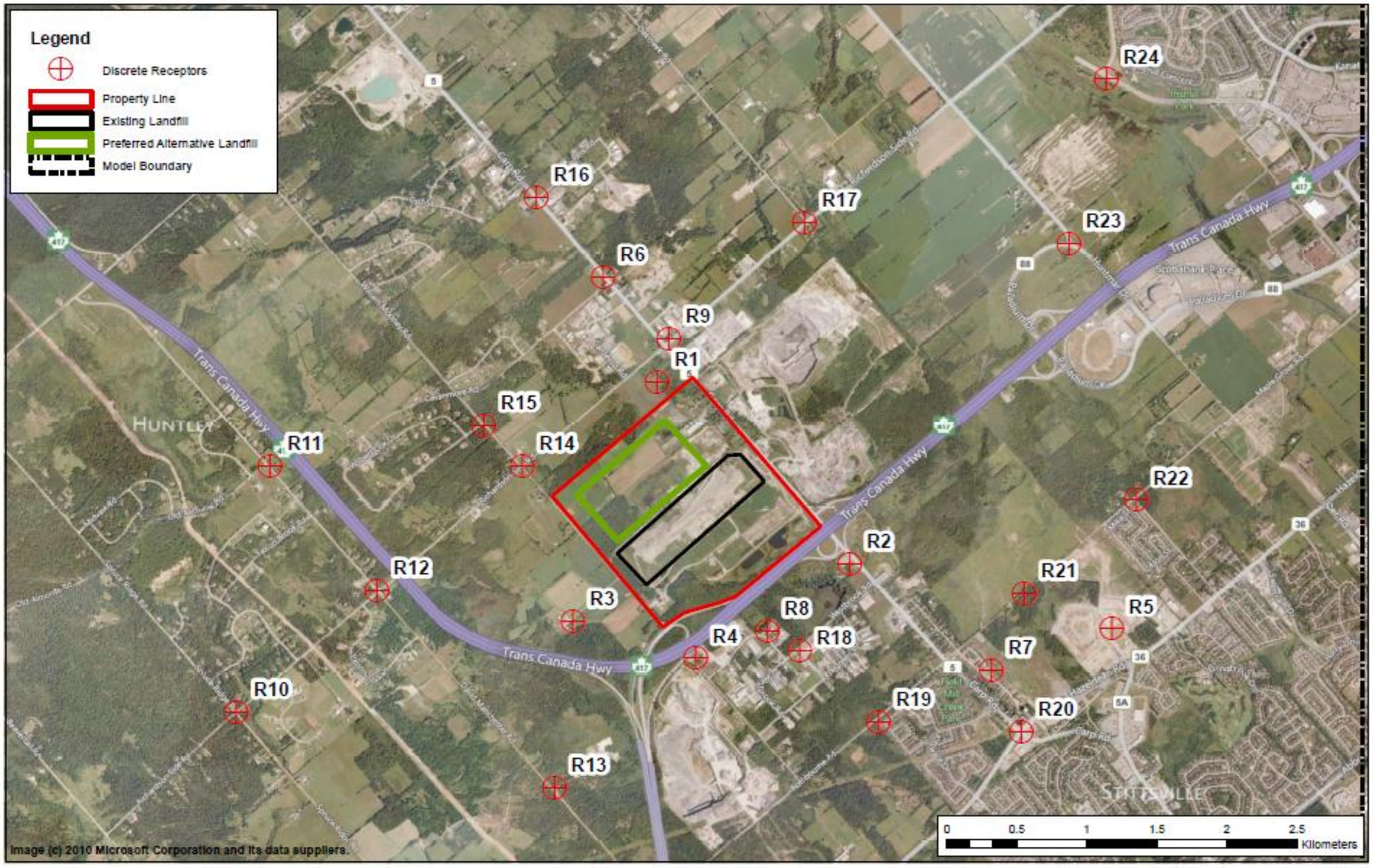


Figure 2. WCEC Landfill Site Plan

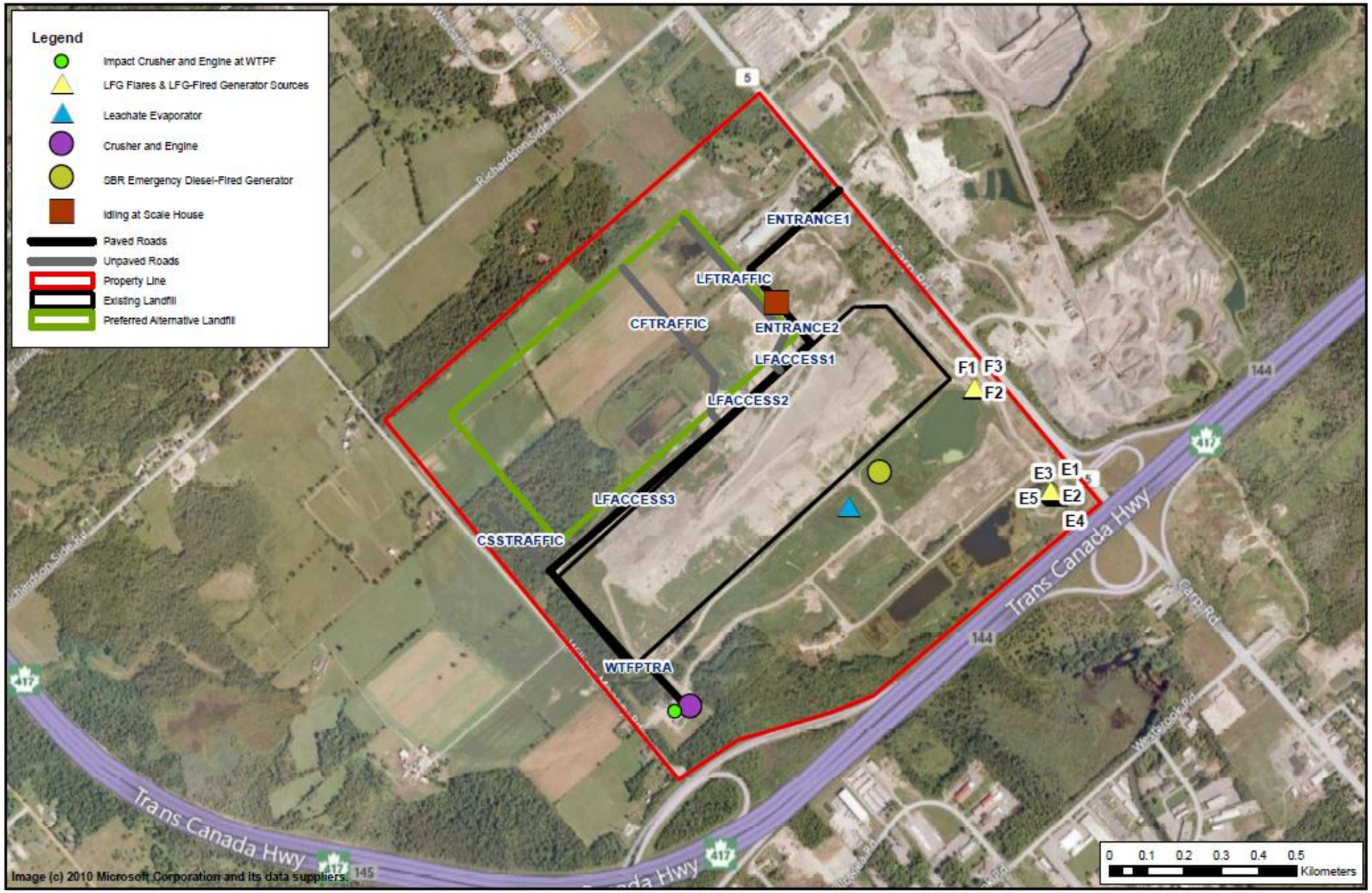


Figure 3. WCEC Landfill Site Plan including Modelled On-Site Combustion Sources

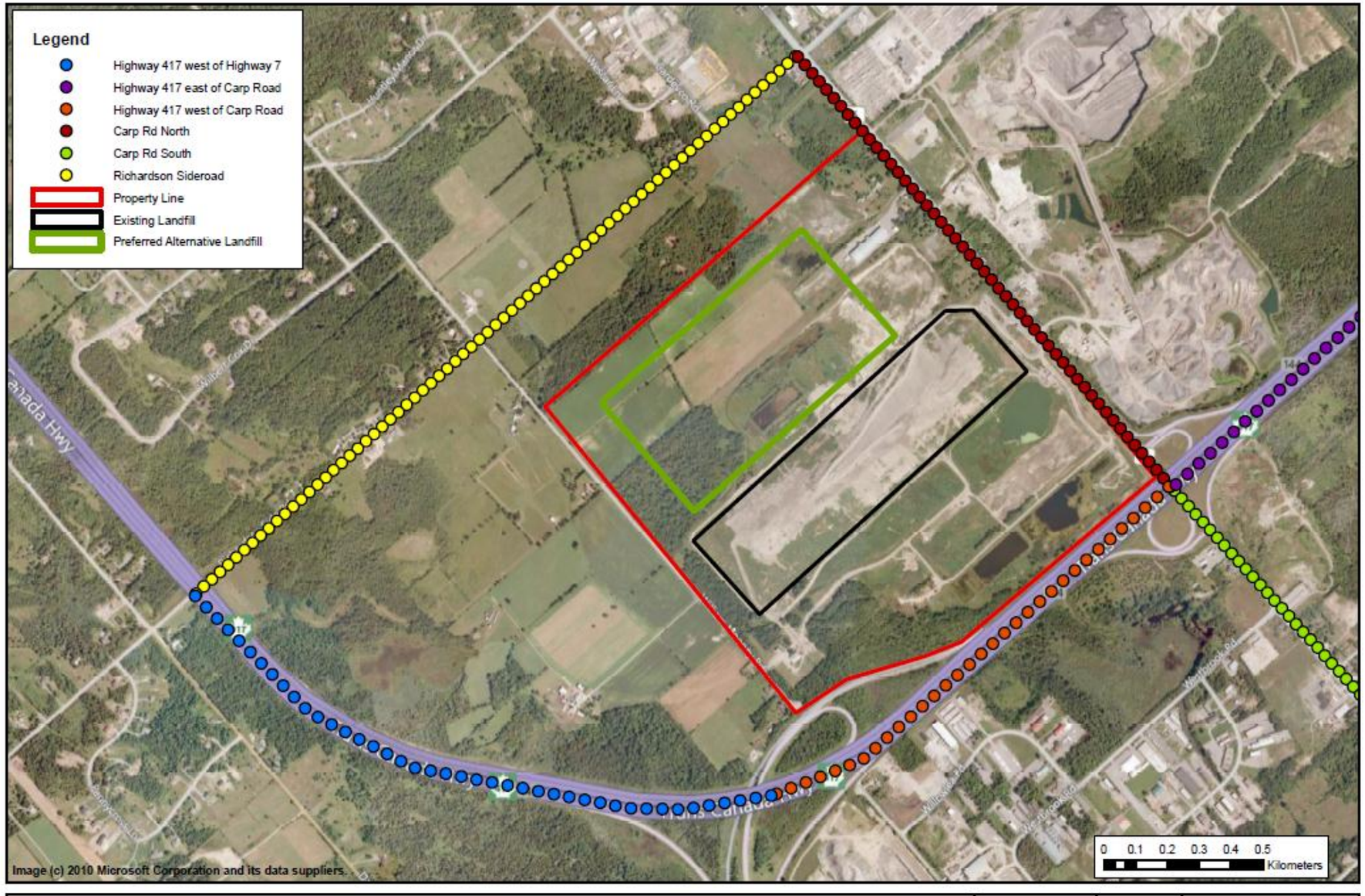


Figure 4. WCEC Landfill Site Plan including Modelled Off-Site Combustion Sources

3. Methodology

The assessment of impacts associated with the Preferred Alternative Landfill Footprint was undertaken through a series of steps that were based, in part, on two previously prepared reports (Atmospheric Existing Conditions Report – Haul Route Baseline Assessment and Atmospheric Environment Comparative Evaluation). The net effects associated with the four Alternative Landfill Footprint Options identified during the Alternative Methods phase of the EA were based on Conceptual Designs. These effects were reviewed within the context of the preliminary design plans developed for the Preferred Alternative Landfill Footprint. Additional investigations were then carried out, where necessary, to augment the previous work undertaken.

With these additional investigations in mind, the potential impact on the atmospheric environment of the Preferred Alternative Landfill Footprint was documented.

With a more detailed understanding of the atmospheric environment developed, the previously identified potential effects and recommended mitigation or compensation measures associated with the Preferred Alternative Landfill Footprint (documented in the Atmospheric Environment Comparative Evaluation Technical Report, September 2011) were reviewed to ensure their accuracy in the context of the preliminary design. Based on this review, the potential effects, mitigation or compensation measures, and net effects associated with the Preferred Alternative Landfill Footprint were confirmed and documented. In addition to identifying mitigation or compensation measures, potential enhancement opportunities associated with the preliminary design for the Preferred Alternative Landfill Footprint were also identified, where possible.

Following this confirmatory exercise, the requirement for monitoring in relation to net effects was identified, where appropriate. Finally, any atmospheric approvals required as part of the implementation of the Preferred Alternative Landfill Footprint were identified.

3.1 Assessment Scenario

The potential air quality impacts that would result from the construction and operation of the proposed preferred alternative landfill were assessed at the worst case future build stage of development. The worst case future build scenario assessed was the first operating year scenario (Year 2013), as described in Section 1.7.2. This operating condition was chosen as the worst case scenario because it has the highest traffic volumes and the haul routes to the landfill and construction working faces are positioned in worst case locations, in close proximity to the property boundary and discrete sensitive receptors.

The future build scenario was assessed by determining the combustion emissions from the significant on-site emission sources and from the predicted 2013 off-site traffic volumes and determining the potential off-site impacts through dispersion modelling.

In addition to the first operating year scenario, two proposed leachate management methods used to treat the leachate, as described in Section 1.7.5 were assessed: the preferred method (excluding leachate evaporator) and the contingency method (including leachate evaporator).

An overview of the modelling scenarios assessed in this study is presented in Table 4.

Table 4. Summary of Emission Sources Included in Each Landfill Gas Modelling Scenario

Leachate Management System	Future Build Scenarios Assessed	Sources Included in the Scenario														
		On-Site Roadways	Off-Site Roadways	Idling Vehicle s	LFG Engine #1 - CAT 3520	LFG Engine #2 - CAT 3520	LFG Engine #3 - CAT 3520	LFG Engine #4 - CAT 3520	LFG Engine #5 - CAT 3520	LFG Flare #1	LFG Flare #2	LFG Candlestick Flare #3	Leachate Management System Emergency Generator	Leachate Evaporator Stack	Secondary Impact Crusher Engine	Impact Crusher
Preferred Leachate Treatment Method	*First Operating Year (Year 2013)*	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Contingency Leachate Treatment Method	*First Operating Year (Year 2013)*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: X – Indicated source included in modelling scenario

3.2 Emission Rate Development

The emission rate development methodology for each source is presented in the following sections. Please refer to the Appendix section for additional details and sample calculations.

3.2.1 On-site Roadway Emissions

3.2.1.1 Traffic Volume Data

Emissions of CO NO_X from vehicles travelling along paved and unpaved roadways on-site were included in the Haul Route Detailed Impact Assessment. Estimated traffic volumes were provided by AECOM and assumed to be constant for all hours of the landfill operation and WTPF operation. The estimated traffic numbers were assigned reasonable on-site routes to

arrive at specific landfill destinations. These routes were divided into roadway segments. New roadway segments were created to account for a change in traffic volumes or road characteristics.

Table 5 provides a summary of the On-Site Haul Route Segments and their roadway characteristics. The traffic volumes and hourly distributions used for each on-site haul route segment are presented in Appendix A1.

Table 5. On-Site Haul Route Segments as Included in the Haul Route Detailed Impact Assessment

On-Site Haul Route Segment ID	Link Description	Link Length (m)	No. of Lanes
ENTRANCE1	Entrance to Landfill (East to West portion)	330	3
ENTRANCE2	Entrance to Landfill (North to South portion)	270	4
LFACCESS1	Landfill Access Road	115	2
LFTRAFFIC	From Landfill Access Road to the Landfill Active Stage	530	2
LFACCESS2	Landfill Access Road	220	2
CFTRAFFIC	From Landfill Access Road to the Construction Working Face	510	2
LFACCESS3	Landfill Access Road	610	2
CSSTRAFFIC	From Landfill Access Road to the Stockpiled Material (Contaminated Soil and Overburden)	235	2
WTPFTRAFFIC	From Landfill Access Road to WTPF	530	2

3.2.1.2 Tailpipe Emission Rates

The emissions from the tailpipe of a motor vehicle depend on a large number of factors, including the type, age, and weight of the vehicle, the mode of operation, the weather conditions, and the maintenance condition of the vehicle and of the road. The standard approach for estimating vehicular emissions is to use computer simulation techniques that are based on extensive previous testing of a wide range of vehicles. The most widely used software for this purpose was developed by the U.S. Environmental Protection Agency, and the latest version of the software is known as MOBILE6.2.

There is a Canadian version of the program, MOBILE6.2C, however the final version of the program has not been officially released. The MOBILE6.2 and MOBILE6.2C (draft version) programs were compared, based on default input values, with a vehicle speed of 100 km/hr for a horizon year of 2031. The results of the two programs were similar, with the MOBILE6.2 version producing slightly higher emission factors. Therefore MOBILE6.2 was applied in this assessment instead of the Canadian version.

Vehicular emission factors for CO, and NO_X were generated using MOBILE6.2. For the assessment of mobile sources, only typical vehicular emissions of CO and NO_X were evaluated.

Sample MOBILE6.2.C input and output files are included in Appendix A2. A summary of the key input parameters for the MOBILE6.2 model are presented in Table 6.

Table 6. MOBILE6.2 Input Parameters for On-Site Roadways

Input Parameter	Value
Pollutants	CO, NO_X
Operating Year	2013
Evaluation Month	January
Ambient Temperature	Minimum Daily Temperature = 4.5 °C Maximum Daily Temperature = 21 °C (Canadian Climate Normals, Ottawa)
Altitude	Low
Absolute Humidity	20 Grains / lb
Diesel Sulphur [1]	15 ppm
Particle Size	10 µm, 2.5 µm
Fuel Volatility	Reid Vapour Pressure (RVP) = 9 psi
Fuel Program	Conventional Gasoline East
Vehicle Speed	20 km/h

Note: [1]: The current on-road diesel sulphur limit 15 ppm.

There are 28 different vehicle types available in MOBILE6.2. The user may set the model to estimate emission factors for any combination of the vehicle types. By default, all of the available vehicle types were included.

Not all 28 vehicle types were used for the on-site traffic in this Detailed Impact Assessment, only those that best represent the vehicles used on the on-site haul routes. Only four of the vehicle types (HDDV6, HDDV7, HDDV8A and HDDV8B) were found to be representative of the haul trucks used in the WCEC operations. These four vehicle types were combined to into one group of Heavy Duty Vehicles (HDV) for the purposes of calculating emissions from the on-site haul routes. For each pollutant, emission factors for traveling vehicles were calculated for the HDV category. These emission factors for the traveling vehicles were converted to grams per vehicle km traveled (g/VKT) by multiplying the g/VMT factors by 1.61. A summary of the HDV emission factors calculated from MOBILE6.2 outputs is presented in Table 7. CO and NO_X emission rates are presented in Appendix A3.

Table 7. MOBILE6.2 Emission Factors by Pollutant Type and Vehicle Category

Pollutants	Emission Factors (g/VKT) HDV
CO	1.57
NO_X	3.57

Notes: VKT – Vehicle kilometre traveled
Vehicle particulate matter emission factors include exhaust, brake wear, and tire wear

The combustion emission factor for any given roadway segment at any given hour is a composite of the HDV emission factors, based on the relative percentage of heavy duty vehicles and transfer trailers. It should be noted that the emission factors listed in Table 7 are based on January ambient temperatures (minimum and maximum Climate Normals), which resulted in higher emission factors compared to warmer temperatures at other times of year. This is done to ensure that reasonable worst case emissions are considered in the Detailed Impact Assessment.

3.2.2 Idling Vehicles

Tailpipe CO and NO_X emissions were developed using the MOBILE6.2 emissions model. As MOBILE6.2 does not estimate combustion emissions for idling vehicles, the minimal input vehicle speed of 4 km/hr was used to estimate the idling emission rates. Otherwise, the same inputs provided in Table 6 of Section 3.2.1.2 were used. The same vehicles types, as used to develop the emission factors for traveling vehicles and referred to in Section 3.2.1.2, were used to develop the idling vehicle emission rates. For each pollutant, emission factors for idling vehicles were calculated for the HDV category. These emission factors for the traveling vehicles were converted to g/VKT by dividing the g/VMT factors by 1.61. To obtain the emission rate in grams per second, the emission factor was multiplied by the assumed 4 km traveled in the period of an hour.

Table 8. MOBILE6.2 Emission Factors by Pollutant Type and Vehicle Category

Pollutants	Idling Emission Factor (g/VKT) HDV
CO	3.32
NO_X	5.13

Idling emission rates are presented in Appendix A4.

3.2.2.1 Landfill Gas-Fired Generator

The landfill gas-fired generators emit CO, NO_X, and D&F as by-products of the combustion of LFG. The emission rates from the landfill gas-fired generators were based on source testing. The source testing conducted on the landfill gas-fired generators were completed and summarized in the “Stack Sampling Program” prepared by RWDI AIR Inc., in November 2010.

As a conservative approach, the generators were all assumed to be operating simultaneously at maximum capacity, 24 hours per day, 365 days per year.

Further details regarding the generators, including source testing results and emission rate calculations, are provided in Appendix B.

3.2.2.2 Landfill Gas Flares

The landfill flares emit CO, NO_X, and D&F as by-products of the combustion of LFG. Emission rates were calculated based on AP-42 Chapter 2.4 "Municipal Solid Waste Landfills" and source testing conducted on Flare 2. The source testing conducted on the flares were completed and summarized in the memo "Results of Stack testing on the Flare Stack, Carp Road Landfill, March Testing Program" prepared by RWDI AIR Inc., in June 2007.

