APPENDIX I

Air Quality

AIR EMISSIONS INVENTORY

By: Daigler Engineering, P.C.

December 2011
Last Revised March 2015

AIR EMISSIONS INVENTORY

For the Draft Environmental Impact Statement

CARROLL LANDFILL EXPANSION APPLICATION

CARROLL, NEW YORK

SEALAND WASTE, LLC

Prepared on behalf of:

Sealand Waste, LLC
85 High Tech Drive
Rush, New York 14543

Prepared by:

DAIGLER ENGINEERING P.C.
2620 Grand Island Blvd.
Grand Island, New York 14072-2131

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Carroll Landfill Expansion

Sealand Waste, LLC

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1 INTRODUCTION

The purpose of the air emissions inventory for the proposed Carroll Landfill Expansion is two-fold; (1) to identify and quantify any environmental impacts the facility and facility operations may have on air quality, and (2) to determine what, if any, air permits or registrations are applicable to the facility as proposed.

The proposed Carroll Landfill Expansion project is currently undergoing environmental review as part of the State Environmental Quality Review process. A Draft Environmental Impact Statement (DEIS) is being prepared under the direction of the New York State Department of Environmental Conservation (NYSDEC). As part of the DEIS, existing and proposed sources of air emissions must be identified and evaluated as to their impact on the surrounding environment including nearby residential receptors. Although potential impacts to human health are of primary concern, nuisance odors are also to be evaluated. Identified air quality impacts must be quantified and mitigation measures must be proposed for all potentially significant impacts.

As with any landfill in New York State, the Carroll Landfill will be permitted under 6 NYCRR Part 360 Regulations. However, ancillary permits may be necessary for the operation of the facility, including air permits or registrations. The air emissions quantified herein will be compared to the applicable regulations to identify all required permits or registrations. Compliance with the identified regulations will be demonstrated.

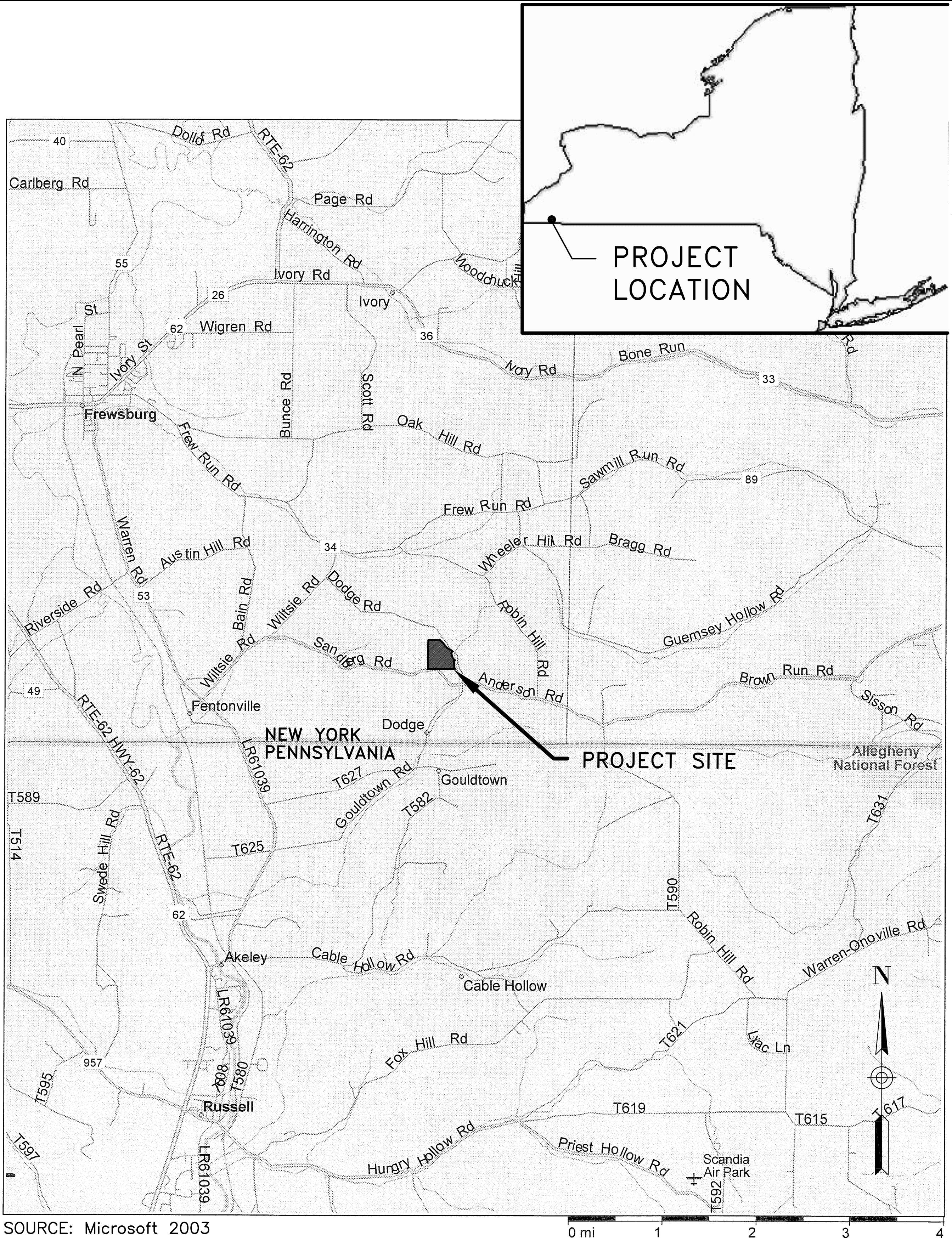
2 FACILITY DESCRIPTION

The project site is located in the Town of Carroll, Chautauqua County, New York, as shown on Figure 2-1. The 53.3-acre property is near the intersection of Dodge Road and Sandberg Road in the southeastern corner of the Town of Carroll, approximately one mile north of the New York/Pennsylvania border. The site currently contains a three-acre construction and demolition (C&D) debris landfill, which has been capped with a soil barrier layer, topsoil layer, and is well vegetated. The existing landfill is reported to contain approximately 142,350 cubic yards of waste. The entrance gate and access road for the existing landfill are located off the west side of Dodge Road. Other areas of the site are undeveloped, or were used for stockpiling of metal scrap for resale, and cover soil borrow areas. Currently, no landfilling, or recycling operations are occurring at the site.

The subject property and lands in the area surrounding the site are zoned AR-1, Agricultural/Residential District 1. In the vicinity of the site, the land is characteristic of a rural setting consisting of wooded lands, agricultural fields, and residences.

Sealand Waste, LLC (Sealand) proposes to purchase the 53.3-acre parcel of land, including the existing Carroll Landfill, from Carol L. Jones. Sealand intends to continue the C&D landfilling activity expanding to an approximate 35-acre landfill footprint in accordance with the applicable local, state, and federal requirements. The existing waste from the three-acre footprint would be removed and placed inside the proposed double composite liner system for the expanded landfill.

The proposed facility will accept C&D waste as defined by 6 NYCRR Paragraph 360-1.2(b)(38). Additionally ancillary and support facilities will be constructed onsite to include a scale house, office building, access roadways, leachate storage and load-out facility, equipment maintenance and repair shop (shop), active gas collection and control system, and stormwater management basins and structures.



SOURCE: Microsoft 2003

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CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

SITE LOCATION MAP CARROLL LANDFILL EXPANSION APPLICATION			
SEALAND WASTE, LLC			FIGURE 2-1
TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	
February 2015	SCALE: AS SHOWN	REVISION # 0	

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