As a conservative approach, the flares were all assumed to be operating simultaneously at maximum capacity, 24 hours per day, 365 days per year.

Further details regarding the flares, including source testing results and emission rate calculations, are provided in Appendix C.

3.2.2.3 SBR System (Preferred Leachate Management Method)

Emission rates of CO and NO_X for the SBR emergency diesel generator were calculated based on manufacturer's specifications. The emergency diesel generator was assumed not to be a significant contributor of D&F emissions.

As a conservative approach, the SBR emergency diesel generator was assumed to be operating at maximum capacity, 24 hours per day, 365 days per year.

The manufacturer's specifications are included in Appendix D.

3.2.2.4 SBR System and Leachate Evaporator (Contingency Leachate Management Method)

Emission rates of CO, NO_X, and D&F from the leachate evaporator were determined through the use of a source testing program. An emission sampling program was conducted on the exhaust system serving the leachate evaporator system currently installed and operating at WM's Glenn's Landfill site located in Maple City, Michigan. The leachate evaporator was processing approximately 20,000 gallons of leachate per day. This is equivalent to the amount that would be processed at the Ottawa Landfill site if this contingency leachate treatment method is proven to be the method with the least impact on the atmospheric environment.

The emission rates for the WCEC's leachate evaporator were calculated using the average emission results from the source testing of the Glenn's Landfill leachate evaporator. The equipment design parameters for the WCEC leachate evaporator, including the exhaust flow

rates, exhaust temperature, the leachate evaporator stack height and diameter, were assumed to be the same as those of the Glenn's Landfill leachate evaporator.

Please refer to Appendix E for full details on the leachate evaporator source testing and results, as found in the "Voluntary Source Testing Program (Leachate Evaporator), Waste Management of Canada", prepared by RWDI Air Inc., in 2011.

3.2.2.5 Impact Crusher Engine

One 300 horsepower diesel engine is associated with the impact crusher. Specifications for the specific unit to be used at the WCEC were not available, since the equipment has not yet been selected. Emission rates for the engine was based on emission factors from AP-42 Chapter 3.3, Gasoline and Diesel Industrial Engines, with exhaust parameters assumed based on typical units. Complete emission calculations for the generator can be found in Appendix F.

3.2.3 Off-Site Sources

3.2.3.1 Traffic Data

Traffic volumes for existing conditions on Carp Road and Richardson Side Road were provided by AECOM. The traffic data for Carp Road and Richardson Side Road were provided as hourly vehicle volumes.

Highway 417 traffic volumes for 2009 in the form of Average Annual Daily Traffic (AADT) and hourly distribution were provided by AECOM. Road traffic volumes for the various segment lengths of Highway 417 were taken from MTO Provincial Highways Traffic Volumes for 2006 to 2007. The most recent annual percent change in traffic volume based on data from MTO's AADT was applied to approximate the 2012 traffic volumes. Where an annual percent change was not available, a default target of 1% growth per year was applied per the City of Ottawa 2020 Transportation Master Plan. Where hourly distributions were not provided by AECOM, a typical distribution was used.

Historical road traffic volumes for the various segment lengths of Highway 417 and Highway 7 were taken from MTO Provincial Highways Traffic Volumes for 2006 to 2007. The most recent annual percent change in traffic volume based on data from MTO's AADT was applied to approximate the 2013 traffic volumes. Where an annual percent change was not available, a default target of 1% growth per year was applied as per City of Ottawa 2020 Transportation Master Plan. To estimate the future (2013) traffic volumes, a traffic growth value of 1% per year was applied. On-site traffic was added to the off-site roadways. It was assumed that 5% of the landfill and construction traffic would enter and exit the landfill from the north, traveling from

Richardson Road (West of Carp). The other 95% of the landfill and construction traffic were assumed to enter and exit the landfill from the south, 5% traveling south on Carp Road, past Highway 417, the other 95% getting on Highway 417 and traveling east of Carp Road.

Traffic volume data are summarized in Appendix G.

3.2.3.2 Tailpipe Emissions

As it was done for the on-site tailpipe emissions, the vehicular emission factors for CO and NO_X were generated using MOBILE6.2. Sample MOBILE6.2 input and output files are included in Appendix G. Key model inputs are summarized in Table 9.

Table 9. MOBILE6.2 Input Parameters for Off-Site Roadways

Input Parameter	Value
Pollutants	CO, NO_X
Operating Year	2013
Evaluation Month	January
Ambient Temperature	Minimum Daily Temperature = 4.5 °F Maximum Daily Temperature = 21 °F (Canadian Climate Normals, Ottawa)
Altitude	Low
Absolute Humidity	20 Grains / lb
Fuel Volatility	Reid Vapour Pressure (RVP) = 9 psi
Fuel Program	Conventional Gasoline East
Vehicle Speed	100 km/hr (Hwy. 417) 80 km/hr (Carp Road & Richardson Side Road)

In MOBILE6.2, the emission rates are generally projected to decrease over future years. This change in emission rates for a given vehicle category over time is due to fleet turnover, through which older vehicles built to less stringent emission standards are replaced by newer vehicles built to comply with more stringent standards. For this reason, the MOBILE6.2 model was set up to calculate emission rates for the year of 2013, as a conservative approach.

The emission rates for CO and NO_X from vehicle tailpipes vary with the speed at which the vehicle is travelling. Therefore, the vehicle speed for each roadway section was determined. The posted speed limits were assumed to represent the average vehicle speed along each roadway segment. For those roadways that had multiple posted speed limits, the maximum speed was used to develop the emission rates.

There are 28 different vehicle types available in MOBILE6.2. The user may set the model to estimate emission factors for any combination of the vehicle types. By default, all of the available vehicle types were included for the calculation of emissions from off-site traffic.

All of the 28 vehicle types were combined into three groups for the purpose of this study: Light Duty Vehicles (LDV), Medium Duty Vehicles (MDV), and Heavy Duty Vehicles (HDV). For each pollutant, a single emission factor was calculated for each of the LDV, MDV, and HDV categories. MOBILE6.2 produces emission factors in grams per vehicle mile traveled (g/VMT). The emissions factors calculated for the landfill and construction traffic were applied to the vehicles as they travelled on the off-site roads. These emission factors were converted to g/VKT by multiplying the g/VMT factors by 0.621.

A gram per second (g/s) emission rate was calculated for each hour of the day for each roadway segment. This emission rate is based on the tailpipe emission factor developed using MOBILE6.2 as well as the length of the roadway segment and the number of vehicles travelling upon it.

Further details regarding the haul route emission calculations are provided in Appendix G.

3.3 Dispersion Modelling

The criteria air contaminant impacts (CO, NO_X and D&F) from conditions at the WCEC facility under the future scenario were determined using a dispersion model and reasonable worst-case emission rates. The emission rates were determined as described in the preceding section. The U.S. EPA's AERMOD dispersion Model was used to predict maximum concentrations emitted from the WCEC preferred alternative existing landfill operations at various receptors in the vicinity.

The AERMOD model is an advanced dispersion model that has been approved for use in Ontario by the Ministry of the Environment (MOE). AERMOD is a steady-state Gaussian model that is capable of handling multiple emission sources. Within the model, receptor grids as well as discrete receptor locations of interest can be considered. The modelling assessment was conducted in accordance with MOE's Guideline A11: "Air Dispersion Modelling Guideline for Ontario", March 2009.

Electronic copies input and output modelling files are provided on a CD.

3.3.1 Compounds Modelled

To determine the impact from the haul routes and on-site combustion sources, three contaminants were modelled:

- carbon monoxide (CO);
- nitrogen oxides (NO_X); and
- dioxins and furans (D&F).

The three contaminants were modelled individually using their respective calculated emission rates for each of the sources included in the model.

3.3.2 Sources Modelled

The AERMOD dispersion model was used to predict potential maximum concentrations for the following source types:

- vehicles travelling along the on-site haul routes;
- idling vehicles;
- the landfill gas-fired engines;
- the LFG flares;
- the SBR emergency diesel-fired generator;
- the leachate evaporator;
- the impact crusher engine; and
- vehicles travelling along the adjacent off-site roadways.

The roadway sources were classified as line sources. Within the AERMOD model, each line source is treated as a series of volume sources. The idling vehicle source was modelled as a volume source. The stack sources were modelled as point sources.

3.3.3 Variable Emissions

As mentioned in the emission rate development section, many sources were not constantly emitting CO, NO_X and D&F. The on-site haul routes and the impact crusher engine were varied by the hour of day. These sources were assumed to be emitting while the facility was in operation and not emitting during other hours. The off-site roadways were also varied by the hour of day, in order to account for the hourly variation in traffic patterns on the off-site roadways. This was accounted for using the variable emission portion of AERMOD.

The point source emissions from the LFG flares, generator, leachate evaporator stack, and SBR emergency diesel fired generator were conservatively assumed to occur 24 hours per day, 365 days per year.

3.3.4 Meteorological Data

Five years of local meteorological data (2006-2010) were used in the AERMOD dispersion model. The meteorological data set was developed by the MOE's Environmental Monitoring and Reporting Branch (EMRB) for the WCEC. This dataset, however, was based on the MOE's

regional meteorological data for Eastern Ontario, which considers surface data from the Ottawa International Airport. The Ottawa Airport, which is located approximately 25 km away from the landfill, is the nearest weather station providing the desired meteorological parameters on an hourly basis. The EMRB adjusted the regional meteorological dataset to account for local land uses surrounding the WCEC facility. The data set provided by the EMBR was used directly in the dispersion model, with no changes or alterations conducted by RWDI.

Consultation on the meteorological dataset was conducted with Jinliang (John) Liu from the EMRB. As the meteorological dataset provided by the EMRB is still based on the regional data, rather than local data, a Section 13(1) request is not required.

3.3.5 Area of Modelling

To determine CO, NO_X and D&F impacts in the vicinity of the WCEC site, a multi-tiered receptor grid was developed with reference to Section 7.2 of the Air Dispersion Modelling Guideline for Ontario, Version 2.0, March 2009. In this receptor grid the interval spacing was dependent on the receptor distance from on-site sources. The interval spacing was as follows:

- Tier 1: 20 m spacing a minimum of 200 m from each source;
- Tier 2: 50 m spacing up to 300 m from Tier 1;
- Tier 3: 100 m spacing up to 500 m from Tier 2;
- Tier 4: 200 m spacing up to 1,000 m from Tier 3; and,
- Tier 5: 500 m spacing up to 3,000 m from Tier 4.

The property line of the WCEC Landfill facility was defined in the AERMOD dispersion model. In addition to the gridded receptors, discrete receptors were placed along the property line at 10 m intervals. Those receptors in the aforementioned grid that fell within the WCEC Landfill property line were eliminated from consideration in the modelling. Each receptor in this grid was positioned at grade level. This approach is consistent with MOE Air Dispersion Modelling Guideline for Ontario, Version 2.0, March 2009. The receptor grid was used to develop contour plots of maximum predicted concentrations and to assess compliance for CO, NO_X and D&F.

To realistically assess impacts at the property line at the intersection with the landfill site entrance, all receptors within 1.5 road widths (16.9 m) of this intersection were removed. This approach was previously approved by the MOE for other projects.

The evaluation also considered the potential impacts from the preferred alternative landfill conditions at 24 sensitive receptor locations (See Figure 2). For all cases, humans were assumed to be present at these receptors for 24-hours per day.

3.3.6 Terrain Data

Terrain information for the area surrounding the existing WCEC Landfill was obtained from the MOE Ontario Digital Elevation Model Data web site. The terrain data are based on the North American Datum 1983 (NAD83) horizontal reference datum. These data were run through the AERMAP terrain pre-processor to estimate base elevations for receptors and to help the model account for changes in elevation of the surrounding terrain.

3.3.7 Building Information

The Building Profile Input Program (BPIP) is used to calculate the effects of building downwash on point sources, such as stacks. The proposed leachate evaporator enclosure, the landfill-gas-to-energy building and the flare building were included in the modelling, as these structures have the potential to affect emissions from the leachate evaporator, engines and flares. The BPIP model was run prior to running the AERMOD model in order to incorporate the potential building downwash effects.

The potential building downwash effects were only evaluated for the point sources within the dispersion model. Although the existing and proposed preferred alternative landfill mounds may be considered “structures”, dispersion modelling tests were completed including these landfill mound “structures” and it was found that the effects of mound downwash have insignificant impacts on the maximum off-site concentrations. The effects of the mound downwash are insignificant as the sloping features of the mound do not act as a solid block building.

3.3.8 Averaging Periods Used

Emissions were modelled for 1-hour, 8-hour and 24-hour averaging times, to correspond with the AAQC Limits for the various compounds.

4. Additional Investigations

The off-site traffic is the main source of CO and NO_X emissions in the vicinity of the WCEC. No additional investigations of off-site sources of combustion emissions were conducted.

5. Detailed Description of the Environment Potentially Affected

This section describes the predicted air quality impacts that would result from the construction and operation of the proposed preferred alternative landfill. There are two proposed leachate management systems: the preferred leachate management system and the contingency leachate management system. The only difference between the two leachate management systems is the evaporator stack. For the Haul Route Detailed Impact Assessment, the leachate evaporator is a minor source; therefore the results for the preferred and contingency scenarios are essentially the same. Only the results for the contingency scenario (which includes the leachate evaporator stack) have been presented in this section.

5.1 On-Site and in the Vicinity

The maximum predicted concentrations for all of the compounds of interest predicted at off-site locations at or beyond the property line of the WCEC site are summarized in Table 10.

Table 10. Summary of Maximum Predicted Concentrations Off-site

CAS #	Compound	Averaging Period (hours)	MOE AAQC/ Standard ($\mu g/m^3$)	WCEC Sources		Off-Site Sources		WCEC & Off-Site Sources	
				Maximum Predicted Concentrations ($\mu g/m^3$)	Percentage of the AAQC (%)	Maximum Predicted Concentrations ($\mu g/m^3$)	Percentage of the AAQC (%)	Maximum Predicted Concentrations ($\mu g/m^3$)	Percentage of the AAQC (%)
630-08-0	Carbon Monoxide (CO)	1	36,200	738	2.0%	7,541	21%	7,752	21%
		8	15,700	595	3.8%	2,287	15%	2,442	16%
10102-44-0	Nitrogen Oxides (NOx)	1	400	234	58%	**1,523**	**381%**	**1,560**	**390%**
		24	200	84	42%	**263**	**132%**	**289**	**145%**
n/a	Dioxins, Furans and Dioxin-like PCBs (D&F)	24	1.00E-07 TEQ	1.02E-08	10%	n/a	n/a	1.02E-08	10%

Although the maximum predicted NO_X concentrations exceed the AAQC at certain off-site locations, these exceedances are driven by the off-site traffic. The maximum predicted NO_X concentrations from WCEC sources are all well within the AAQC for each compound. The maximum predicted CO and D&F concentrations are less than the AAQC when the WCEC and off-site traffic are combined.

5.2 Discrete Receptors

Dispersion modelling analysis was completed for CO, NO_X, and D&F at each of the 24 discrete receptors. Detailed summary tables for the predicted maximum concentration at each of the 24 sensitive receptors for are presented for each contaminant and averaging period.

Table 11 presents the maximum predicted 1-hour CO concentrations at each discrete receptor location. The CO concentrations were predicted to not exceed the 1-hour AAQC at any of the receptors for the first year of operation scenario. The maximum predicted 1-hour average concentration from WCEC sources is 146 µg/m^3, occurring at Receptor 2. The maximum predicted 1-hour average concentration from off-site and WCEC sources combined was 2,869 µg/m^3, occurring at Receptor 4.

Table 11. Maximum Predicted 1-Hour CO Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)
1	113	0.3%	972	3%	997	3%
2	**146**	**0.4%**	2465	7%	2780	8%
3	103	0.3%	854	2%	901	2%
4	118	0.3%	**2865**	**8%**	**2869**	**8%**
5	76	0.2%	409	1%	414	1%
6	82	0.2%	663	2%	933	3%
7	91	0.3%	691	2%	805	2%
8	122	0.3%	1910	5%	1930	5%
9	99	0.3%	1123	3%	1132	3%
10	70	0.2%	586	2%	617	2%
11	84	0.2%	602	2%	604	2%
12	81	0.2%	2254	6%	2255	6%
13	88	0.2%	1250	3%	1281	4%
14	102	0.3%	1065	3%	1069	3%
15	95	0.3%	516	1%	614	2%
16	74	0.2%	399	1%	544	2%
17	83	0.2%	447	1%	451	1%
18	116	0.3%	1052	3%	1058	3%
19	106	0.3%	585	2%	599	2%
20	85	0.2%	675	2%	831	2%
21	85	0.2%	635	2%	640	2%
22	72	0.2%	418	1%	446	1%
23	71	0.2%	654	2%	662	2%
24	61	0.2%	286	1%	292	1%

Note: The carbon monoxide 1-hour AAQC is 36,200 µg/m^3

Table 12 presents the maximum predicted 8-hour CO concentrations at each discrete receptor location. CO concentrations were predicted to not exceed the 8-hour AAQC at any of the

receptors for the first year of operation scenario. The maximum predicted 8-hour average concentration from WCEC sources is 72 μg/m^3, occurring at Receptor 2. The maximum predicted 1-hour average concentration from off-site and WCEC sources combined was 937 μg/m^3, occurring at Receptor 4.

Table 12. Maximum Predicted 8-Hour CO Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration (μg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (μg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (μg/m^3)	Percentage of the Limit (%)
1	45	0.3%	221	1%	250	2%
2	**72**	**0.5%**	833	5%	841	5%
3	47	0.3%	353	2%	355	2%
4	37	0.2%	**935**	**6%**	**937**	**6%**
5	25	0.2%	115	1%	118	1%
6	22	0.1%	117	1%	159	1%
7	30	0.2%	157	1%	165	1%
8	56	0.4%	448	3%	476	3%
9	29	0.2%	351	2%	402	3%
10	16	0.1%	144	1%	149	1%
11	23	0.1%	129	1%	132	1%
12	25	0.2%	610	4%	613	4%
13	24	0.2%	253	2%	265	2%
14	34	0.2%	289	2%	290	2%
15	29	0.2%	152	1%	163	1%
16	21	0.1%	79	1%	100	1%
17	38	0.2%	101	1%	118	1%
18	37	0.2%	306	2%	316	2%
19	27	0.2%	187	1%	193	1%
20	30	0.2%	93	1%	113	1%
21	25	0.2%	198	1%	201	1%
22	33	0.2%	147	1%	166	1%
23	24	0.2%	136	1%	156	1%
24	21	0.1%	59	0.4%	62	0.4%

Note: The carbon monoxide 24-hour AAQC is 15,700 μg/m^3

Table 13 presents the maximum predicted 1-hour NO_X concentrations at each discrete receptor location. NO_X concentrations were predicted to exceed the 1-hour AAQC at three of the receptors based on off-site sources. No exceedances of the 1-hour AAQC for NO_X are predicted based on WCEC sources. The maximum predicted 1-hour average NO_X concentration was 577 μg/m^3 at Receptor 4. Concentrations predicted at Receptor 2 and Receptor 12 are also exceeding the 1-hour AAQC.

It is important to note that the predicted impacts at the receptors where exceedances are predicted are based mainly on the contribution from the off-site roadways. The WCEC sources are contributing only a small percentage of the maximum predicted impact at these receptors.

Table 13. Maximum Predicted 1-Hour NO_X Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration ($\mu g/m^3$)	Percentage of the Limit (%)	Maximum Predicted Concentration ($\mu g/m^3$)	Percentage of the Limit (%)	Maximum Predicted Concentration ($\mu g/m^3$)	Percentage of the Limit (%)
1	48	12%	187	47%	193	48%
2	**68**	**17%**	**424**	**106%**	**485**	**121%**
3	83	21%	176	44%	190	48%
4	77	19%	**576**	**144%**	**577**	**144%**
5	29	7%	77	19%	91	23%
6	38	10%	118	30%	170	42%
7	31	8%	102	25%	123	31%
8	84	21%	390	98%	394	99%
9	44	11%	168	42%	195	49%
10	37	9%	120	30%	144	36%
11	37	9%	119	30%	119	30%
12	46	12%	**452**	**113%**	**452**	**113%**
13	73	18%	255	64%	260	65%
14	54	13%	146	37%	148	37%
15	48	12%	93	23%	123	31%
16	27	7%	72	18%	100	25%
17	32	8%	86	21%	87	22%
18	75	19%	210	53%	211	53%
19	50	12%	116	29%	117	29%
20	34	8%	108	27%	136	34%
21	34	9%	118	30%	127	32%
22	27	7%	81	20%	106	27%
23	34	8%	134	33%	135	34%
24	28	7%	58	14%	59	15%

Note: The nitrogen oxides 1-hour AAQC is 400 $\mu g/m^3$

Table 14 presents the maximum predicted 24-hour NO_X concentrations at each discrete receptor location. NO_X concentrations were predicted to not exceed the 24-hour AAQC at any of the receptors for the first year of operation scenario. The maximum predicted 24-hour average concentration from WCEC sources is 12 $\mu g/m^3$, occurring at both Receptor 2 and Receptor 4. The maximum predicted 24-hour average concentration from off-site and WCEC sources combined was 97 $\mu g/m^3$, occurring at Receptor 4.

Table 14. Maximum Predicted 24-Hour NO_X Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg/m^3)	Percentage of the Limit (%)
1	5	3%	26	13%	32	16%
2	**12**	**6%**	70	35%	71	36%
3	10	5%	43	22%	43	22%
4	**12**	**6%**	**97**	**48%**	**97**	**49%**
5	5	3%	12	6%	17	9%
6	5	3%	10	5%	13	7%
7	4	2%	15	7%	19	9%
8	8	4%	52	26%	54	27%
9	5	2%	36	18%	43	22%
10	3	2%	12	6%	15	7%
11	3	2%	10	5%	13	6%
12	5	3%	59	29%	60	30%
13	4	2%	20	10%	22	11%
14	5	2%	26	13%	28	14%
15	4	2%	14	7%	15	7%
16	3	1%	7	3%	9	4%
17	5	2%	11	6%	13	7%
18	8	4%	29	14%	30	15%
19	5	2%	13	6%	14	7%
20	4	2%	10	5%	11	6%
21	5	2%	18	9%	23	11%
22	4	2%	14	7%	17	8%
23	3	1%	12	6%	14	7%
24	3	1%	5	3%	8	4%

Note: The nitrogen oxides 24-hour AAQC is 200 µg/m^3

Table 15 presents the maximum predicted 24-hour D&F concentrations at each discrete receptor location. D&F concentrations were predicted to not exceed the 24-hour AAQC / standard at any of the receptors.

Table 15. Maximum Predicted 24-Hour D&F Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration (µg TEQ / m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg TEQ / m3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg TEQ / m3)	Percentage of the Limit (%)
1	3.90E-10	0.4%	0.00E+00	0.0%	3.90E-10	0.4%
2	**1.54E-09**	**1.5%**	0.00E+00	0.0%	**1.54E-09**	**1.5%**
3	4.00E-10	0.4%	0.00E+00	0.0%	4.00E-10	0.4%
4	3.80E-10	0.4%	0.00E+00	0.0%	3.80E-10	0.4%
5	3.00E-10	0.3%	0.00E+00	0.0%	3.00E-10	0.3%

Table 15. Maximum Predicted 24-Hour D&F Concentrations at Discrete Receptors for Contingency Leachate Management System

Receptor No.	WCEC Sources Only		Off-Site Sources Only		WCEC and Off-Site Sources	
	Maximum Predicted Concentration (µg TEQ / m^3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg TEQ / m3)	Percentage of the Limit (%)	Maximum Predicted Concentration (µg TEQ / m3)	Percentage of the Limit (%)
6	1.80E-10	0.2%	0.00E+00	0.0%	1.80E-10	0.2%
7	3.50E-10	0.4%	0.00E+00	0.0%	3.50E-10	0.4%
8	6.50E-10	0.7%	0.00E+00	0.0%	6.50E-10	0.7%
9	2.40E-10	0.2%	0.00E+00	0.0%	2.40E-10	0.2%
10	1.70E-10	0.2%	0.00E+00	0.0%	1.70E-10	0.2%
11	3.00E-10	0.3%	0.00E+00	0.0%	3.00E-10	0.3%
12	2.20E-10	0.2%	0.00E+00	0.0%	2.20E-10	0.2%
13	2.30E-10	0.2%	0.00E+00	0.0%	2.30E-10	0.2%
14	4.80E-10	0.5%	0.00E+00	0.0%	4.80E-10	0.5%
15	3.10E-10	0.3%	0.00E+00	0.0%	3.10E-10	0.3%
16	1.30E-10	0.1%	0.00E+00	0.0%	1.30E-10	0.1%
17	3.40E-10	0.3%	0.00E+00	0.0%	3.40E-10	0.3%
18	6.90E-10	0.7%	0.00E+00	0.0%	6.90E-10	0.7%
19	3.30E-10	0.3%	0.00E+00	0.0%	3.30E-10	0.3%
20	2.40E-10	0.2%	0.00E+00	0.0%	2.40E-10	0.2%
21	4.30E-10	0.4%	0.00E+00	0.0%	4.30E-10	0.4%
22	2.00E-10	0.2%	0.00E+00	0.0%	2.00E-10	0.2%
23	2.50E-10	0.3%	0.00E+00	0.0%	2.50E-10	0.3%
24	2.10E-10	0.2%	0.00E+00	0.0%	2.10E-10	0.2%

Note: The dioxin and furan 24-hour AAQC and O. Reg. 419/05 Schedule 3 standard is 1.00E-07 µg TEQ / m^3

6. Environmental Air Quality Net Effects

As mentioned, the previously identified potential effects and recommended mitigation or compensation measures associated with the selection of the Preferred Alternative Landfill Footprint were reviewed to ensure their accuracy in the context of the preliminary design of the Preferred Alternative Landfill Footprint, based on the more detailed understanding of the atmospheric environment developed through the additional investigations. With this in mind, the confirmed potential effects, mitigation or compensation measures, and net effects are summarized in Table 16 and described in further detail in the sections below.

6.1 Potential Effects on Atmospheric Environment

Through comparison of the modelling results from the baseline condition and the conditions presented due to the preferred alternative landfill, it is possible to determine the net effect of the proposed landfill expansion on the Site Vicinity and community based discrete receptors. The impact of the expansion is evaluated based on the maximum predicted concentration.

For CO and D&F the predicted impacts do not exceed the applicable AAQC at any off-site location. The 1-hour NO_X is predicted to exceed the AAQC at off-site locations, including 3 of the discrete receptor locations. The 24-hour NO_X is predicted to exceed the AAQC at some off-site locations; however, it is not predicted to exceed the AAQC at any of the discrete receptor locations.

The predicted NO_X exceedances are a product of the high traffic volumes along off-site roadways, especially the 417 Highway. Exceedances of the 1-hour NO_X AAQC from time-to-time are not unexpected at locations near a 400-series highway in Ontario. The contribution from WCEC sources to the predicted NO_X exceedances is low. Consequently, the impact of the expansion is considered low at all discrete receptors for all future build scenarios.

6.2 Additional Mitigation and/or Compensation Measures

The following additional mitigation measures were recommended and may be undertaken, but are not limited to:

- Minimizing on-site idling of vehicles
- Routine monitoring for waste vehicles arriving to the site in unfit or un-maintained conditions
- Proper staging and planning for internal vehicles arriving at the site and site sequencing

6.3 Potential Impacts on the Environment with Additional Mitigation Measures

The predicted environmental impacts of CO and NO_X are largely dominated by the presence of traffic on off-site roadways; therefore, the additional mitigation measures for WCEC sources are not expected to have a significant impact on off-site concentrations. The predicted environmental impacts of D&F are dominated by WCEC sources; however, the maximum predicted concentrations of D&F represent only a small percentage of the AAQC. The proposed mitigation measures are not expected to have a significant impact on the D&F emissions from on-site sources.

6.4 Net Effects

Through comparison of the modelling results from the WCEC sources, the off-site roadways, and the combination of the WCEC and off-site roadways, it is possible to determine the net

effect of the proposed landfill expansion on the community based discrete receptors. The impact of the expansion is evaluated based on the maximum predicted concentration. The predicted concentrations at the discrete receptors do not exceed the AAQC for CO, D&F, or 24-hour NO_X. Although exceedances are predicted for 1-hour NO_X at three of the discrete receptor locations, these exceedances are a result of off-site traffic, with only a minor contribution from WCEC sources. Consequently, the impact of the expansion is considered low at all discrete receptors for all future build scenarios. A summary of the net effects is presented in Table 16. The net effects discussed in this table are based on the WCEC contribution only.

Table 16. Potential Effects, Proposed Mitigation and Compensation Measures, and Resulting Net Effects

ID #	Potential Effect – WCEC Sources	Mitigation/ Compensation	Net Effect
1.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria	The following additional mitigation measures were recommended and may be undertaken: • Minimizing on-site idling of vehicles • Routine monitoring for waste vehicles arriving to the site in unfit or un-maintained conditions • Proper staging and planning for internal vehicles arriving at the site and site sequencing	• Further reduced haul route impacts
2.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
3.	• No predicted exceedances, maximum predicted concentration less than 25% of the air quality criteria		• Further reduced haul route impacts
4.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
5.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
6.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
7.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
8.	• No predicted exceedances, maximum predicted concentration less than 25% of the air quality criteria		• Further reduced haul route impacts
9.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
10.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
11.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
12.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts

ID #	Potential Effect – WCEC Sources	Mitigation/ Compensation	Net Effect
13.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
14.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
15.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
16.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
17.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
18.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
19.	• No predicted exceedances, maximum predicted concentration less than 20% of the air quality criteria		• Further reduced haul route impacts
20.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
21.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
22.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
23.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts
24.	• No predicted exceedances, maximum predicted concentration less than 10% of the air quality criteria		• Further reduced haul route impacts

7. Impact Analysis of Other WCEC Facilities

The WTPF facility and the LGTE facilities were included in the assessment of the haul route combustion impacts. None of the other WCEC facilities have associated CO, NO_X, or D&F emissions discharged to the atmosphere. Therefore, the other WCEC facilities do not contribute to the potential impacts effects of the construction and operation of the preferred alternative landfill and an impact analysis of the other WCEC facilities was not performed in this Haul Route Detailed Impact Assessment.

8. Monitoring and Commitments for the Undertaking

To ensure that the mitigation measures identified in **Section 7** are implemented as envisioned, a strategy and schedule was developed for monitoring environmental effects. With these mitigation or compensation measures and monitoring requirements in mind, commitments have also been proposed for ensuring that they are carried out as part of the construction, operation, and maintenance of the landfill.

8.1 Monitoring Strategy and Schedule

As mentioned, a monitoring strategy and schedule was developed based on the Atmospheric Impact Assessment carried out for the Preferred Alternative Landfill Footprint to ensure that (1) predicted net negative effects are not exceeded, (2) unexpected negative effects are addressed, and (3) the predicted benefits are realized.

8.1.1 Environmental Effects Monitoring

Based on the results of the dispersion modelling assessment, no monitoring is recommended, since impacts from WCEC-related activities are relatively minor.

8.1.2 Development of an Environmental Management Plan

An Environmental Management Plan (EMP) or Plans will be prepared following approval of the undertaking by the Minister of the Environment and prior to construction. The EMP will include a description of the proposed mitigation measures, commitments, and monitoring.

8.2 Commitments

The following commitments have been proposed for ensuring that the identified mitigation or compensation measures and monitoring requirements are carried out as part of the construction, operation, and maintenance of the undertaking:

a) Increase stack height of leachate evaporator stack to a minimum of 22 m above grade, should the contingency leachate management system be installed.

9. Environmental Air Quality Approvals Required for the Undertaking

WM currently has ECA approvals #7816-7C9JMR and #7025-7F4PN5 in place, covering the operation of their flares, the current configuration of the landfill gas-fired engines, and an emergency diesel generator. WM also has additional ECAs under review by the MOE to cover the SBR leachate treatment process as well as amendments to the landfill gas-fired engines. WM may need to seek additional approvals or amend or consolidate their existing ECAs to incorporate future changes at the facility, which may include:

- Proposed landfill expansion operations;
- Installation of the leachate evaporator;
- Potential modifications to the configuration of the landfill gas-fired engines or flares; and,
- Development of any of the other on-site diversion facilities.

Some sources, such as the emergency diesel generators, may need to be registered under the MOE's Environmental Activities and Sector Registry.

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10. References

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Tables

WCEC Source Summary Table: Combustion

RWDI Project #1100798

Source ID [1]	Source Type [1]	Source Description	Source Data								Emission Data				
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temp. (ºC)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	% of Overall Emissions (%)
E1	Point	LFG Engine #1 - CAT 3520	6.48	445	0.4	51.6	13.4	5.5	424756	5014676	Carbon Monoxide	630-08-0	3.00E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.20E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	2.70E-11	24	7%
E2	Point	LFG Engine #2 - CAT 3520	6.48	445	0.4	51.6	13.4	5.5	424760	5014671	Carbon Monoxide	630-08-0	3.00E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.20E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	2.70E-11	24	7%
E3	Point	LFG Engine #3 - CAT 3520	6.48	445	0.4	51.6	13.4	5.5	424764	5014667	Carbon Monoxide	630-08-0	3.00E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.20E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	2.70E-11	24	7%
E4	Point	LFG Engine #4 - CAT 3520	6.48	445	0.4	51.6	13.4	5.5	424768	5014663	Carbon Monoxide	630-08-0	3.00E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.20E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	2.70E-11	24	7%
E5	Point	LFG Engine #5 - CAT 3520	6.48	445	0.4	51.6	13.4	5.5	424772	5014660	Carbon Monoxide	630-08-0	3.00E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.20E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	2.70E-11	24	7%
F1	Point	LFG Flare #1	31.3	871	2.1	9.0	12.19	n/a	424557	5014950	Carbon Monoxide	630-08-0	3.42E+00	1 & 8	6%
											Nitrogen Oxides	10102-44-0	1.85E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	8.80E-11	24	22%
F2	Point	LFG Flare #2	57.3	900	2.7	10.0	12.2	n/a	424551	5014946	Carbon Monoxide	630-08-0	6.24E+00	1 & 8	12%
											Nitrogen Oxides	10102-44-0	1.85E-01	1 & 24	2%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	8.80E-11	24	22%
F3	Point	Candlestick LFG Flare	1.0	900	0.2	31.8	10.4	n/a	424551	5014952	Carbon Monoxide	630-08-0	6.00E+00	1 & 8	11%
											Nitrogen Oxides	10102-44-0	3.25E-01	1 & 24	3%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	8.80E-11	24	22%
EVAP [1]	Point	Leachate Evaporator Stack	13.3	84	0.9	19.1	22	1	424216	5014634	Carbon Monoxide	630-08-0	1.45E+00	1 & 8	3%
											Nitrogen Oxides	10102-44-0	5.00E-02	1 & 24	<1%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	1.00E-11	24	2%
LEACHGEN	Point	Emergency Diesel-Fired Generator for SBR	1.23	432	0.2	39.2	3.1	0.1	424298	5014726	Carbon Monoxide	630-08-0	7.80E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	6.30E-01	1 & 24	6%
CR_ENG	Point	Impact Crusher Diesel Engine	0.555	600	0.12	49.100	2	N/A	423800	5014110	Carbon Monoxide	630-08-0	2.52E-01	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.17E+00	1 & 24	11%
ENTRANCE1 [3]	Line Volume	On-Site Roadway: Entrance	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	1.05E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.39E-02	1 & 24	<1%
ENTRANCE2 [3]	Line Volume	On-Site Roadway: Entrance	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	8.58E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.95E-02	1 & 24	<1%
LFACCESS1 [3]	Line Volume	On-Site Roadway: Landfill Access Road, to Landfill Active Stage Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	3.65E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	8.31E-03	1 & 24	<1%
LFTRAFFIC [3]	Line Volume	On-Site Roadway: Landfill Active Stage Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	5.30E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.21E-02	1 & 24	<1%
LFACCESS2 [3]	Line Volume	On-Site Roadway: Landfill Access Road, to Construction Working Stage Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	5.55E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.26E-02	1 & 24	<1%
CFTRAFFIC [3]	Line Volume	On-Site Roadway: Construction Working Stage Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	3.99E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	9.09E-03	1 & 24	<1%
LFACCESS3 [3]	Line Volume	On-Site Roadway: Landfill Access Road, to Contaminated Soil Stockpile Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	1.11E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	2.54E-02	1 & 24	<1%
CSSTRAFFIC [3]	Line Volume	On-Site Roadway: Contaminated Soil Stockpile Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	7.16E-04	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.63E-03	1 & 24	<1%
WTPFTRAFFIC [3]	Line Volume	On-Site Roadway: WTPF Haul Route	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	8.07E-03	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	1.84E-02	1 & 24	<1%
CARP_NN [3]	Line Volume	Carp Road - North of Hwy 417, North of Landfill Entrance	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	1.28E+00	1 & 8	2%
											Nitrogen Oxides	10102-44-0	2.27E-01	1 & 24	2%
CARP_NS [3]	Line Volume	Carp Road - North of Hwy 417, South of Landfill Entrance	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	2.26E+00	1 & 8	4%
											Nitrogen Oxides	10102-44-0	4.20E-01	1 & 24	4%

WCEC Source Summary Table: Combustion

RWDI Project #1100798

Source ID [1]	Source Type [1]	Source Description	Source Data								Emission Data				
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temp. (ºC)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	% of Overall Emissions (%)
CARP_S [3]	Line Volume	Carp Road - South of Hwy 417	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	3.45E+00	1 & 8	6%
											Nitrogen Oxides	10102-44-0	5.21E-01	1 & 24	5%
RSROAD [3]	Line Volume	Richardson Side Road from Carp to 417	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	2.15E+00	1 & 8	4%
											Nitrogen Oxides	10102-44-0	4.93E-01	1 & 24	5%
417_W7 [3]	Line Volume	Highway 417 - West of Highway 7	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	1.03E+01	1 & 8	19%
											Nitrogen Oxides	10102-44-0	2.07E+00	1 & 24	19%
417WCARP [3]	Line Volume	Highway 417 - West of Carp Road	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	7.56E+00	1 & 8	14%
											Nitrogen Oxides	10102-44-0	1.52E+00	1 & 24	14%
417ECARP [3]	Line Volume	Highway 417 - East of Carp	N/A	N/A	N/A	N/A	N/A	N/A	varies	varies	Carbon Monoxide	630-08-0	8.84E+00	1 & 8	17%
											Nitrogen Oxides	10102-44-0	1.87E+00	1 & 24	17%
IDLING [3]	Volume	Idling Vehicles	N/A	N/A	N/A	N/A	N/A	N/A	424021	5015181	Carbon Monoxide	630-08-0	2.24E-02	1 & 8	<1%
											Nitrogen Oxides	10102-44-0	3.47E-02	1 & 24	<1%
Total	--	--	--	--	--	--	--	--	--	--	Carbon Monoxide	630-08-0	5.35E+01	1 & 8	100%
											Nitrogen Oxides	10102-44-0	1.09E+01	1 & 24	100%
											Dioxins, Furans and Dioxin-like PCBs [2]	n/a	4.09E-10	24	100%

Notes:

[1] For the preferred leachate management method, the emissions associated with the leachate evaporator were not included in the modelling.

[2] The dioxin-like PCBs were not included in the assessment of emissions as dioxin-like PCBs are not formed as by-products of combustion and are not constituents of landfill gas.

[3] For sources with variable emission rates, the maximum emission rates are shown in this table.

Appendix A

Appendix A1

Traffic Distribution for On-site Haul Route Segments

APPENDIX A1: TRAFFIC DISTRIBUTION FOR ON-SITE HAUL ROUTE SEGMENTS

Scenario 2013 First Year
Routine Phase 1 Operations
Landfill in progress during 2005 WMF operations, 50 Trips/hour
No Final Cover Construction

Haul Route ID	Description	No. of Trips per hour	No. of Equivalent Trucks per hour	No. of Equivalent Landfill Trucks per hour	No. of Equivalent Construction Trucks per hour	No. of Equivalent WTFP Trucks (inbound) per hour	No. of Equivalent WTFP Trucks (outbound) per hour	Distance (m)	No. of Lanes	Road Type	Hours of Operation
ENTRANCE1	Entrance	146	73	21	17	25	10	330	3 Lanes	Paved Road	7:00 AM to 4:30 PM
ENTRANCE2	Entrance	146	73	21	17	25	10	270	4 Lanes	Paved Road	7:00 AM to 4:30 PM
LFACCESS1	Landfill Access Road, before landfill entrance to final cover construction area	146	73	21	17	25	10	115	2 Lanes	Paved Road	7:00 AM to 4:30 PM
LFTRAFFIC	Landfill Working Face Traffic	46	23	23	0	0	0	530	2 Lanes	Unpaved Road	7:00 AM to 4:30 PM
LFACCESS2	Landfill Access Road, after landfill entrance to final cover construction area	116	58	6	17	25	10	220	2 Lanes	Paved Road	7:00 AM to 4:30 PM
CFTRAFFIC	Construction Working Face Traffic	36	18	0	18	0	0	510	2 Lanes	Unpaved Road	7:00 AM to 4:30 PM
LFACCESS3	Landfill Access Road, after Landfill Active Face Traffic, to CSS and WTF	84	42	6	1	25	10	610	2 Lanes	Paved Road	7:00 AM to 4:30 PM
CSSTRAFFIC	To CSS, Overburden pile	14	7	6	1	0	0	100	2 Lanes	Unpaved Road	7:00 AM to 4:30 PM
WTFPTRAFFIC	To WTFP	70	35	0	0	25	10	530	2 Lanes	Paved Road	6:30 AM to 8:00 PM

Appendix A2

Sample MOBILE6.2.C Input and Output Files

```
************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                           *
* Input file: WCEC_CP.IN (file 1, run 1).                              *
************************************************************************
  M603 Comment:
              User has disabled the calculation of REFUELING emissions.


* Reading start Starts/day distribution from the following external
* data file: STPERDAY.D

* # # # # # # # # # # # # # # # # # # # # # # # # #
* WCEC - 100
km/h

* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M581 Warning:
            The user supplied freeway average speed of 62.1
            will be used for all hours of the day. 100% of VMT
            has been assigned to the freeway roadway type for
            all hours of the day and all vehicle types.
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M 48 Warning:
              there are no sales for vehicle class LDDT12

                    Calendar Year:  2013
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   4.5 (F)
              Maximum Temperature:  21.0 (F)
                Absolute Humidity:   20. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT
       HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------
                        ------    ------    ------
    VMT Distribution:    0.3228    0.4087    0.1394              0.0358    0.0003    0.0020
    0.0859    0.0052    1.0000

  ------------------------------------------------------------------------------------------
  ----------------------
 Composite Emission Factors (g/mi):
```

```
     Composite VOC :      0.217     0.261     0.454     0.310     0.287     0.050     0.143
     0.214      1.27     0.275
     Composite CO  :     11.18     11.73     16.76     13.01     10.70     0.373     0.295
     0.851     16.35    11.281
     Composite NOX :      0.571     0.728     1.269     0.866     2.106     0.322     0.743
     7.129      2.27     1.360

  ---------------------------------------------------------------------------------------------
  ----------------------
Exhaust emissions (g/mi):
        VOC   Start:     0.000     0.000     0.000     0.000               0.000
        0.000                0.000
      VOC   Running:     0.145     0.184     0.303     0.214               0.050
      0.143                1.253
  VOC Total Exhaust:     0.145     0.184     0.303     0.214     0.161     0.050     0.143
  0.214      1.25     0.195

          CO Start:      0.00      0.00      0.00      0.00               0.000
          0.000                 0.000
        CO Running:     11.18     11.73     16.76     13.01               0.373
        0.295                16.350
   CO Total Exhaust:     11.18     11.73     16.76     13.01     10.70     0.373     0.295
   0.851     16.35    11.281

         NOx Start:     0.000     0.000     0.000     0.000               0.000
         0.000                 0.000
       NOx Running:     0.571     0.728     1.269     0.866               0.322
       0.743                 2.269
  NOx Total Exhaust:     0.571     0.728     1.269     0.866     2.106     0.322     0.743
  7.129      2.27     1.360

  ---------------------------------------------------------------------------------------------
  ----------------------
         Veh. Type:    HDGV2B    HDGV3     HDGV4     HDGV5     HDGV6     HDGV7     HDGV8A
         HDGV8B
                       ------    ------    ------    ------    ------    ------    ------
                       ------
           VMT Mix:    0.0300    0.0011    0.0003    0.0010    0.0023    0.0009    0.0000
           0.0000
-----------------------------------------------------------------------------------------------
---------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.268     0.233     0.424     0.389     0.392     0.432     0.546
     0.000
     Composite CO  :    10.16     11.43     11.95     13.63     13.55     15.01     16.45
     0.00
     Composite NOX :     1.989     1.985     2.491     2.668     2.674     3.013     3.577
     0.000
-----------------------------------------------------------------------------------------------
---------------------
Exhaust emissions (g/mi):
  VOC Total Exhaust:     0.156     0.145     0.175     0.190     0.190     0.210     0.247
  0.000
```

```
   CO Total Exhaust:    10.16     11.43     11.95     13.63     13.55     15.01     16.45
   0.00
  NOx Total Exhaust:     1.989     1.985     2.491     2.668     2.674     3.013     3.577
  0.000
-------------------------------------------------------------------------------------------
---------------------
          Veh. Type:    HDDV2B    HDDV3     HDDV4     HDDV5     HDDV6     HDDV7     HDDV8A
          HDDV8B
                        ------    ------    ------    ------    ------    ------    ------
                        ------
            VMT Mix:    0.0090    0.0028    0.0029    0.0014    0.0065    0.0094    0.0112
            0.0399
-------------------------------------------------------------------------------------------
---------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.089     0.094     0.133     0.143     0.170     0.211     0.220
     0.261
     Composite CO  :     0.312     0.311     0.527     0.559     0.551     0.690     0.850
     1.098
     Composite NOX :     2.345     2.279     3.871     4.088     4.799     6.009     7.221
     9.143
-------------------------------------------------------------------------------------------
---------------------
Exhaust emissions (g/mi):
  VOC Total Exhaust:     0.089     0.094     0.133     0.143     0.170     0.211     0.220
  0.261
   CO Total Exhaust:     0.312     0.311     0.527     0.559     0.551     0.690     0.850
   1.098
  NOx Total Exhaust:     2.345     2.279     3.871     4.088     4.799     6.009     7.221
  9.143
-------------------------------------------------------------------------------------------
---------------------



* # # # # # # # # # # # # # # # # # # # # # # # # #
* WCEC  - 80
km/h

* File 1, Run 1, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M581 Warning:
            The user supplied freeway average speed of 49.7
            will be used for all hours of the day. 100% of VMT
            has been assigned to the freeway roadway type for
            all hours of the day and all vehicle types.
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M 48 Warning:
              there are no sales for vehicle class LDDT12

                    Calendar Year:  2013
                           Month:  Jan.
                        Altitude:  Low
```

```
              Minimum Temperature:   4.5 (F)
              Maximum Temperature:  21.0 (F)
                Absolute Humidity:   20. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT
      HDDV        MC   All Veh
              GVWR:                <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------
                      ------    ------    ------
   VMT Distribution:    0.3228    0.4087    0.1394              0.0358    0.0003    0.0020
   0.0859    0.0052    1.0000

  ------------------------------------------------------------------------------------------------
  -----------------------
 Composite Emission Factors (g/mi):
    Composite VOC :      0.235     0.279     0.504     0.336     0.310     0.054     0.154
    0.230      0.84     0.296
    Composite CO  :      9.80     10.23     14.73     11.37      7.74     0.312     0.246
    0.712      6.00     9.767
    Composite NOX :      0.535     0.689     1.218     0.824     1.937     0.216     0.498
    4.989      1.65     1.132

  ------------------------------------------------------------------------------------------------
  -----------------------
Exhaust emissions (g/mi):
       VOC   Start:     0.000     0.000     0.000     0.000              0.000
       0.000                0.000
     VOC   Running:     0.153     0.192     0.335     0.228              0.054
     0.154                0.829
  VOC Total Exhaust:    0.153     0.192     0.335     0.228     0.169     0.054     0.154
  0.230      0.83     0.205

          CO Start:      0.00      0.00      0.00      0.00              0.000
          0.000                 0.000
        CO Running:      9.80     10.23     14.73     11.37              0.312
        0.246                 5.997
   CO Total Exhaust:     9.80     10.23     14.73     11.37      7.74     0.312     0.246
   0.712      6.00     9.767

         NOx Start:     0.000     0.000     0.000     0.000              0.000
         0.000                 0.000
       NOx Running:     0.535     0.689     1.218     0.824              0.216
       0.498                 1.645
  NOx Total Exhaust:    0.535     0.689     1.218     0.824     1.937     0.216     0.498
  4.989      1.65     1.132
```

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0300	0.0011	0.0003	0.0010	0.0023	0.0009	0.0000	0.0000

Composite Emission Factors (g/mi):

Composite VOC :	0.291	0.253	0.455	0.417	0.420	0.462	0.583	0.000
Composite CO :	7.35	8.27	8.65	9.87	9.80	10.87	11.91	0.00
Composite NOX :	1.830	1.826	2.291	2.454	2.460	2.772	3.291	0.000

Exhaust emissions (g/mi):

VOC Total Exhaust:	0.163	0.152	0.184	0.199	0.199	0.220	0.259	0.000
CO Total Exhaust:	7.35	8.27	8.65	9.87	9.80	10.87	11.91	0.00
NOx Total Exhaust:	1.830	1.826	2.291	2.454	2.460	2.772	3.291	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0090	0.0028	0.0029	0.0014	0.0065	0.0094	0.0112	0.0399

Composite Emission Factors (g/mi):

Composite VOC :	0.095	0.101	0.142	0.153	0.183	0.226	0.236	0.280
Composite CO :	0.261	0.260	0.440	0.467	0.461	0.577	0.710	0.918
Composite NOX :	1.571	1.527	2.593	2.738	3.234	4.049	5.093	6.508

Exhaust emissions (g/mi):

VOC Total Exhaust:	0.095	0.101	0.142	0.153	0.183	0.226	0.236	0.280
CO Total Exhaust:	0.261	0.260	0.440	0.467	0.461	0.577	0.710	0.918
NOx Total Exhaust:	1.571	1.527	2.593	2.738	3.234	4.049	5.093	6.508

```
--------------------------------------------------------------------------------------------------------------
--------------------


* # # # # # # # # # # # # # # # # # # # # # # # # #
* WCEC  - 20
km/h

* File 1, Run 1, Scenario 9.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of 12.4
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M 48 Warning:
              there are no sales for vehicle class LDDT12

                    Calendar Year:  2013
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   4.5 (F)
              Maximum Temperature:  21.0 (F)
                Absolute Humidity:   20. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT
       HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------
                        ------    ------    ------
    VMT Distribution:    0.3228    0.4087    0.1394              0.0358    0.0003    0.0020
    0.0859    0.0052    1.0000

  --------------------------------------------------------------------------------------------------------------
  ----------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      0.503     0.569     1.077     0.698     1.189     0.149     0.425
     0.636      2.13     0.654
     Composite CO  :     11.20     11.46     16.70     12.80     23.08     0.995     0.785
     2.269     24.42    11.778
     Composite NOX :      0.673     0.864     1.518     1.030     1.440     0.247     0.570
     5.181      1.02     1.285
```

```
  ------------------------------------------------------------------------------------------------
  ----------------------
Exhaust emissions (g/mi):
        VOC   Start:     0.000     0.000     0.000     0.000              0.000
        0.000                0.000
      VOC   Running:     0.320     0.399     0.751     0.489              0.149
      0.425                2.115
  VOC Total Exhaust:     0.320     0.399     0.751     0.489     0.907     0.149     0.425
  0.636      2.12     0.470

          CO Start:      0.00      0.00      0.00      0.00              0.000
          0.000                0.000
        CO Running:     11.20     11.46     16.70     12.80              0.995
        0.785               24.423
   CO Total Exhaust:     11.20     11.46     16.70     12.80     23.08     0.995     0.785
   2.269     24.42    11.778

         NOx Start:     0.000     0.000     0.000     0.000              0.000
         0.000                0.000
       NOx Running:     0.673     0.864     1.518     1.030              0.247
       0.570                1.017
  NOx Total Exhaust:     0.673     0.864     1.518     1.030     1.440     0.247     0.570
  5.181      1.02     1.285

  ------------------------------------------------------------------------------------------------
  ----------------------
         Veh. Type:    HDGV2B    HDGV3     HDGV4     HDGV5     HDGV6     HDGV7     HDGV8A
         HDGV8B
                       ------    ------    ------    ------    ------    ------    ------
                       ------
           VMT Mix:    0.0300    0.0011    0.0003    0.0010    0.0023    0.0009    0.0000
           0.0000
------------------------------------------------------------------------------------------------
---------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     1.138     1.031     1.453     1.453     1.457     1.603     1.941
     0.000
     Composite CO  :    21.91     24.67     25.79     29.42     29.23     32.39     35.50
     0.00
     Composite NOX :     1.360     1.357     1.703     1.824     1.828     2.060     2.446
     0.000
------------------------------------------------------------------------------------------------
---------------------
Exhaust emissions (g/mi):
  VOC Total Exhaust:     0.875     0.817     0.986     1.066     1.066     1.180     1.391
  0.000
   CO Total Exhaust:    21.91     24.67     25.79     29.42     29.23     32.39     35.50
   0.00
  NOx Total Exhaust:     1.360     1.357     1.703     1.824     1.828     2.060     2.446
  0.000
------------------------------------------------------------------------------------------------
---------------------
         Veh. Type:    HDDV2B    HDDV3     HDDV4     HDDV5     HDDV6     HDDV7     HDDV8A
```

```
          HDDV8B
                        ------    ------    ------    ------    ------    ------    ------
                        ------
            VMT Mix:    0.0090    0.0028    0.0029    0.0014    0.0065    0.0094    0.0112
            0.0399
-------------------------------------------------------------------------------------------------
---------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.264     0.281     0.394     0.425     0.506     0.626     0.652
     0.776
     Composite CO  :     0.831     0.828     1.404     1.489     1.469     1.839     2.264
     2.927
     Composite NOX :     1.799     1.749     2.971     3.137     3.611     4.523     5.180
     6.530
-------------------------------------------------------------------------------------------------
---------------------
Exhaust emissions (g/mi):
  VOC Total Exhaust:     0.264     0.281     0.394     0.425     0.506     0.626     0.652
  0.776
   CO Total Exhaust:     0.831     0.828     1.404     1.489     1.469     1.839     2.264
   2.927
  NOx Total Exhaust:     1.799     1.749     2.971     3.137     3.611     4.523     5.180
  6.530
-------------------------------------------------------------------------------------------------
---------------------


* # # # # # # # # # # # # # # # # # # # # # # # # #
* WCEC  - 4
km/h

* File 1, Run 1, Scenario 11.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
             The user supplied arterial average speed of  2.5
             will be used for all hours of the day.  100% of VMT
             has been assigned to the arterial/collector roadway
             type for all hours of the day and all vehicle types.
  M 48 Warning:
               there are no sales for vehicle class HDGV8b
  M 48 Warning:
               there are no sales for vehicle class LDDT12

                     Calendar Year:  2013
                             Month:  Jan.
                          Altitude:  Low
               Minimum Temperature:   4.5 (F)
               Maximum Temperature:  21.0 (F)
                 Absolute Humidity:   20. grains/lb
                  Nominal Fuel RVP:   9.0 psi
                     Weathered RVP:   9.0 psi
               Fuel Sulfur Content:   30. ppm
```

```
             Exhaust I/M Program:  No
                Evap I/M Program:  No
                     ATP Program:  No
                Reformulated Gas:  No

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT
      HDDV        MC   All Veh
              GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------
                        ------    ------    ------
   VMT Distribution:    0.3228    0.4087    0.1394              0.0358    0.0003    0.0020
   0.0859    0.0052    1.0000

  ------------------------------------------------------------------------------------------
  ----------------------
 Composite Emission Factors (g/mi):
    Composite VOC :      2.929     2.920     5.545     3.587     4.837     0.244     0.697
    1.042      7.56     3.215
    Composite CO  :     36.47     35.57     51.96     39.74     52.47     2.109     1.664
    4.807    110.80    36.423
    Composite NOX :      1.066     1.361     2.369     1.617     1.299     0.361     0.833
    7.469      1.24     1.926

  ------------------------------------------------------------------------------------------
  ----------------------
Exhaust emissions (g/mi):
       VOC   Start:     0.000     0.000     0.000     0.000               0.000
       0.000                0.000
     VOC   Running:     1.015     1.319     2.515     1.623               0.244
     0.697                7.544
  VOC Total Exhaust:    1.015     1.319     2.515     1.623     2.128     0.244     0.697
  1.042      7.54     1.424

         CO Start:      0.00      0.00      0.00      0.00               0.000
         0.000                 0.000
       CO Running:     36.47     35.57     51.96     39.74               2.109
       1.664              110.797
   CO Total Exhaust:    36.47     35.57     51.96     39.74     52.47     2.109     1.664
   4.807    110.80    36.423

        NOx Start:     0.000     0.000     0.000     0.000               0.000
        0.000                 0.000
      NOx Running:     1.066     1.361     2.369     1.617               0.361
      0.833                 1.236
  NOx Total Exhaust:    1.066     1.361     2.369     1.617     1.299     0.361     0.833
  7.469      1.24     1.926

  ------------------------------------------------------------------------------------------
  ----------------------
        Veh. Type:    HDGV2B    HDGV3     HDGV4     HDGV5     HDGV6     HDGV7     HDGV8A
        HDGV8B
                      ------    ------    ------    ------    ------    ------    ------
                      ------
```

VMT Mix:	0.0300	0.0011	0.0003	0.0010	0.0023	0.0009	0.0000
0.0000							

Composite Emission Factors (g/mi):

Composite VOC :	4.636	4.080	6.153	5.789	5.826	6.317	7.704
0.000							
Composite CO :	49.81	56.08	58.62	66.88	66.45	73.64	80.69
0.00							
Composite NOX :	1.227	1.224	1.537	1.646	1.650	1.859	2.207
0.000							

Exhaust emissions (g/mi):

VOC Total Exhaust:	2.053	1.918	2.315	2.502	2.501	2.768	3.265
0.000							
CO Total Exhaust:	49.81	56.08	58.62	66.88	66.45	73.64	80.69
0.00							
NOx Total Exhaust:	1.227	1.224	1.537	1.646	1.650	1.859	2.207
0.000							

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A
HDDV8B							
	------	------	------	------	------	------	------

VMT Mix:	0.0090	0.0028	0.0029	0.0014	0.0065	0.0094	0.0112
0.0399							

Composite Emission Factors (g/mi):

Composite VOC :	0.433	0.459	0.645	0.696	0.828	1.026	1.068
1.270							
Composite CO :	1.761	1.755	2.975	3.155	3.113	3.898	4.797
6.202							
Composite NOX :	2.627	2.554	4.338	4.581	5.285	6.619	7.456
9.348							

Exhaust emissions (g/mi):

VOC Total Exhaust:	0.433	0.459	0.645	0.696	0.828	1.026	1.068
1.270							
CO Total Exhaust:	1.761	1.755	2.975	3.155	3.113	3.898	4.797
6.202							
NOx Total Exhaust:	2.627	2.554	4.338	4.581	5.285	6.619	7.456
9.348							

Appendix A3

Emission Rates

Appendix A3: Emission Rates - ENTRANCE1

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway	330	m	**(approximate length - measured in AERMOD)**
	0.33	km	
Landfill Truck Traffic	21		
Construction Truck Traffic	17		
WTFP Truck Traffic (inbound)	25		
WTFP Truck Traffic (outbound)	10		
Total	73	trucks per hour	

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO			NO_x		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	5.03E-03	5.74E+00	3.56E+00	1.14E-02
8:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
9:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
10:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
11:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
12:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
13:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
14:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
15:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
16:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
17:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	1.05E-02	5.74E+00	3.56E+00	2.39E-02
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	5.03E-03	5.74E+00	3.56E+00	1.14E-02
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	5.03E-03	5.74E+00	3.56E+00	1.14E-02
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	5.03E-03	5.74E+00	3.56E+00	1.14E-02
Total	0		0		730		140		870						

Appendix A3: Emission Rates - ENTRANCE2

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway 270 m **(approximate length - measured in AERMOD)**
0.27 km

Landfill Truck Traffic 21
Construction Truck Traffic 17
WTFP Truck Traffic (inbound) 25
WTFP Truck Traffic (outbound) 10
Total 73

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO			NO_X		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	4.11E-03	5.74E+00	3.56E+00	9.36E-03
8:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
9:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
10:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
11:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
12:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
13:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
14:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
15:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
16:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
17:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	8.58E-03	5.74E+00	3.56E+00	1.95E-02
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	4.11E-03	5.74E+00	3.56E+00	9.36E-03
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	4.11E-03	5.74E+00	3.56E+00	9.36E-03
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	4.11E-03	5.74E+00	3.56E+00	9.36E-03
Total	0		0		730		140		870						

Appendix A3: Emission Rates - LFACCESS1

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway 115 m (approximate length - measured in AERMOD)
0.115 km

Landfill Truck Traffic 21
Construction Truck Traffic 17
WTFP Truck Traffic (inbound) 25
WTFP Truck Traffic (outbound) 10
Total 73

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO			NO_X		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	1.75E-03	5.74E+00	3.56E+00	3.99E-03
8:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
9:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
10:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
11:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
12:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
13:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
14:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
15:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
16:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
17:00	0	0%	0	0%	63	86%	10	14%	73	2.52E+00	1.57E+00	3.65E-03	5.74E+00	3.56E+00	8.31E-03
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	1.75E-03	5.74E+00	3.56E+00	3.99E-03
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	1.75E-03	5.74E+00	3.56E+00	3.99E-03
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	1.75E-03	5.74E+00	3.56E+00	3.99E-03
Total	0		0		730		140		870						

Appendix A3: Emission Rates - LFACCESS2

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway 220 m **(approximate length - measured in AERMOD)**
0.22 km

Landfill Truck Traffic	6
Construction Truck Traffic	17
WTFP Truck Traffic (inbound)	25
WTFP Truck Traffic (outbound)	10
Total	58

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO Weighted Average Tailpipe Emissions			NO_X Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	3.35E-03	5.74E+00	3.56E+00	7.63E-03
8:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
9:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
10:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
11:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
12:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
13:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
14:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
15:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
16:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
17:00	0	0%	0	0%	48	83%	10	17%	58	2.52E+00	1.57E+00	5.55E-03	5.74E+00	3.56E+00	1.26E-02
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	3.35E-03	5.74E+00	3.56E+00	7.63E-03
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	3.35E-03	5.74E+00	3.56E+00	7.63E-03
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	3.35E-03	5.74E+00	3.56E+00	7.63E-03
Total	0		0		580		140		720						

Appendix A3: Emission Rates - LFACCESS3

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway 610 m **(approximate length - measured in AERMOD)**
0.61 km

Landfill Truck Traffic 6
Construction Truck Traffic 1
WTFP Truck Traffic (inbound) 25
WTFP Truck Traffic (outbound) 10
Total 42

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO Weighted Average Tailpipe Emissions			NO_X Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	9.29E-03	5.74E+00	3.56E+00	2.11E-02
8:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
9:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
10:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
11:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
12:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
13:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
14:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
15:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
16:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
17:00	0	0%	0	0%	32	76%	10	24%	42	2.52E+00	1.57E+00	1.11E-02	5.74E+00	3.56E+00	2.54E-02
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	9.29E-03	5.74E+00	3.56E+00	2.11E-02
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	9.29E-03	5.74E+00	3.56E+00	2.11E-02
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	9.29E-03	5.74E+00	3.56E+00	2.11E-02
Total	0		0		420		140		560						

Appendix A3: Emission Rates - CSSTRAFFIC

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway	235	m	**(approximate length - measured in AERMOD)**
	0.235	km	

Landfill Truck Traffic	6
Construction Truck Traffic	1
WTFP Truck Traffic (inbound)	0
WTFP Truck Traffic (outbound)	0
Total	7

										CO			NO_x		
Hour of Day	**Cars [1]**		**Medium [2]**		**Heavy [3]**		**Tractor Trailer**		**Total**	**Weighted Average Tailpipe Emissions**			**Weighted Average Tailpipe Emissions**		
	Count	**Distribution**	**Count**	**Distribution**	**Count**	**Distribution**	**Count**	**Distribution**	**Count**	**(g/vmt)**	**(g/vkt)**	**(g/s)**	**(g/vmt)**	**(g/vkt)**	**(g/s)**
7:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
9:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
10:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
11:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
12:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
13:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
14:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
15:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
16:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
17:00	0	0%	0	0%	7	100%	0	0%	7	2.52E+00	1.57E+00	7.16E-04	5.74E+00	3.56E+00	1.63E-03
18:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	0		0		70		0		70						

Emission Rates - WTPFTRAFFIC

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway	530	m	**(approximate length - measured in AERMOD)**
	0.53	km	
Landfill Truck Traffic	0		
Construction Truck Traffic	0		
WTFP Truck Traffic (inbound)	25		
WTFP Truck Traffic (outbound)	10		
Total	35		

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO Weighted Average Tailpipe Emissions			NO_x Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
8:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
9:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
10:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
11:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
12:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
13:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
14:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
15:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
16:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
17:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
18:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
19:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
20:00	0	0%	0	0%	25	71%	10	29%	35	2.52E+00	1.57E+00	8.07E-03	5.74E+00	3.56E+00	1.84E-02
Total	0		0		350		140		490						

Appendix A3: Emission Rates - LFTRAFFIC

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway 530 m **(approximate length - measured in AERMOD)**
0.53 km

Landfill Truck Traffic	23
Construction Truck Traffic	0
WTFP Truck Traffic (inbound)	0
WTFP Truck Traffic (outbound)	0
Total	23

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO			NO_X		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
9:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
10:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
11:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
12:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
13:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
14:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
15:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
16:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
17:00	0	0%	0	0%	23	100%	0	0%	23	2.52E+00	1.57E+00	5.30E-03	5.74E+00	3.56E+00	1.21E-02
18:00	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19:00	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20:00	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	0		0		230		0		230						

Appendix A3: Emission Rates - CFTRAFFIC

Tailpipe Emissions

(g/vmt)	CO	NOX
LDV	0.000	0.000
MDV	0.000	0.000
HDV	2.522	5.740

Length of Modelled Roadway	510	m	**(approximate length - measured in AERMOD)**
	0.51	km	

Landfill Truck Traffic	0
Construction Truck Traffic	18
WTFP Truck Traffic (inbound)	0
WTFP Truck Traffic (outbound)	0
Total	18

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Tractor Trailer		Total	CO			NO_X		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
7:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
9:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
10:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
11:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
12:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
13:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
14:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
15:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
16:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
17:00	0	0%	0	0%	18	100%	0	0%	18	2.52E+00	1.57E+00	3.99E-03	5.74E+00	3.56E+00	9.09E-03
18:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20:00	0	0%	0	0%	0	0%	0	0%	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	0		0		180		0		180						

Appendix A4

Idling Emission Rates

APPENDIX A4: IDLING EMISSION RATES

Inbound and Outbound Scales with Scale House located on ENTRANCE 2 Haul Route
Assume that for each trip, the truck spends 5 minutes idling

ALL On-Site Trucks (Landfill+Construction+WTFP)

No. of Trips per hour	146	
No. of Trucks per hour	73	
No. of idling minutes per hour	365	min
	6.1	hr (equivalent hours)
CO	5.34	g/vmt
NOX	8.25	g/vmt
CO	3.32	g/vkt
NOX	5.13	g/vkt

Used 4 km/hr to determine the idling emission factors

CO	**3.69E-03**	**g/s per vehicle**
NOX	**5.70E-03**	**g/s per vehicle**
CO	**2.24E-02**	**g/s**
NOX	**3.47E-02**	**g/s**

WTFP (ONLY)

No. of Trips per hour	70	
No. of Trucks per hour	35	
No. of idling minutes per hour	175	min
	2.9	hr (equivalent hours)
CO	5.34	g/vmt
NOX	8.25	g/vmt
CO	3.32	g/vkt
NOX	5.13	g/vkt

CO	**3.69E-03**	**g/s per vehicle**
NOX	**5.70E-03**	**g/s per vehicle**
CO	**1.08E-02**	**g/s**
NOX	**1.66E-02**	**g/s**

Hour of Day	CO (g/s)	NOX (g/s)
7:00	1.08E-02	1.66E-02
8:00	2.24E-02	3.47E-02
9:00	2.24E-02	3.47E-02
10:00	2.24E-02	3.47E-02
11:00	2.24E-02	3.47E-02
12:00	2.24E-02	3.47E-02
13:00	2.24E-02	3.47E-02
14:00	2.24E-02	3.47E-02
15:00	2.24E-02	3.47E-02
16:00	2.24E-02	3.47E-02
17:00	2.24E-02	3.47E-02
18:00	1.08E-02	1.66E-02
19:00	1.08E-02	1.66E-02
20:00	1.08E-02	1.66E-02

Appendix B

Combustion Emission Calculations – Landfill Gas-Fired Generators

Combustion Emission Calculations - Landfill Gas-Fired Generators

Based on AP-42 Chapter 2.4

Pollutant	Emission Factor (kg/106 dscm Methane)	Rating	Emission Factor (kg/106 dscm Methane)	Rating
Particulate Matter	770	E	232	D
	from final section (Nov. 1998)		from draft section (Oct. 2008)	

	Total Gas Volumetric Flow	Methane Volumetri	Emission Rate (g/s) NOx	CO	PM	
CAT3516 Engine	0.14	0.07	- -	- -	0.054	source testing results used for Nox, CO, and D&F
CAT3520 Engine	0.28	0.14	- -	- -	0.108	source testing results used for Nox, CO, and D&F
Assumed % Methane	50%					

Table 1: Sampling Summary - Flow Characteristics

CAT 3516

Stack Gas Parameter		Test No. 2 SVOC	Test No. 3 SVOC	Test No. 4 SVOC	TOTAL AVERAGE
Testing Date		15-Jun-10	16-Jun-10	16-Jun-10	-
Stack Temperature	°F	671	671	674	672
	°C	355	355	357	356
Moisture	%	12.4	14.4	13.7	13.5
Velocity	ft/s	75.75	77.67	78.4	77.3
	m/s	23.1	23.67	23.9	23.6
Actual Flow Rate	CFM	6,149	6,305	6,362	6,272
Referenced Flow Rate	CFM	2,547	2,543	2,559	2,550
	m^3/s	1.2	1.2	1.2	1.2
Sampling Isokinetic Rate	%	99	103	101	101

= 2.90 m^3/s

CAT 3520

Stack Gas Parameter		Test No. 5 SVOC	Test No. 6 SVOC	Test No. 7 SVOC	TOTAL AVERAGE
Testing Date		17-Jun-10	17-Jun-10	18-Jun-10	-
Stack Temperature	°F	834	829	835	833
	°C	446	443	446	445
Moisture	%	13.2	13.3	13.2	13.2
Velocity	ft/s	168.3	167.7	167.9	167.9
	m/s	51.3	51.1	51.2	51.2
Actual Flow Rate	CFM	13,749	13,699	13,713	13,720
Referenced Flow Rate	CFM	4,929	4,923	4,931	4,928
	m^3/s	2.3	2.3	2.3	2.3
Sampling Isokinetic Rate	%	98	98	99	98

= 6.48 m^3/s

Notes:

SVOC = Sampling for PAH's, Dioxins, and Furans

-All referenced values are expressed at 101.3kPa, 25°C

-Average of three tests

SVOC Test 1 was discarded due to insufficient process data

Detailed sampling results including individual test results can be found in Appendix B

Results from Ottawa Landfill Landfill Gas-to-Energy Engines - as sent to client

(from RWDI Job # 0925116 spreadsheet "Tables et 20100929 by CTW.xls")

Table 2: Polycyclic Aromatic Hydrocarbons (PAH) - Averaged Results

Parameter	CAT 3516		CAT 3520	
	Concentration	Emission Rate	Concentration	Emission Rate
	(ug/m^3)	(ug/s)	(ug/m^3)	(ug/s)
1-Methylnaphthalene	2.6	3.1	3.1	7.2
1-Methylphenanthrene	< 0.2	< 0.28	< 0.4	< 0.921
2-Chloronaphthalene	< 0.1	< 0.1	< 0.3	< 0.731
2-Methylanthracene	< 0.1	< 0.1	< 0.3	< 0.731
2-Methylnaphthalene	3.5	4.2	3.9	9.0
3-Methylcholanthrene	< 0.2	< 0.20	< 0.6	< 1.46
7,12-Dimethylbenzo(a)anthracene	< 0.2	< 0.21	< 0.6	< 1.46
9,10-Dimethylanthracene	< 0.2	< 0.20	< 0.6	< 1.46
Acenaphthene	0.1	0.13	< 0.2	< 0.37
Acenaphthylene	< 0.1	< 0.15	< 0.2	< 0.53
Anthracene	< 0.04	< 0.05	< 0.24	< 0.55
Benzo(a)anthracene	< 0.04	< 0.05	0.20	0.46
Benzo(a)fluorene	< 0.2	< 0.21	< 0.6	< 1.46
Benzo(a)pyrene	< 0.04	< 0.05	< 0.16	< 0.365
Benzo(b)fluoranthene	< 0.04	< 0.05	0.37	0.86
Benzo(b)fluorene	< 0.1	< 0.10	< 0.3	< 0.73
Benzo(e)pyrene	< 0.1	< 0.1	< 0.3	< 0.731
Benzo(g,h,i)perylene	< 0.04	< 0.05	< 0.16	< 0.37
Benzo(k)fluoranthene	< 0.04	< 0.05	< 0.16	< 0.37
Biphenyl	109.0	131	1190	2770
Chrysene	89.4	107	90.3	210
Coronene	< 0.2	< 0.21	< 0.6	< 1.46
Dibenz(a,h)anthracene	< 0.04	< 0.05	< 0.16	< 0.37
Dibenzo(a,e)pyrene	< 0.2	< 0.21	< 0.6	< 1.46
Fluoranthene	0.3	0.34	0.8	1.97
Fluorene	0.2	0.23	10.3	24.0
Indeno(1,2,3-cd)pyrene	< 0.04	< 0.05	< 0.16	< 0.37
m-Terphenyl	1.8	2.1	37.3	86.8
Naphthalene	15.2	18	23.6	55
o-Terphenyl	2.3	2.8	10.2	23.7
Perylene	< 0.2	< 0.21	< 0.6	< 1.46
Phenanthrene	1.1	1.32	3.7	8.65
p-Terphenyl	1.3	1.6	20.8	48.5
Pyrene	0.1	0.17	0.3	0.635
Quinoline	< 0.2	< 0.2	< 0.6	< 1.5
Tetralin	0.6	0.76	< 0.4	< 0.90

Notes:

-Sampling followed Environment Canada Method RM/2

-All referenced concentration values are expressed at 101.3kPa and 25°C

-Average of three tests

-When laboratory analysis was below the detection limit, this detection limit was used to calculate the concentration and emission rate.

Detailed sampling results including individual test results can be found in Appendix B

= detected contaminants, in common with leachate treatment plant

= other detected contaminants

Table 3: Dioxins and Furans - Average Results

CAT 3516

Parameter	Concentration @ 11% O_2	International TEQ Factor	Toxicity Equivalent (TEQ)	TEQ Emission Rate
	(pg/m3)		(pg TEQ/m3)	(pg/s)
2,3,7,8-Tetra CDD *	28.3	1	28	46.0
1,2,3,7,8-Penta CDD	47.1	0.5	24	39.0
1,2,3,4,7,8-Hexa CDD	12.3	0.1	1.2	2.10
1,2,3,6,7,8-Hexa CDD	15.9	0.1	1.6	2.60
1,2,3,7,8,9-Hexa CDD	14.5	0.1	1.4	2.40
1,2,3,4,6,7,8-Hepta CDD	18.8	0.01	0.19	0.31
1,2,3,4,6,7,8,9-Octa CDD	15.2	0.001	0.02	0.03
2,3,7,8-Tetra CDF **	1376	0.1	140	220.0
1,2,3,7,8-Penta CDF	144.9	0.5	72	120.0
2,3,4,7,8-Penta CDF	268.0	0.05	13.0	22.00
1,2,3,4,7,8-Hexa CDF	94.2	0.1	9.4	15.0
1,2,3,6,7,8-Hexa CDF	86.9	0.1	8.7	14.00
2,3,4,6,7,8-Hexa CDF	79.7	0.1	8.0	13.00
1,2,3,7,8,9-Hexa CDF	4.2	0.1	0.4	0.69
1,2,3,4,6,7,8-Hepta CDF	79.7	0.01	0.8	1.30
1,2,3,4,7,8,9-Hepta CDF	7.0	0.01	0.07	0.120
1,2,3,4,6,7,8,9-Octa CDF	9.4	0.001	0.0094	0.016
TEQ			310	500

CAT 3520

Parameter	Concentration @ 11% O_2	International TEQ Factor	Toxicity Equivalent (TEQ)	TEQ Emission Rate
	(pg/m3)		(pg TEQ/m3)	(pg/s)
2,3,7,8-Tetra CDD *	1.0	1	1	3
1,2,3,7,8-Penta CDD	1.7	0.5	0.84	2.6
1,2,3,4,7,8-Hexa CDD	0.7	0.1	0.073	0.22
1,2,3,6,7,8-Hexa CDD	1.0	0.1	0.1	0.29
1,2,3,7,8,9-Hexa CDD	1.0	0.1	0.1	0.29
1,2,3,4,6,7,8-Hepta CDD	2.4	0.01	0.024	0.072
1,2,3,4,6,7,8,9-Octa CDD	6.6	0.001	0.0066	0.02
2,3,7,8-Tetra CDF **	27.6	0.1	2.8	8.5
1,2,3,7,8-Penta CDF	5.0	0.5	2.5	7.5
2,3,4,7,8-Penta CDF	7.0	0.05	0.35	1.1
1,2,3,4,7,8-Hexa CDF	3.7	0.1	0.37	1.1
1,2,3,6,7,8-Hexa CDF	4.0	0.1	0.4	1.2
2,3,4,6,7,8-Hexa CDF	3.2	0.1	0.32	0.99
1,2,3,7,8,9-Hexa CDF	0.7	0.1	0.068	0.21
1,2,3,4,6,7,8-Hepta CDF	5.9	0.01	0.059	0.18
1,2,3,4,7,8,9-Hepta CDF	1.2	0.01	0.012	0.038
1,2,3,4,6,7,8,9-Octa CDF	2.5	0.001	0.0025	0.0073
TEQ			9.0	27

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, and 25° C)

'<' indicates that the laboratory results were less than the Estimated Detection Limit (EDL). This EDL was used to calculate the concentration and emission rate.

* CDD = Chloro Dibenzo-p-Dioxin, ** CDF = Chloro Dibenzo-p-Furan, **CDF = Chloro Dibenzo-p-Furan

(J) Estimated concentration between the Estimated Detection Limit (EDL) and the Reportable Detection Limit (RDL)

- Refer to the lab report for EDL and RDL values

Detailed sampling results including individual test results can be found in Appendix B

= detected contaminants, in common with leachate treatment plant

= other detected contaminants

Schedule 2 | Health | 830 | 0.5 | 4.4E+01 | Regulation 346 | 5.00E-01 | 7446-09-5

Table 4: Volatile Organic Compounds - Average Results

Parameter	CAT 3516 Concentration	CAT 3516 Emission Rate	CAT 3520 Concentration	CAT 3520 Emission Rate
	(ug/m^3)	(mg/s)	(ug/m^3)	(mg/s)
Dichlorodifluoromethane (FREON 12)	< 11.8	< 0.01	< 11.4	< 0.026
Chloromethane	< 9.1	< 0.01	< 10.5	< 0.024
Vinyl Chloride	11.7	0.01	< 8.7	< 0.02
Bromomethane	< 9.0	< 0.01	< 10.5	< 0.024
Chloroethane	< 4.0	< 0.005	< 4.7	< 0.011
Trichlorofluoromethane (FREON 11)	< 4.5	< 0.01	< 5.3	< 0.01
Acetone (2-Propanone)	< 26.4	< 0.03	< 27.1	< 0.062
1,1-Dichloroethylene	< 4.5	< 0.01	< 5.3	< 0.01
Iodomethane	< 9.0	< 0.01	< 10.5	< 0.024
Carbon Disulfide	< 13.6	< 0.02	< 15.8	< 0.036
Methylene Chloride(Dichloromethane)	< 9.0	< 0.01	< 10.5	< 0.024
1,1-Dichloroethane	< 4.5	< 0.005	< 5.3	< 0.012
trans-1,2-Dichloroethylene	< 4.7	< 0.006	< 5.3	< 0.012
cis-1,2-Dichloroethylene	12.4	0.01	< 7.9	< 0.018
Chloroform	< 4.5	< 0.01	< 5.3	< 0.012
1,2-Dichloroethane	< 3.1	< 0.000	< 3.7	< 0.008
Methyl Ethyl Ketone (2-Butanone)	< 22.6	< 0.03	< 21.0	< 0.048
1,1,1-Trichloroethane	< 4.5	< 0.005	< 5.3	< 0.012
Carbon Tetrachloride	< 9.0	< 0.010	< 10.5	< 0.024
Benzene	165.9	0.2	133.4	0.307
1,1,2-Trichloroethane	< 9.0	< 0.01	< 10.5	< 0.024
1,2-Dichloropropane	< 4.5	< 0.005	< 5.3	< 0.012
Trichloroethylene	< 5.4	< 0.01	< 5.3	< 0.012
Dibromomethane	< 4.5	< 0.005	< 5.3	< 0.012
Bromodichloromethane	< 4.5	< 0.005	< 5.3	< 0.012
cis-1,3-Dichloropropene	< 4.5	< 0.005	< 5.3	< 0.012
trans-1,3-Dichloropropene	< 3.1	< 0.004	< 3.7	< 0.008
Dibromochloromethane	< 4.0	< 0.005	< 4.7	< 0.011
Methyl Isobutyl Ketone	< 9.1	< 0.01	< 10.5	< 0.024
Methyl Butyl Ketone (2-Hexanone)	< 14.2	< 0.02	< 15.8	< 0.036
Toluene	176.0	0.21	136.2	0.313
Ethylene Dibromide	< 4.5	< 0.005	< 5.3	< 0.012
Tetrachloroethylene	24.6	0.03	< 18.3	< 0.042
Chlorobenzene	< 5.1	< 0.01	< 5.3	< 0.012
1,1,1,2-Tetrachloroethane	< 4.5	< 0.01	< 5.3	< 0.01
Ethylbenzene	49.5	0.06	25.3	0.06
m / p-Xylene (combine for total Xylene)	94.8	0.11	50.6	0.12
Styrene	< 4.5	< 0.01	< 5.3	< 0.01
o-Xylene (combine for total Xylene)	26.2	0.03	< 14.9	< 0.03
Bromoform	< 4.5	< 0.01	< 5.3	< 0.01
1,1,2,2-Tetrachloroethane	< 4.5	< 0.01	< 5.3	< 0.01
1,2,3-Trichloropropane	< 9.0	< 0.01	< 10.5	< 0.02
1,3-Dichlorobenzene	< 9.0	< 0.01	< 10.5	< 0.02
1,4-Dichlorobenzene	< 13.6	< 0.02	< 12.3	< 0.03
1,2-Dichlorobenzene	< 9.0	< 0.01	< 10.5	< 0.02

non-detected

non-detected

non-detected

non-detected

Notes:

-Sampling followed U.S. EPA SW846 Method 0030-VOST

-All referenced concentration values are expressed at 101.3kPa and 25°C

-Average of six tests

-When laboratory analysis was below the detection limit, this detection limit was used to calculate the concentration and emission rate.

Detailed sampling results including individual test results can be found in Appendix C

= detected contaminants, in common with leachate treatment plant

= ~~de~~ not detected in Engine testing but detected in leachate analysis

= other detected contaminants.

Table 5: Gaseous Pollutants - Average Results

CAT 3516

Parameter	Concentration		Emission Rate
		Actual O_2	
	(ppm)	(mg/m^3)	(g/s)
Nitrogen Oxides, expressed as NO_2 (NO_X)	103.1	193.9	0.23
Sulphur Dioxide (SO_2)	24.5	64	0.1
Total Hydrocarbons (expressed as Methane)	1130	739	0.89
Total Hydrocarbons (10 min.)	1200	-	-
Total Hydrocarbons (30 min.)	3.0	-	-
Carbon Monoxide (CO)	2.2	2.5	0.02
	(%)		
Oxygen (O_2)	7.4	-	-

CAT 3520

Parameter	Concentration		Emission Rate
		Actual O_2	
	(ppm)	(mg/m^3)	(g/s)
Nitrogen Oxides, expressed as NO_2 (NO_X)	50.4	94.8	0.22
Sulphur Dioxide (SO_2)	22	57.5	0.1
Total Hydrocarbons (expressed as Methane)	1331	871	2.00
Total Hydrocarbons (10 min.)	1530.0	-	-
Total Hydrocarbons (30 min.)	11.7	-	-
Carbon Monoxide (CO)	3.5	4.0	0.03
	(%)		
Oxygen (O_2)	8.0	-	-

Notes:

-Sampling followed U.S. EPA Method 3 (O_2 and CO_2), Method 10 (CO), Method 6C (SO_2), and Method 7E (NO_X)

-All referenced concentration values are expressed at 101.3kPa and 25°C

-Average all tests

-Emission rate for CAT 3516 calculated based on average volumetric flow rate of 1.2 Rm^3/sec

-Emission rate for CAT 3520 calculated based on average volumetric flow rate of 2.3 Rm^3/sec

Detailed sampling results including individual test results can be found in Appendix D

= detected contaminants, in common with leachate treatment plant

Appendix C

Combustion Emission Calculations – Landfill Gas Flares

Combustion Emission Calculations - Landfill Gas Flares

Based on AP-42 Chapter 2.4

from final section (Nov. 1998)

**** dscm = dry standard cubic meter ****

Pollutant	Emission Factor ($kg/10^6$ dscm Methane)	Rating
Nitrogen Dioxide	650	C
Carbon Monoxide	12000	C
Particulate Matter	270	D

from draft section (Oct. 2008)

Pollutant	Emission Factor ($kg/10^6$ dscm Methane)	Rating
Nitrogen Dioxide	631	A
Carbon Monoxide	737	A
Particulate Matter	238	A

	Total Gas Volumetric Flow Rate (standard) m^3/s	Methane Volumetric Flow Rate (standard) m^3/s	Emission Rate (g/s)			
			NOx	CO	PM	
Flare 1	0.57	0.285	0.185	3.42	0.077	
Flare 2	1.04	0.52	0.338	6.24	0.140	<--- use source testing results for this flare for Nox
Candlestick Flare	1.0	0.5	0.325	6.00	0.135	
Assumed % Methane		50%				

Appendix D

Emission Rate Calculations for the Diesel-Fired Emergency Generator

G1: Emission Rate Calculations for the Diesel-Fired Emergency Generator - Ottawa Landfill Leachate Plant

RWDI Project #1100036

Source ID - LEACHGEN

Contaminant	Emission Factor (lb/hp-hr)	Emission Factor (g/hp-hr)	Emission Rate (g/hr)	Emission Rate (g/s)	Data Quality Rating
Oxides of Nitrogen [1]	- -	4.35	2262	0.63	A
Carbon Monoxide [1]	- -	0.54	281	0.078	A
Particulate Matter [1]	- -	0.05	26	0.007	A
Sulphur Dioxide [2]	0.00205	0.93	484	0.13	D

Note:
[1] Emission Factors from specifications provided by Cummins for a DFEG-320 kW Generator
[2] Emission Factor from AP-42 Chapter 3.3 "Gasoline and Diesel Industrial Engines"

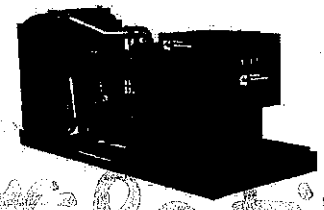
Additional Information from specifications provided by Cummins for a DFEG-320 kW Generator

HP at Rated kW = 520 hp based on Cummins Specifications

Exhaust Gas Flow = 2610 cfm
1.23 m^3/s

Exhaust Temperature = 810 ^oF

Diesel generator set QSX15 series engine EPA emissions



> Specification sheet
350 kW - 500 kW standby

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Power Generation

Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications.

This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.

The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.

All low voltage models are CSA certified to product class 4215-01.

The generator set is available Listed to UL 2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.

U.S. EPA Engine certified to U.S. EPA Nonroad Source Emissions Standards, 40 CFR 89, Tier 2.

Features

Cummins® heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Permanent magnet generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

Fuel tanks - Dual wall sub-base fuel tanks are also offered.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DFEG	350 (438)		320 (400)				D-3398	
DFEH	400 (500)	352 (440)	350 (438)	320 (400)			D-3399	D-3402
DFEJ	450 (563)	400 (500)	410 (513)	364 (455)			D-3400	D-3403
DFEK	500 (625)	440 (550)	455 (569)	400 (500)			D-3401	D-3404

S-1582 (9/08)

Generator set specifications

Governor regulation class	ISO 8528 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.25%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	IEC 801.2, Level 4 electrostatic discharge IEC 801.3; Level 3 radiated susceptibility

Engine specifications

Design	Turbocharged with air-to-air charge air cooling
Bore	136.9 mm (5.39 in)
Stroke	168.9 mm (6.65 in)
Displacement	14.9 L (912.0 in^3)
Cylinder block	Cast iron with replaceable wet liners, in-line 6 cylinder
Battery capacity	900 amps minimum at ambient temperature of 0 °C (32 °F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Full authority electronic (FAE) Cummins HPI-TP
Fuel filter	
Air cleaner type	
Lube oil filter type(s)	Single spin-on combination element with full flow and bypass filtration
Standard cooling system	40 °C (104 °F) ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip proof revolving field
Stator	2/3 pitch
Rotor	Direct coupled, flexible disc
Insulation system	Class H per NEMA MG1-1.65 and BS2757
Standard temperature rise	125 °C (257 °F) standby
Exciter type	Permanent magnet generator (PMG)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower
AC waveform total harmonic distortion	< 5% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 50 per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3

Available voltages

60 Hz line-neutral/line-line

- 110/190
- 110/220
- 115/200
- 115/230
- 120/208
- 127/220
- 139/240
- 220/380
- 230/400
- 240/416
- 255/440
- 277/480
- 347/600

50 Hz line-neutral/line-line

- 110/190
- 110/220
- 115/200
- 115/230
- 120/208
- 127/220
- 139/240
- 220/380
- 230/400
- 240/415
- 255/440

Note: Consult factory for other voltages.

Generator set options and accessories

Engine

- ☐ 208/240/480 V, thermostatically controlled coolant heater for ambient above 4.5 °C (40 °F)
- ☐ 208/240/480 V, thermostatically controlled coolant heater for ambient below 4.5 °C (40 °F)
- ☐ 120 V 300 W lube oil heater
- ☐ Heavy duty air cleaner with safety element

Alternator

- ☐ 80 °C rise alternator
- ☐ 105 °C rise alternator
- ☐ 150 °C rise alternator
- ☐ 120/240 V, 300 W anti-condensation heater

Exhaust system

- ☐ Critical grade exhaust silencer
- ☐ Exhaust packages
- ☐ Industrial grade exhaust silencer
- ☐ Residential grade exhaust silencer

Fuel system - 60 Hz

- ☐ 1136 L (300 gal) sub-base tank
- ☐ 1514 L (400 gal) sub-base tank
- ☐ 1893 L (500 gal) sub-base tank
- ☐ 2271 L (600 gal) sub-base tank
- ☐ 2498 L (660 gal) sub-base tank
- ☐ 3218 L (850 gal) sub-base tank
- ☐ 6435 L (1700 gal) sub-base tank

Fuel system - 50 Hz

- ☐ 155 L (41 gal) in-skid day tank (dual wall)
- ☐ 208 L (55 gal) in-skid day tank (single wall)
- ☐ 1595 L (425 gal) sub-base tank
- ☐ 3191 L (850 gal) sub-base tank

Cooling system

- ☐ High ambient 50 °C (122 °F) radiator

Control panel

- ☐ 120/240 V, 100 W control anti-condensation space heater
- ☐ Ground fault alarm
- ☐ Power transfer control
- ☐ Remote fault signal package
- ☐ Run relay package

Generator set

- ☐ AC entrance box
- ☐ Batteries
- ☐ Battery charger
- ☐ Export box packaging
- ☐ UL 2200 Listed
- ☐ Main line circuit breaker
- ☐ Paralleling accessories
- ☐ Remote annunciator panel
- ☐ Spring isolators
- ☐ Enclosure: aluminum, steel, weather protective or sound attenuated
- ☐ 2 year standby warranty
- ☐ 2 year prime power warranty
- ☐ 5 year basic power warranty
- ☐ 10 year major components warranty

Note: Some options may not be available on all models - consult factory for availability.

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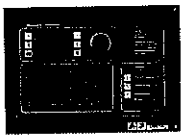
S-1582 (9/08)

Power Generation

Control system PCC 2100 or PCC 3201



PowerCommand control is an integrated generator set control system providing governing, voltage regulation, engine protection and operator interface functions. Major features include:

- Integral AmpSentry™ Protective Relay providing a full range of alternator protection functions that are matched to the alternator provided.
- Battery monitoring and testing features and smart starting control system.
- Three phase sensing, full wave rectified voltage regulation system, with a PWM output for stable operation with all load types.
- Standard PCCNet™ and optional Echelon® LONWORKS® network interface.
- Control suitable for operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.

Operator/display panel

- Off/manual/auto mode switch
- Manual run/stop switch
- Panel lamp test switch
- Emergency stop switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments
- LED lamps indicating genset running, not in auto, common warning, common shutdown
- Configurable for local language

Engine protection

- Overspeed shut down
- Low oil pressure warning and shut down
- High coolant temperature warning and shut down
- High oil temperature warning (some models)
- Low coolant level warning or shut down
- Low coolant temperature warning
- High and low battery voltage warning
- Weak battery warning
- Dead battery shut down
- Fail to start (overcrank) shut down
- Fail to crank shut down
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Lube oil temperature (some models)
- Engine speed

AmpSentry AC protection

- Over current and short-circuit shut down
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shut down
- Over and under frequency shut down
- Overload warning with alarm contact
- Reverse power and reverse Var shut down
- Excitation fault

Alternator data

- Line-to-line and line-to-neutral AC volts
- Three phase AC current
- Frequency
- Total and individual phase power factor, kW and kVA

Other data

- Genset model data
- Start attempts, starts, running hours
- kW hours (total and since reset)
- Fault history

Governing

- Digital electronic isochronous governor
- Temperature dynamic governing
- Smart idle speed mode
- Glow plug control (some models)

Voltage regulation

- Digital PWM electronic voltage regulation
- Three phase line-to-neutral sensing
- Suitable for PMG or shunt excitation
- Single and three phase fault regulation
- Configurable torque matching

Control functions

- Data logging on faults
- Fault simulation (requires InPower)
- Time delay start and cooldown
- Cycle cranking
- Configurable customer inputs (4)
- Configurable customer outputs (4)
- Configurable network inputs (8) and outputs (16) (with optional network)
- Remote emergency stop

Paralleling (Option)

- Active digital phase lock loop synchronizer
- Isochronous kW and kVar load sharing controls
- kW import/export and kVar/PF control for utility (mains) paralleling

Options

- ☐ PCC 3201 paralleling control
- ☐ LED bargraph AC data display
- ☐ Thermostatically controlled space heater
- ☐ Key-type mode switch
- ☐ Ground fault module
- ☐ Auxiliary relays (3)
- ☐ Echelon LONWORKS interface
- ☐ Modion Gateway to convert to Modbus (loose)
- ☐ PowerCommand iWatch web server for remote monitoring and alarm notification (loose)
- ☐ Digital input and output module(s) (loose)
- ☐ Remote annunciator (loose)

For further detail on PCC 2100 see document S-1409.
For further detail on PCC 3201 see document S-1444.

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S-1582 (9/08)

Power Generation

Ratings definitions

Emergency standby power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-time running power (LTP):

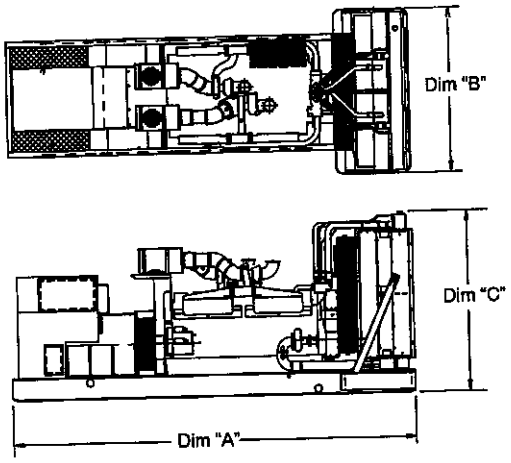
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base load (continuous) power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set Weight* dry kg (lbs)	Set Weight* wet kg (lbs)
DFEG	3864 (152.1)	1524 (60.0)	1812 (71.3)	3856 (8500)	3992 (8800)
DFEH	3864 (152.1)	1524 (60.0)	1812 (71.3)	3856 (8500)	3992 (8800)
DFEJ	3864 (152.1)	1524 (60.0)	1812 (71.3)	4082 (9000)	4218 (9300)
DFEK	3864 (152.1)	1524 (60.0)	1812 (71.3)	4309 (9500)	4445 (9800)

* Weights represent a set with standard features. See outline drawings for weights of other configurations.

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Telephone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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S-1582 (9/08)

Power Generation

Model: DFEG
KW rating: 350 standby
320 prime
Frequency: 60
Fuel type: Diesel

Generator set data sheet

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Cummins® Power Generation

Exhaust emission data sheet:	**EDS-187**
Exhaust emission compliance sheet:	**EPA-1027**
Sound performance data sheet:	**MSP-186**
Cooling performance data sheet:	**MCP-110**
Prototype test summary data sheet:	**PTS-145**
Standard set-mounted radiator cooling outline:	**0500-3326**
Optional set-mounted radiator cooling outline:	
Optional heat exchanger cooling outline:	
Optional remote radiator cooling outline:	

Fuel consumption

	Standby kW (kVA)				Prime kW (kVA)				Continuous kW (kVA)
Ratings	350 (438)				320 (400)				
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**Full**
US gph	9.0	14.3	19.4	24.1	8.5	13.4	18.1	22.1	
L/hr	34	54	73	91	32	51	69	84	

Engine

	Standby rating	Prime rating	Continuous rating
Engine manufacturer	Cummins Inc.		
Engine model	QSX15-G9		
Configuration	Cast iron with replaceable wet cylinder liners, in-line 6 cylinder		
Aspiration	Nonroad 2, turbocharged with air-to-air charge air cooling		
Gross engine power output, kWm (bhp)	563.0 (755.0)	507.3 (680.0)	
BMEP at rated load, kPa (psi)	1716.8 (249.0)	1578.9 (229.0)	
Bore, mm (in)	136.9 (5.39)		
Stroke, mm (in)	168.9 (6.65)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	10.1 (1995.0)		
Compression ratio	17.0:1		
Lube oil capacity, L (qt)	83.3 (88.0)		
Overspeed limit, rpm	2150 ± 50		
Regenerative power, kW	52.0		

Fuel flow

Fuel flow at rated load, L/hr (US gph)	423.9 (112.0)	
Maximum inlet restriction, mm Hg (in Hg)	127.0 (5.0)	
Maximum return restriction, mm Hg (in Hg)	165.1 (6.5)	

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Air

	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	32.4 (1145.0)	31.1 (1100.0)	
Maximum air cleaner restriction, kPa (in H_2O)	6.2 (25.0)		
Alternator cooling air, m^3/min (scfm)	62.0 (2190.0)		

Exhaust

Exhaust flow at rated load, m^3/min (cfm)	73.6 (2600.0)	70.9 (2505.0)	
Exhaust temperature, °C (°F)	432.2 (810.0)	429.4 (805.0)	
Maximum back pressure, kPa (in H_2O)	10.2 (41.0)		

Standard set-mounted radiator cooling

Ambient design, °C (°F)	40 (104)		
Fan load, kW (HP)			
Coolant capacity (with radiator), L (US gal)	57.9 (15.3)		
Coolant system air flow, m^3/min (scfm)	707.5 (25000.0)		
Total heat rejection, MJ/min (Btu/min)	15.7 (14785.0)	14.8 (13970.0)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		

Optional set-mounted radiator cooling

Ambient design, °C (°F)			
Fan load, kW_m (HP)			
Coolant capacity (with radiator), L (US gal)			
Cooling system air flow, m^3/min (scfm)			
Total heat rejection, MJ/min (Btu/min)			
Maximum cooling air flow static restriction, kPa (in H_2O)			

Optional heat exchanger cooling

Set coolant capacity, L (US gal)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, after-cooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum raw water pressure, jacket water circuit, kPa (psi)			
Maximum raw water pressure, aftercooler circuit, kPa (psi)			
Maximum raw water pressure, fuel circuit, kPa (psi)			
Maximum raw water flow, jacket water circuit, L/min (US gal/min)			
Maximum raw water flow, aftercooler circuit, L/min (US gal/min)			
Maximum raw water flow, fuel circuit, L/min (US gal/min)			
Minimum raw water flow @ 27 °C (80 °F) Inlet temp, jacket water circuit, L/min (US gal/min)			
Minimum raw water flow @ 27 °C (80 °F) Inlet remp, after-cooler circuit, L/min (US gal/min)			
Minimum raw water flow @ 27 °C (80 °F) Inlet temp, fuel circuit, L/min (US gal/min)			
Raw water delta P @ min flow, jacket water circuit, kPa (psi)			
Raw water delta P @ min flow, after-cooler circuit, kPa (psi)			
Raw water delta P @ min flow, fuel circuit, kPa (psi)			
Maximum jacket water outlet temp, °C (°F)			
Maximum after-cooler inlet temp, °C (°F)			
Maximum after-cooler inlet temp @ 25 °C (77 °F) ambient, °C (°F)			

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Optional remote radiator cooling[1]

Set coolant capacity, L (US gal)			
Max flow rate @ max friction head, jacket water circuit, L/min (US gal/min)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum friction head, jacket water circuit, kPa (psi)			
Maximum static head, jacket water circuit, m (ft)			
Maximum jacket water outlet temp, °C (°F)			

Weights[2]

Unit dry weight kgs (lbs)	3856 (8500)
Unit wet weight kgs (lbs)	3992 (8800)

Notes:

[1] For non-standard remote installations contact your local Cummins Power Generation representative.

[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Standby	Genset may be operated up to 3650 m (11900 ft) and 40 °C (104 °F) without power deration. For sustained operation above these conditions, derate by 1.8% per 305 m (1000 ft), and 10.0% per 10 °C (5.6% per 10 °F).
Prime	Genset may be operated up to 3650 m (11900 ft) and 40 °C (104 °F) without power deration. For sustained operation above these conditions, derate by 1.8% per 305 m (1000 ft), and 10.0% per 10 °C (5.6% per 10 °F).
Continuous	

Ratings definitions

Emergency standby power (ESP):	**Limited-time running power (LTP):**	**Prime power (PRP):**	**Base load (continuous) power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

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Alternator data

Three phase table[1]		105 °C	105 °C	125 °C	125 °C	125 °C	125 °C	125 °C	150 °C	150 °C	150 °C	150 °C
Feature code		B259	B301	B258	B252	B414	B246	B300	B426	B413	B424	B419
Alternator data sheet number		306	305	305	305	306	305	305	305	305	305	305
Voltage ranges		110/190 thru 139/240 220/380 thru 277/480	347/600	110/190 thru 139/240 220/380 thru 277/480	120/208 thru 139/240 240/416 thru 277/480	120/208 thru 139/240 240/416 thru 277/480	277/480	347/600	110/190 thru 139/240 220/380 thru 277/480	120/208 thru 139/240 240/416 thru 277/480	277/480	347/600
Surge kW		512	515	509	512	514	515	515	509	512	515	515
Motor starting kVA (at 90% sustained voltage)	Shunt											
	PMG	1896	1749	1749	1749	1896	1749	1749	1749	1749	1749	1749

Full load current amps at standby rating	110/190	120/208	110/220	115/230	139/240	220/380	230/400	240/416	255/440	277/480	347/600
	1329	1214	1148	1098	1052	665	631	607	574	526	421

Notes:

[1] Single phase power can be taken from a three phase generator set at up to 40% of the generator set nameplate kW rating at unity power factor.

Formulas for calculating full load currents:

Three phase output

$$\frac{kW \times 1000}{Voltage \times 1.73 \times 0.8}$$

Single phase output

$$\frac{kW \times SinglePhaseFactor \times 1000}{Voltage}$$

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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D-3398 (9/08)

Power Generation

Power Generation

Exhaust Emission Data Sheet
350DFEG
60 Hz Diesel Generator Set
EPA Emissions: Tier 2

Engine Information:

Model: Cummins Inc. QSX15-G9 Nonroad 2
Nameplate BHP @ 1800 RPM: 755
Type: 4 Cycle, In-Line, 6 Cylinder Diesel
Aspiration: Turbo-charged with air-to-air charge air cooling
Compression Ratio: 17:1
Emission Control Device: Turbocharged with Charge Air Cooled

Bore: 5.39 in. (137 mm)
Stroke: 6.65 in. (169 mm)
Displacement: 912 cu. in. (14.9 liters)

	1/4	1/2	3/4	Full	Full
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	**Prime**
Engine HP @ Stated Load (1800 RPM)	150	273	397	520	478
Fuel Consumption (gal/hr)	9.1	14.6	19.4	24.3	22.8
Exhaust Gas Flow (CFM)	1150	1720	2280	2610	2540
Exhaust Temperature (°F)	680	785	820	810	815
EXHAUST EMISSION DATA					
HC (Total Unburned Hydrocarbons)	0.23	0.10	0.07	0.06	0.06
NOx (Oxides of Nitrogen as NO2)	2.90	3.20	3.70	4.35	4.15
CO (Carbon Monoxide)	0.60	0.45	0.30	0.54	0.36
PM (particular Matter)	0.11	0.06	0.05	0.05	0.05
Smoke (Bierburg)	0.50	0.55	0.55	0.50	0.51

All values are Grams per HP-Hour

TEST METHODS AND CONDITIONS

Test Methods:
Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rated stabilized.

Fuel Specification: 40-48 Cetane Number, 0.05 Wt.% max. Sulfur; Reference ISO8178-5, 40CFR86.1313-98 Type 2-D and ASTM D975 No. 2-D.

Reference Conditions:
25 °C (77 °F) Air Inlet Temperature, 40 °C (104 °F) Fuel Inlet Temperature, 100 kPa (29.53 in Hg) Barometric Pressure; 10.7 g/kg (75 grains H_2O/lb) of dry air Humidity (required for NOx correction); Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.

Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Tests conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results.

Data Subject to Change Without Notice.

Power Generation

Sound Data

350DFEG 60Hz

Sound Pressure Level @ 7 meters, dB(A)

See Notes 1-8 listed below

Configuration		Measurement Location Number								Average
		1	2	3	4	5	6	7	8	
Standard - Unhoused	Infinite Exhaust	88	92	92	91	86	91	89	92	90
F184-Critical Muffler	Mounted Muffler	88	91	89	88	86	90	88	92	89
F200–Weather	Mounted Muffler	87	88	82	85	86	85	82	88	86
F201 - Quiet Site II First Stage	Mounted Muffler	89	87	82	80	77	78	80	87	85
F202 - Quiet Site II Second Stage	Mounted Muffler	71	71	70	71	72	72	73	72	72

Sound Power Level, dB(A)

See Notes 2-6, 9, 10 listed below

Configuration		Octave Band Center Frequency (Hz)								Overall Sound Power Level
		63	125	250	500	1000	2000	4000	8000	
Standard - Unhoused (Note 3)	Infinite Exhaust	80	97	103	108	110	111	110	108	117
F184-Critical Muffler	Mounted Muffler	95	103	103	108	109	109	106	104	115
F200–Weather	Mounted Muffler	102	108	102	106	108	107	104	98	114
F201 - Quiet Site II First Stage	Mounted Muffler	102	108	101	104	107	105	103	96	113
F202 - Quiet Site II Second Stage	Mounted Muffler	82	91	92	94	95	97	94	86	102

Exhaust Sound Pressure Level @ 1 meter, dB(A)

	Octave Band Center Frequency (Hz)								Sound Pressure Level
Open Exhaust (No Muffler Rated Load)	63	125	250	500	1000	2000	4000	8000	
	90	106	109	107	109	110	111	105	117.1

Note:

1. Position 1 faces the engine front. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All positions are at 7m (23 ft) from the surface of the generator set and 1.2m (48") from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Sound data with remote-cooled generator sets are based on rated loads without cooling fan noise.
4. Sound levels for aluminum enclosures are approximately 2 dB(A)s higher than listed sound levels for steel enclosures.
5. Sound data for generator set with infinite exhaust do not include exhaust noise.
6. Data is based on full rated load with standard radiator-cooling fan package
7. Sound Pressure Levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
8. Reference sound pressure is 20 µPa.
9. Sound Power Levels per ISO 3744 and ISO 8528-10, as applicable.
10. Reference power = 1 pw (10^{-12} W)
11. Exhaust Sound Pressure Levels are per ISO 6798, as applicable.

Appendix E

Leachate Evaporator Source Testing and Results

Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests	Sampling Parameter	Sampling Method
Leachate Evaporator Stack NW	3	Flow Rate, Temperature, Moisture	OSTC[1] Methods 1 to 4 (including US EPA Method 2G)
Leachate Evaporator Stack NW	2	Total Particulate Matter[1]	OSTC[1] Method 5
Leachate Evaporator Stack NW	2	Metals (including Hg)	US EPA[2] Method 29
Leachate Evaporator Stack NW	1	Polycyclic Aromatic Hydrocarbons, Dioxins and Furans	Environment Canada Method RM/2
Leachate Evaporator Stack NW	3	Volatile Organic Compounds	US EPA[2] SW846 Method 0030 VOST
Leachate Evaporator Stack SE	3	Flow Rate, Temperature, Moisture	OSTC[1] Methods 1 to 4 (including US EPA Method 2G)
Leachate Evaporator Stack SE	1	Total Particulate Matter[1]	OSTC[1] Method 5
Leachate Evaporator Stack SE	1	Metals (including Hg)	US EPA[2] Method 29
Leachate Evaporator Stack SE	2	Polycyclic Aromatic Hydrocarbons, Dioxins and Furans	Environment Canada Method RM/2
Leachate Evaporator Stack SE	2	Oxygen/Carbon Dioxide	US EPA[2] Method 3A (CEM)
Leachate Evaporator Stack SE	2	Sulphur Dioxide	US EPA[2] Method 6C (CEM)
Leachate Evaporator Stack SE	2	Nitrogen Oxides (NOx)	US EPA[2] Method 7E (CEM)
Leachate Evaporator Stack SE	2	Carbon Monoxide (CO)	US EPA[2] Method 10 (CEM)
Leachate Evaporator Stack SE	2	Total Hydrocarbon (THC)	US EPA[2] Method 25A (CEM)
Leachate Evaporator Stack NW	1	Oxygen/Carbon Dioxide	US EPA[2] Method 3A (CEM)
Leachate Evaporator Stack NW	1	Sulphur Dioxide	US EPA[2] Method 6C (CEM)
Leachate Evaporator Stack NW	1	Nitrogen Oxides (NOx)	US EPA[2] Method 7E (CEM)
Leachate Evaporator Stack NW	1	Carbon Monoxide (CO)	US EPA[2] Method 10 (CEM)
Leachate Evaporator Stack NW	1	Total Hydrocarbon (THC)	US EPA[2] Method 25A (CEM)
Leachate Evaporator Stack NW	3	Ammonia	US EPA Method 26
Leachate Evaporator Stack SE	3	Odour	MOE Method “Source Sampling for Odours (Version #2)

Notes:
[1] OSTC - Ontario Source Testing Code (Version 2)
[2] USEPA - United States Environmental Protection Agency
[3] NCASI - National Council for Air and Stream Improvement, Inc.
[4] CARB - California Air Resources Board

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time	RWDI Sample ID	Lab Sample ID
Velocity / Total Particulate / Metals					
Test #1	27-Sep-11	9:45 AM	1:16 PM	T1-BASELINE-M5/29	LC3471
Test #2	28-Sep-11	8:13 AM	12:09 PM	T2-BASELINE-M5/29	LC3472
Test #3	28-Sep-11	1:47 PM	5:20 PM	T3-BASELINE-M5/29	LC3473
Velocity / PAH / Dioxins and Furans					
Test #1	27-Sep-11	9:45 AM	1:20 PM	T1-BASELINE- SVOC	LC1531
Test #2	28-Sep-11	10:15 AM	12:03 PM	T2-BASELINE -SVOC	LC1532
Test #3	28-Sep-11	1:47 PM	5:12 PM	T3-BASELINE- SVOC	LC1533
Continuous Emissions Monitor[1]					
Test #1	27-Sep-11	9:45 AM	1:16 PM	-	-
Test #2	28-Sep-11	8:12 AM	12:10 PM	-	-
Test #3	28-Sep-11	1:47 PM	5:22 PM	-	-
Volatile Organic Compounds					
Test #1	27-Sep-11	11:39 AM	1:25 PM	T1-BASELINE-PAIR 1 A/B	LC1382
Test #2	27-Sep-11	3:46 PM	4:46 PM	T2-BASELINE-PAIR 2 A/B	LC1384
Test #3	27-Sep-11	4:38 PM	5:58 PM	T3-BASELINE-PAIR3 A/B	LC1386
Odour					
Test #1	29-Sep-11	10:02 AM	10:22 AM	Odour Baseline #1 / 21:1	1
Test #2	29-Sep-11	10:25 AM	10:45 AM	Odour Baseline #1 / 21:1	2
Test #3	29-Sep-11	10:50 AM	11:10 AM	Odour Baseline #1 / 21:1	3
Ammonia					
Test #1	28-Sep-11	8:23 AM	9:23 AM	T1-BASELINE-CTM27	LC1769
Test #2	28-Sep-11	10:13 AM	11:15 AM	T2-BASELINE-CTM27	LC1770
Test #3	28-Sep-11	1:44 PM	2:44 PM	T3-BASELINE-CTM27	LC1771

Notes:

[1] CEM's: Sulphur Dioxide, Oxides of Nitrogen, Oxygen, Carbon Dioxide, Carbon Monoxide, Total Hydrocarbons

Table 3: Sampling Summary - Flow Characteristics

Stack Gas Parameter		Test No. 1			Test No. 2			Test No. 3			TOTAL AVERAGE
		SVOC[1]	TPM[2]	Average	SVOC[1]	TPM[2]	Average	SVOC[1]	TPM[2]	Average	
Testing Date											-
Stack Temperature	°F	183	182	183	184	182	183	185	182	184	183
	°C	84	84	84	84	83	84	85	83	84	84
Moisture	%	0.482	0.5	0.474	0.469	0.5	0.471	0.466	0.5	0.47	0.5
Velocity	ft/s	67.6	61.8	64.7	65.5	57.9	61.7	63.8	58.8	61.3	62.6
	m/s	20.6	18.8	19.7	19.9	17.7	18.8	19.5	17.9	18.7	19.1
Actual Flow Rate	CFM	16,700	15,300	16,000	16,200	14,300	15,300	15,800	6,390	11,100	14,100
Referenced Flow Rate[3]	CFM	7,230	6,840	7,040	7,160	6,310	6,740	7,020	181	3,600	5,790
	m^3/s	3.41	3.2	3.3	3.38	3.0	3.2	3.31	3.0	3.2	3.2
Sampling Isokinetic Rate	%	99	94.7	96.8	96	98	97	97	98	97.5	97

Notes:

[1] SVOC = Sampling for PAH's, Dioxins, and Furans

[2] TPM = Sampling for total particulate matter and metals

[3] Referenced flow rate expressed as dry at 101.3 kPa, 25 °C, and Actual Oxygen

Appendix F

Combustion Emission Calculations – Generator

Combustion Spreadsheet for Generators

RWDI Project #1101678

RWDI Project Name:	Cambridge Aggregates
RWDI Project Number:	1101678
Manufacturer:	
Engine Model:	300 HP Crusher Engine

Parameter	Units	Value
Engine Fuel		Diesel
Fuel Heating Value	(Btu/gal)	1020
Stroke Cycle		4-Stroke
Engine Loading	(%)	90-105%
Burn Style		Rich
NOx Controlled?		No

Site Specific Emission Factors	Units	Emission Factor
Oxides of Sulphur (SOx)	g/hp-hr	
Oxides of Nitrogen (NO_x)	lb/hp-hr	
Carbon Monoxide (CO)	g/hp-hr	
PM	g/hp-hr	
Source:		

Rating (enter one set of units)	Units	Value
Engine Horsepower (hp)	(hp)	300
Transfer Efficiency	(%)	90
Calculated Input	(hp)	300.00

Emission Factors	Units	Emission Factor	Source:
Oxides of Sulphur (SOx)	lb/hp-hr	0.00205	AP 42 (10/1996) Ch 3.3, Tables 3.3-1
Oxides of Nitrogen (NO_x)	lb/hp-hr	0.031	AP 42 (10/1996) Ch 3.3, Tables 3.3-1
Carbon Monoxide (CO)	lb/hp-hr	0.00668	AP 42 (10/1996) Ch 3.3, Tables 3.3-1
PM	lb/hp-hr	0.0022	AP 42 (10/1996) Ch 3.3, Tables 3.3-1

	Units	Value
Exhaust Temperature (ºC)	(ºC)	600
Calculated Exit Temperature	(K)	873

Fuel Sulphur Information	Units	Value
Natural Gas Sulphur Content	(%)	0.5
Fuel Oil Sulphur Content	(%)	0.05

Emission Rates	Units	Emission Rate	Quality
Oxides of Sulphur (SOx)	(g/s)	7.75E-02	D
Oxides of Nitrogen (NO_x)	(g/s)	1.17E+00	D
Carbon Monoxide (CO)	(g/s)	2.52E-01	D
Particulate Matter (PM)	(g/s)	8.32E-02	D

Appendix G

Traffic Volume Data

Appendix G1: Determination of Off-SiteTraffic Volume - Year 2013

WCEC Landfill - Ottawa, Ontario

	2013 Highway 417	
	West of Carp	East of Carp
AADT	25869	45508
Peak Hour	2259	3632
Day/Night Split	90/10	90/10

	2013 Carp Road	
	North of 417	South of 417
AADT	12320	21769
Peak Hour	1088	1893
Day/Night Split	91/9	92/8

	2013 Richardson Road	
	West of Carp	East of Carp
AADT	5038	7125
Peak Hour	474	670
Day/Night Split	91/9	90/10

	Carp Road North of 417				Carp Road South of 417				Richardson Road West of Carp Road				Highway 417	
Hour of Day	Cars [1]	Medium [2]	2013 Heavy (Excluding Landfill Trucks)	Total	Cars [1]	Medium [2]	2013 Heavy (Excluding Landfill Trucks)	Total	Cars [1]	Medium [2]	Heavy [3]	Total	Hourly Volume as % of AADT	
1:00	32	3	0	35	66	4	1	71	15	3	0	18	1:00	0.74%
2:00	20	1	0	21	47	1	1	49	5	0	0	5	2:00	0.41%
3:00	11	1	1	13	19	3	0	22	5	1	0	6	3:00	0.31%
4:00	22	1	1	24	27	1	0	28	7	1	0	8	4:00	0.27%
5:00	24	3	6	34	49	6	3	58	6	2	1	9	5:00	0.42%
6:00	158	26	5	189	248	37	3	288	78	11	0	89	6:00	1.69%
7:00	604	99	8	711	999	104	8	1111	231	67	1	299	7:00	4.95%
8:00	881	134	17	1032	1503	106	15	1624	360	78	0	438	8:00	5.77%
9:00	728	151	12	892	1549	154	5	1708	295	46	1	342	9:00	5.44%
10:00	588	189	11	788	1215	137	9	1361	226	49	1	276	10:00	5.61%
11:00	549	131	22	702	944	129	22	1095	183	238	1	421	11:00	5.76%
12:00	570	137	13	720	1018	102	6	1126	214	38	0	252	12:00	6.29%
13:00	673	137	17	827	1215	105	8	1328	211	41	1	253	13:00	6.21%
14:00	661	150	16	827	1123	115	11	1250	204	60	1	265	14:00	6.35%
15:00	676	141	21	839	1122	133	16	1271	209	48	1	258	15:00	6.72%
16:00	854	126	15	996	1507	112	14	1633	306	53	2	361	16:00	7.29%
17:00	950	131	8	1088	1782	103	8	1893	403	69	2	474	17:00	8.26%
18:00	816	79	1	896	1824	56	3	1883	382	24	0	406	18:00	7.54%
19:00	509	39	2	550	1285	24	2	1312	260	18	0	278	19:00	5.74%
20:00	335	29	4	367	765	13	5	783	163	16	0	180	20:00	4.31%
21:00	296	13	1	310	619	7	2	628	144	8	0	152	21:00	3.63%
22:00	199	8	0	207	510	7	2	519	102	4	0	106	22:00	3.07%
23:00	162	11	0	173	551	8	0	559	93	6	0	99	23:00	1.95%
24:00	74	4	0	79	167	1	0	168	39	3	0	42	24:00	1.26%
Total	10394	1741	185	12320	20153	1469	147	21769	4141	885	12	5038		

Notes:

- Traffic data provided by AECOM (MTO 2009 for Highway 417, April 2011 counts for Carp Road and Richardson Road).

[1] Cars: motorcycle, cars, cars with trailer, pickups, pickups with trailer.

[2] Medium: bus, single unit truck with dual rear axle, 3 axle truck with less than 5.49 m spacing between axle 2 and 3, 4 axle truck.

[3] Heavy: Transports, 3 axle truck with greater than 5.69m spacing between axles 2 and 3, 4 axle truck with greater than 1.52m spacing between axles 2 and 3 and less than 1.07m spacing between axles 3 and 4 and 4 axle trucks with greater than 1.52m spacing between axles 2 and 3 and greater than 3.05m spacing between axles 3 and 4, any other trucks with 5 or 6 axles.

Appendix G1: Determination of Traffic Volume - 2013

WCEC Landfill - Ottawa, Ontario

TRAFFIC (2013)

Road ID	Road Segment	Year	Traffic Volume Growth [4]		2023 AADT Including Landfill Traffic				Day/Night Split [1]		Traffic Volume					
											Day (16h)			Night (8h)		
			%Growth	#Years	Cars	Medium	Heavy	Total	Day	Night	Cars	Medium	Heavy	Cars	Medium	Heavy
Landfill	dfill 2-Way Traffic at Weigh S	2013	--	--	--	--	--	**--**	--	--	--	--	--	--	--	--
Highway 7	South of 417	2013	1.2%	4	14304	822	1315	**16441**	90%	10%	12874	740	1184	1430	82	132
Highway 417	West of Highway 7	2013	3.6%	4	22033	1377	4131	**27541**	90%	10%	18356	1239	3718	2203	138	413
Highway 417	West of Carp	2013	1.0%	4	20696	1293	3880	**25869**	90%	10%	18442	1164	3492	2070	129	388
Highway 417	East of Carp	2013	1.0%	4	35834	2240	7434	**45508**	90%	10%	31932	2016	6690	3583	224	743
Carp Road	of 417 - North of Landfill Ent	2013	1.0%	2	10394	1741	229	**12364**	91%	9%	9365	1585	208	935	157	21
Carp Road	of 417 - South of Landfill Ent	2013	1.0%	2	10394	1741	1012	**13147**	91%	9%	9365	1585	921	935	157	91
Carp Road	South of 417	2013	1.0%	2	20153	1469	189	**21811**	92%	8%	18357	1351	174	1612	118	15
Richardson Road	West of Carp Road	2013	1.0%	2	4141	885	12	**5038**	91%	9%	3731	806	11	373	80	1
Richardson Road	East of Carp Road	2013	1.0%	2	6324	363	625	**7313**	90%	10%	5524	327	563	632	36	63

Notes:

[1] Traffic data for the Landfill (2009), Highway 417 (2009), Carp Road (2011), and Richardson Road (2011) provided by AECOM.

[2] Landfill traffic for 2009 are expected to be approximately equivalent to traffic volume in 2011.

[3] Freeways have breakdown of 5 MM/15 HH and 5 MM/8 HH for Regional Roads (as per MTO Environmental Guide for Noise October 2006)

[4] Percent growth for Highway 417 and Highway 7 were estimated from MTO Provincial Highways - AADT Traffic Volumes 1988 - 2007 and 2009 AADT provided by AECOM.
Traffic growth for Ottawa is targeted to be less than 1% for Carp Road and Richardson Road (as per City of Ottawa 2020 Transportation Master Plan).

Appendix G2: Emission Rates - Carp Road, North of 417

Tailpipe Emissions

(g/vmt)	CO	NOx
LDV	10.735	0.721
MDV	7.980	4.141
HDV	11.697	8.636
LANDFILL	0.946	7.961

Length of Modelled Roadway 650 m
0.65 km

Total Landfill Truck AADT 870 trucks per day
% Trucks Travelling on Carp Road, North of 417 5% North of Landfill Entrance
95% South of Landfill Entrance

Of the Total Landfill Truck AADT

North of Landfill Entrance

Hour of Day	Cars		Medium		Heavy		Landfill Trucks [1]		Total	CO Weighted Average Tailpipe Emissions			NO_x Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
0:00	32	91%	3	9%	0	0%	0	0.00%	35	1.05E+01	6.52E+00	4.08E-02	1.02E+00	6.36E-01	3.98E-03
1:00	20	95%	1	5%	0	0%	0	0%	21	1.06E+01	6.59E+00	2.55E-02	8.84E-01	5.49E-01	2.12E-03
2:00	11	85%	1	8%	1	8%	0	0%	13	1.06E+01	6.58E+00	1.58E-02	1.59E+00	9.90E-01	2.37E-03
3:00	22	92%	1	4%	1	4%	0	0%	24	1.07E+01	6.62E+00	2.93E-02	1.19E+00	7.41E-01	3.28E-03
4:00	24	73%	3	9%	6	18%	0	0%	34	1.07E+01	6.62E+00	4.02E-02	2.47E+00	1.53E+00	9.33E-03
5:00	158	84%	26	14%	5	3%	0	0%	189	1.04E+01	6.45E+00	2.20E-01	1.40E+00	8.68E-01	2.96E-02
6:00	604	85%	99	14%	8	1%	0	0%	711	1.04E+01	6.44E+00	8.26E-01	1.29E+00	8.00E-01	1.03E-01
7:00	881	85%	134	13%	17	2%	2	4.02%	1034	1.04E+01	6.47E+00	1.21E+00	1.62E+00	1.00E+00	1.87E-01
8:00	728	81%	151	17%	12	1%	4	8.39%	895	1.03E+01	6.41E+00	1.04E+00	2.07E+00	1.29E+00	2.08E-01
9:00	588	74%	189	24%	11	1%	4	8.39%	791	1.01E+01	6.29E+00	8.98E-01	2.31E+00	1.44E+00	2.05E-01
10:00	549	78%	131	19%	22	3%	4	8.39%	705	1.03E+01	6.38E+00	8.13E-01	2.27E+00	1.41E+00	1.80E-01
11:00	570	79%	137	19%	13	2%	4	8.39%	724	1.03E+01	6.37E+00	8.33E-01	2.18E+00	1.35E+00	1.77E-01
12:00	673	81%	137	16%	17	2%	4	8.39%	831	1.03E+01	6.42E+00	9.63E-01	2.11E+00	1.31E+00	1.97E-01
13:00	661	80%	150	18%	16	2%	4	8.39%	831	1.03E+01	6.39E+00	9.59E-01	2.16E+00	1.34E+00	2.01E-01
14:00	676	80%	141	17%	21	3%	4	8.39%	842	1.03E+01	6.42E+00	9.76E-01	2.16E+00	1.34E+00	2.04E-01
15:00	854	85%	126	13%	15	2%	4	8.39%	999	1.04E+01	6.49E+00	1.17E+00	1.94E+00	1.21E+00	2.17E-01
16:00	950	87%	131	12%	8	1%	4	8.39%	1092	1.05E+01	6.49E+00	1.28E+00	1.85E+00	1.15E+00	2.27E-01
17:00	816	91%	79	9%	1	0%	4	8.39%	899	1.05E+01	6.54E+00	1.06E+00	1.69E+00	1.05E+00	1.71E-01
18:00	509	92%	39	7%	2	0%	2	4.02%	552	1.05E+01	6.55E+00	6.53E-01	1.31E+00	8.13E-01	8.10E-02
19:00	335	91%	29	8%	4	1%	2	4.02%	369	1.05E+01	6.53E+00	4.35E-01	1.39E+00	8.64E-01	5.75E-02
20:00	296	95%	13	4%	1	0%	2	4.02%	312	1.06E+01	6.58E+00	3.71E-01	1.21E+00	7.51E-01	4.23E-02
21:00	199	96%	8	4%	0	0%	0	0%	207	1.06E+01	6.60E+00	2.47E-01	8.56E-01	5.32E-01	1.99E-02
22:00	162	94%	11	6%	0	0%	0	0%	173	1.06E+01	6.56E+00	2.05E-01	9.43E-01	5.86E-01	1.83E-02
23:00	74	95%	4	5%	0	0%	0	0%	79	1.06E+01	6.58E+00	9.33E-02	8.99E-01	5.58E-01	7.92E-03
Total	10394		1741		185			100%	12363						

Length of Modelled Roadway 1140 m
1.14 km

South of Landfill Entrance

Hour of Day	Cars		Medium		Heavy		Landfill Trucks [1]		Total	CO Weighted Average Tailpipe Emissions			NO_x Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
1:00	32	91%	3	9%	0	0%	0	0%	35	1.05E+01	6.52E+00	7.16E-02	1.02E+00	6.36E-01	6.98E-03
2:00	20	95%	1	5%	0	0%	0	0%	21	1.06E+01	6.59E+00	4.47E-02	8.84E-01	5.49E-01	3.73E-03
3:00	11	92%	1	8%	0	0%	0	0%	12	1.05E+01	6.53E+00	2.53E-02	1.01E+00	6.25E-01	2.42E-03
4:00	22	92%	1	4%	1	4%	0	0%	24	1.07E+01	6.62E+00	5.13E-02	1.19E+00	7.41E-01	5.75E-03
5:00	24	86%	3	11%	1	4%	0	0%	29	1.05E+01	6.51E+00	5.88E-02	1.37E+00	8.51E-01	7.70E-03
6:00	158	83%	26	13%	6	3%	0	0%	190	1.04E+01	6.46E+00	3.88E-01	1.44E+00	8.92E-01	5.36E-02
7:00	604	85%	99	14%	5	1%	0	0%	708	1.04E+01	6.43E+00	1.44E+00	1.26E+00	7.80E-01	1.75E-01
8:00	881	83%	134	13%	8	1%	33	4.02%	1056	1.01E+01	6.27E+00	2.10E+00	1.51E+00	9.40E-01	3.14E-01
9:00	728	75%	151	16%	17	2%	69	8.39%	966	9.63E+00	5.98E+00	1.83E+00	2.01E+00	1.25E+00	3.83E-01
10:00	588	68%	189	22%	12	1%	69	8.39%	858	9.35E+00	5.81E+00	1.58E+00	2.20E+00	1.36E+00	3.71E-01
11:00	549	72%	131	17%	11	1%	69	8.39%	760	9.38E+00	5.82E+00	1.40E+00	2.03E+00	1.26E+00	3.03E-01
12:00	570	71%	137	17%	22	3%	69	8.39%	799	9.44E+00	5.86E+00	1.48E+00	2.13E+00	1.33E+00	3.35E-01
13:00	673	75%	137	15%	13	1%	69	8.39%	893	9.57E+00	5.95E+00	1.68E+00	1.97E+00	1.23E+00	3.47E-01
14:00	661	74%	150	17%	17	2%	69	8.39%	898	9.54E+00	5.93E+00	1.68E+00	2.06E+00	1.28E+00	3.63E-01
15:00	676	75%	141	16%	16	2%	69	8.39%	903	9.58E+00	5.95E+00	1.70E+00	2.01E+00	1.25E+00	3.57E-01
16:00	854	80%	126	12%	21	2%	69	8.39%	1071	9.81E+00	6.10E+00	2.07E+00	1.90E+00	1.18E+00	4.01E-01
17:00	950	82%	131	11%	15	1%	69	8.39%	1165	9.88E+00	6.14E+00	2.26E+00	1.83E+00	1.14E+00	4.20E-01
18:00	816	84%	79	8%	8	1%	69	8.39%	972	9.83E+00	6.11E+00	1.88E+00	1.68E+00	1.04E+00	3.21E-01
19:00	509	87%	39	7%	1	0%	33	4.02%	582	9.98E+00	6.20E+00	1.14E+00	1.24E+00	7.71E-01	1.42E-01
20:00	335	84%	29	7%	2	1%	33	4.02%	398	9.68E+00	6.02E+00	7.59E-01	1.27E+00	7.87E-01	9.93E-02
21:00	296	85%	13	4%	4	1%	33	4.02%	346	9.65E+00	5.99E+00	6.57E-01	1.20E+00	7.43E-01	8.15E-02
22:00	199	96%	8	4%	1	0%	0	0%	208	1.06E+01	6.60E+00	4.35E-01	8.94E-01	5.55E-01	3.66E-02
23:00	162	94%	11	6%	0	0%	0	0%	173	1.06E+01	6.56E+00	3.60E-01	9.43E-01	5.86E-01	3.22E-02
24:00	74	95%	4	5%	0	0%	0	0%	79	1.06E+01	6.58E+00	1.64E-01	8.99E-01	5.58E-01	1.39E-02
Total	10394		1741		185		827	100%	13146						

Note [1]: The landfill trucks have been distinguished from other highway traffic, as a different vehicle distribution has been applied to calculate the tailpipe emission factors

The landfill trucks and tractor trailor trucks have been combined when calculating these CO and NOX tailpipe emissions as they are not dependant on vehicle weight

Appendix G2: Emission Rates - Carp Road, South of 417

Tailpipe Emissions

(g/vmt)	CO	NOx
LDV	10.735	0.721
MDV	7.980	4.141
HDV	11.697	8.636
LANDFILL	0.946	7.961

Length of Modelled Roadway	990	m
	0.99	km
Total Landfill Truck AADT	827	trucks per day
% Trucks Travelling on Carp Road, South of 417	5%	**Of the Total Landfill Truck AADT**

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Landfill Trucks		Total	CO Weighted Average Tailpipe Emissions			NO_x Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
0:00	66	93%	4	6%	1	1%	0	0.00%	71	1.06E+01	6.58E+00	1.29E-01	1.03E+00	6.40E-01	1.26E-02
1:00	47	96%	1	2%	1	2%	0	0%	49	1.07E+01	6.64E+00	8.95E-02	9.58E-01	5.95E-01	8.01E-03
2:00	19	86%	3	14%	0	0%	0	0%	22	1.04E+01	6.43E+00	3.97E-02	1.19E+00	7.38E-01	4.55E-03
3:00	27	96%	1	4%	0	0%	0	0%	28	1.06E+01	6.60E+00	5.00E-02	8.48E-01	5.27E-01	3.99E-03
4:00	49	84%	6	11%	3	5%	0	0%	58	1.05E+01	6.52E+00	1.04E-01	1.50E+00	9.30E-01	1.49E-02
5:00	248	86%	37	13%	3	1%	0	0%	288	1.04E+01	6.46E+00	5.11E-01	1.24E+00	7.72E-01	6.10E-02
6:00	999	90%	104	9%	8	1%	0	0%	1111	1.05E+01	6.51E+00	1.99E+00	1.10E+00	6.83E-01	2.09E-01
7:00	1503	92%	106	7%	15	1%	2	4.02%	1626	1.06E+01	6.58E+00	2.94E+00	1.34E+00	8.31E-01	3.72E-01
8:00	1549	90%	154	9%	5	0%	3	8.39%	1711	1.05E+01	6.55E+00	3.08E+00	1.72E+00	1.07E+00	5.03E-01
9:00	1215	89%	137	10%	9	1%	3	8.39%	1364	1.05E+01	6.53E+00	2.45E+00	1.78E+00	1.11E+00	4.16E-01
10:00	944	86%	129	12%	22	2%	3	8.39%	1098	1.05E+01	6.51E+00	1.97E+00	1.95E+00	1.21E+00	3.66E-01
11:00	1018	90%	102	9%	6	1%	3	8.39%	1130	1.05E+01	6.55E+00	2.03E+00	1.74E+00	1.08E+00	3.36E-01
12:00	1215	91%	105	8%	8	1%	3	8.39%	1332	1.06E+01	6.57E+00	2.41E+00	1.71E+00	1.06E+00	3.88E-01
13:00	1123	90%	115	9%	11	1%	3	8.39%	1253	1.05E+01	6.55E+00	2.26E+00	1.77E+00	1.10E+00	3.79E-01
14:00	1122	88%	133	10%	16	1%	3	8.39%	1275	1.05E+01	6.53E+00	2.29E+00	1.84E+00	1.15E+00	4.02E-01
15:00	1507	92%	112	7%	14	1%	3	8.39%	1637	1.06E+01	6.59E+00	2.97E+00	1.69E+00	1.05E+00	4.73E-01
16:00	1782	94%	103	5%	8	0%	3	8.39%	1897	1.06E+01	6.61E+00	3.45E+00	1.61E+00	9.99E-01	5.21E-01
17:00	1824	97%	56	3%	3	0%	3	8.39%	1887	1.07E+01	6.65E+00	3.45E+00	1.50E+00	9.33E-01	4.84E-01
18:00	1285	98%	24	2%	2	0%	2	4.02%	1314	1.07E+01	6.65E+00	2.40E+00	1.12E+00	6.94E-01	2.51E-01
19:00	765	97%	13	2%	5	1%	2	4.02%	785	1.07E+01	6.65E+00	1.44E+00	1.15E+00	7.14E-01	1.54E-01
20:00	619	98%	7	1%	2	0%	2	4.02%	630	1.07E+01	6.66E+00	1.15E+00	1.10E+00	6.86E-01	1.19E-01
21:00	510	98%	7	1%	2	0%	0	0%	519	1.07E+01	6.65E+00	9.49E-01	8.00E-01	4.97E-01	7.09E-02
22:00	551	99%	8	1%	0	0%	0	0%	559	1.07E+01	6.64E+00	1.02E+00	7.71E-01	4.79E-01	7.37E-02
23:00	167	99%	1	1%	0	0%	0	0%	168	1.07E+01	6.66E+00	3.08E-01	7.42E-01	4.61E-01	2.13E-02
Total	20153		1469		147			100%	21810						

Appendix G2: Emission Rates - Richardson Side Road, West of Carp Road

Tailpipe Emissions

(g/vmt)	CO	NOx
LDV	10.735	0.721
MDV	7.980	4.141
HDV	11.697	8.636
LANDFILL	0.946	7.961

Length of Modelled Roadway	2540	m
	2.54	km
Total Landfill Truck AADT	0	trucks per day
% Trucks Travelling on Richardson Side Road, West	0%	

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Landfill Trucks		Total	CO			NO_x		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
0:00	15	83%	3	17%	0	0%	0	0	18	1.03E+01	6.38E+00	8.27E-02	1.29E+00	8.02E-01	1.04E-02
1:00	5	100%	0	0%	0	0%	0	0	5	1.07E+01	6.67E+00	2.40E-02	7.21E-01	4.48E-01	1.61E-03
2:00	5	83%	1	17%	0	0%	0	0	6	1.03E+01	6.38E+00	2.76E-02	1.29E+00	8.02E-01	3.46E-03
3:00	7	88%	1	13%	0	0%	0	0	8	1.04E+01	6.45E+00	3.72E-02	1.15E+00	7.14E-01	4.11E-03
4:00	6	67%	2	22%	1	11%	0	0	9	1.02E+01	6.35E+00	4.12E-02	2.36E+00	1.47E+00	9.50E-03
5:00	78	87%	11	13%	0	0%	0	0	89	1.04E+01	6.45E+00	4.04E-01	1.15E+00	7.17E-01	4.49E-02
6:00	231	77%	67	23%	1	0%	0	0	299	1.01E+01	6.28E+00	1.33E+00	1.52E+00	9.43E-01	1.99E-01
7:00	360	82%	78	18%	0	0%	0	0	438	1.02E+01	6.36E+00	1.97E+00	1.33E+00	8.24E-01	2.55E-01
8:00	295	86%	46	13%	1	0%	0	0	342	1.04E+01	6.44E+00	1.55E+00	1.20E+00	7.48E-01	1.80E-01
9:00	226	82%	49	18%	1	0%	0	0	276	1.03E+01	6.37E+00	1.24E+00	1.36E+00	8.42E-01	1.64E-01
10:00	183	43%	238	56%	1	0%	0	0	421	9.18E+00	5.70E+00	1.70E+00	2.67E+00	1.66E+00	4.93E-01
11:00	214	85%	38	15%	0	0%	0	0	252	1.03E+01	6.41E+00	1.14E+00	1.23E+00	7.66E-01	1.36E-01
12:00	211	83%	41	16%	1	0%	0	0	253	1.03E+01	6.39E+00	1.14E+00	1.30E+00	8.10E-01	1.45E-01
13:00	204	77%	60	23%	1	0%	0	0	265	1.01E+01	6.28E+00	1.18E+00	1.53E+00	9.49E-01	1.78E-01
14:00	209	81%	48	19%	1	0%	0	0	258	1.02E+01	6.35E+00	1.16E+00	1.39E+00	8.62E-01	1.57E-01
15:00	306	85%	53	15%	2	1%	0	0	361	1.03E+01	6.42E+00	1.64E+00	1.27E+00	7.88E-01	2.01E-01
16:00	403	85%	69	15%	2	0%	0	0	474	1.03E+01	6.42E+00	2.15E+00	1.26E+00	7.80E-01	2.61E-01
17:00	382	94%	24	6%	0	0%	0	0	406	1.06E+01	6.56E+00	1.88E+00	9.28E-01	5.76E-01	1.65E-01
18:00	260	93%	18	7%	0	0%	0	0	278	1.06E+01	6.55E+00	1.29E+00	9.47E-01	5.88E-01	1.16E-01
19:00	163	91%	16	9%	0	0%	0	0	180	1.05E+01	6.51E+00	8.25E-01	1.03E+00	6.41E-01	8.12E-02
20:00	144	95%	8	5%	0	0%	0	0	152	1.06E+01	6.58E+00	7.05E-01	9.05E-01	5.62E-01	6.03E-02
21:00	102	96%	4	4%	0	0%	0	0	106	1.06E+01	6.60E+00	4.94E-01	8.53E-01	5.30E-01	3.97E-02
22:00	93	94%	6	6%	0	0%	0	0	99	1.06E+01	6.56E+00	4.58E-01	9.33E-01	5.79E-01	4.05E-02
23:00	39	93%	3	7%	0	0%	0	0	42	1.05E+01	6.54E+00	1.93E-01	9.72E-01	6.04E-01	1.78E-02
Total	4141		885		12				5038						

Appendix G2: Emission Rates - Highway 417, East of Carp Road

Tailpipe Emissions

(g/vmt)	CO	NOx
LDV	12.324	0.765
MDV	10.964	5.405
HDV	15.999	11.313
LANDFILL	0.946	7.961

Length of Modelled Roadway	1060	m
	1.06	km
Total Landfill Truck AADT	870	trucks per day
% Trucks Travelling on HWY 417, East of Carp	90%	**Of the Total Landfill Truck AADT**

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Landfill Trucks		Total	CO			NO_x		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
0:00	265	79%	17	5%	55	16%	0	0%	337	1.29E+01	7.98E+00	7.92E-01	2.72E+00	1.69E+00	1.68E-01
1:00	147	79%	9	5%	30	16%	0	0%	186	1.29E+01	7.98E+00	4.37E-01	2.69E+00	1.67E+00	9.15E-02
2:00	111	79%	7	5%	23	16%	0	0%	141	1.29E+01	7.98E+00	3.32E-01	2.72E+00	1.69E+00	7.00E-02
3:00	97	79%	6	5%	20	16%	0	0%	123	1.29E+01	7.98E+00	2.89E-01	2.71E+00	1.68E+00	6.09E-02
4:00	151	79%	9	5%	31	16%	0	0%	191	1.29E+01	7.99E+00	4.49E-01	2.70E+00	1.67E+00	9.42E-02
5:00	606	79%	38	5%	126	16%	0	0%	770	1.29E+01	7.99E+00	1.81E+00	2.72E+00	1.69E+00	3.83E-01
6:00	1774	79%	111	5%	368	16%	0	0%	2253	1.29E+01	7.99E+00	5.30E+00	2.72E+00	1.69E+00	1.12E+00
7:00	2068	79%	129	5%	429	16%	32	4.02%	2626	1.29E+01	7.99E+00	6.17E+00	2.72E+00	1.69E+00	1.30E+00
8:00	1949	79%	122	5%	404	16%	66	8.39%	2475	1.29E+01	7.99E+00	5.82E+00	2.72E+00	1.69E+00	1.23E+00
9:00	2010	79%	126	5%	417	16%	66	8.39%	2553	1.29E+01	7.99E+00	6.00E+00	2.72E+00	1.69E+00	1.27E+00
10:00	2064	79%	129	5%	428	16%	66	8.39%	2621	1.29E+01	7.99E+00	6.16E+00	2.72E+00	1.69E+00	1.30E+00
11:00	2254	79%	141	5%	468	16%	66	8.39%	2863	1.29E+01	7.99E+00	6.73E+00	2.72E+00	1.69E+00	1.42E+00
12:00	2225	79%	139	5%	462	16%	66	8.39%	2826	1.29E+01	7.99E+00	6.65E+00	2.72E+00	1.69E+00	1.40E+00
13:00	2275	79%	142	5%	472	16%	66	8.39%	2889	1.29E+01	7.99E+00	6.79E+00	2.72E+00	1.69E+00	1.44E+00
14:00	2408	79%	151	5%	500	16%	66	8.39%	3059	1.29E+01	7.99E+00	7.19E+00	2.72E+00	1.69E+00	1.52E+00
15:00	2612	79%	163	5%	542	16%	66	8.39%	3317	1.29E+01	7.99E+00	7.80E+00	2.72E+00	1.69E+00	1.65E+00
16:00	2960	79%	185	5%	614	16%	66	8.39%	3759	1.29E+01	7.99E+00	8.84E+00	2.72E+00	1.69E+00	1.87E+00
17:00	2702	79%	169	5%	561	16%	66	8.39%	3432	1.29E+01	7.99E+00	8.07E+00	2.72E+00	1.69E+00	1.71E+00
18:00	2057	79%	129	5%	427	16%	32	4.02%	2613	1.29E+01	7.99E+00	6.14E+00	2.72E+00	1.69E+00	1.30E+00
19:00	1544	79%	97	5%	320	16%	32	4.02%	1961	1.29E+01	7.99E+00	4.61E+00	2.72E+00	1.69E+00	9.74E-01
20:00	1301	79%	81	5%	270	16%	32	4.02%	1652	1.29E+01	7.99E+00	3.88E+00	2.72E+00	1.69E+00	8.21E-01
21:00	1100	79%	69	5%	228	16%	0	0%	1397	1.29E+01	7.99E+00	3.28E+00	2.72E+00	1.69E+00	6.94E-01
22:00	699	79%	44	5%	145	16%	0	0%	888	1.29E+01	7.99E+00	2.09E+00	2.72E+00	1.69E+00	4.41E-01
23:00	452	79%	28	5%	94	16%	0	0%	574	1.29E+01	7.99E+00	1.35E+00	2.72E+00	1.69E+00	2.85E-01
Total	35831		2241		7434				45506						

Emission Rates - Highway 417, West of Highway 7

Tailpipe Emissions

(g/vmt)	CO	NOx
LDV	12.324	0.765
MDV	10.964	5.405
HDV	15.999	11.313
LANDFILL	0.946	7.961

gth of Modelled Roadway	2050	m
	2.05	km
Total Landfill Truck AADT	0	trucks per day
Trucks Travelling on HWY 417, West of Highway 7	0%	**Of the Total Landfill Truck AADT**

Hour of Day	Cars [1]		Medium [2]		Heavy [3]		Landfill Trucks		Total	CO			NO_X		
										Weighted Average Tailpipe Emissions			Weighted Average Tailpipe Emissions		
	Count	Distribution	Count	Distribution	Count	Distribution	Count	Distribution	Count	(g/vmt)	(g/vkt)	(g/s)	(g/vmt)	(g/vkt)	(g/s)
0:00	163	80%	10	5%	31	15%	0	0%	204	1.28E+01	7.96E+00	9.25E-01	2.60E+00	1.61E+00	1.87E-01
1:00	90	80%	6	5%	17	15%	0	0%	113	1.28E+01	7.95E+00	5.12E-01	2.60E+00	1.61E+00	1.04E-01
2:00	68	80%	4	5%	13	15%	0	0%	85	1.28E+01	7.96E+00	3.85E-01	2.60E+00	1.61E+00	7.81E-02
3:00	59	80%	4	5%	11	15%	0	0%	74	1.28E+01	7.95E+00	3.35E-01	2.58E+00	1.60E+00	6.76E-02
4:00	93	80%	6	5%	17	15%	0	0%	116	1.28E+01	7.95E+00	5.25E-01	2.55E+00	1.58E+00	1.05E-01
5:00	372	80%	23	5%	70	15%	0	0%	465	1.28E+01	7.96E+00	2.11E+00	2.58E+00	1.60E+00	4.25E-01
6:00	1091	80%	68	5%	204	15%	0	0%	1363	1.28E+01	7.95E+00	6.17E+00	2.58E+00	1.60E+00	1.24E+00
7:00	1271	80%	79	5%	238	15%	0	0%	1588	1.28E+01	7.95E+00	7.19E+00	2.58E+00	1.60E+00	1.45E+00
8:00	1199	80%	75	5%	225	15%	0	0%	1499	1.28E+01	7.95E+00	6.79E+00	2.58E+00	1.60E+00	1.37E+00
9:00	1236	80%	77	5%	232	15%	0	0%	1545	1.28E+01	7.96E+00	7.00E+00	2.58E+00	1.60E+00	1.41E+00
10:00	1269	80%	79	5%	238	15%	0	0%	1586	1.28E+01	7.95E+00	7.18E+00	2.58E+00	1.60E+00	1.45E+00
11:00	1386	80%	87	5%	260	15%	0	0%	1733	1.28E+01	7.95E+00	7.85E+00	2.58E+00	1.60E+00	1.58E+00
12:00	1368	80%	86	5%	257	15%	0	0%	1711	1.28E+01	7.95E+00	7.75E+00	2.58E+00	1.60E+00	1.56E+00
13:00	1399	80%	87	5%	262	15%	0	0%	1748	1.28E+01	7.95E+00	7.92E+00	2.58E+00	1.60E+00	1.59E+00
14:00	1481	80%	93	5%	278	15%	0	0%	1852	1.28E+01	7.95E+00	8.39E+00	2.58E+00	1.60E+00	1.69E+00
15:00	1606	80%	100	5%	301	15%	0	0%	2007	1.28E+01	7.95E+00	9.09E+00	2.58E+00	1.60E+00	1.83E+00
16:00	1820	80%	114	5%	341	15%	0	0%	2275	1.28E+01	7.95E+00	1.03E+01	2.58E+00	1.60E+00	2.07E+00
17:00	1661	80%	104	5%	311	15%	0	0%	2076	1.28E+01	7.95E+00	9.40E+00	2.58E+00	1.60E+00	1.89E+00
18:00	1265	80%	79	5%	237	15%	0	0%	1581	1.28E+01	7.95E+00	7.16E+00	2.58E+00	1.60E+00	1.44E+00
19:00	950	80%	59	5%	178	15%	0	0%	1187	1.28E+01	7.95E+00	5.38E+00	2.58E+00	1.60E+00	1.08E+00
20:00	800	80%	50	5%	150	15%	0	0%	1000	1.28E+01	7.95E+00	4.53E+00	2.58E+00	1.60E+00	9.12E-01
21:00	676	80%	42	5%	127	15%	0	0%	845	1.28E+01	7.96E+00	3.83E+00	2.58E+00	1.60E+00	7.71E-01
22:00	430	80%	27	5%	81	15%	0	0%	538	1.28E+01	7.96E+00	2.44E+00	2.59E+00	1.61E+00	4.92E-01
23:00	278	80%	17	5%	52	15%	0	0%	347	1.28E+01	7.96E+00	1.57E+00	2.57E+00	1.60E+00	3.16E-01
Total	22031		1376		4131				27538						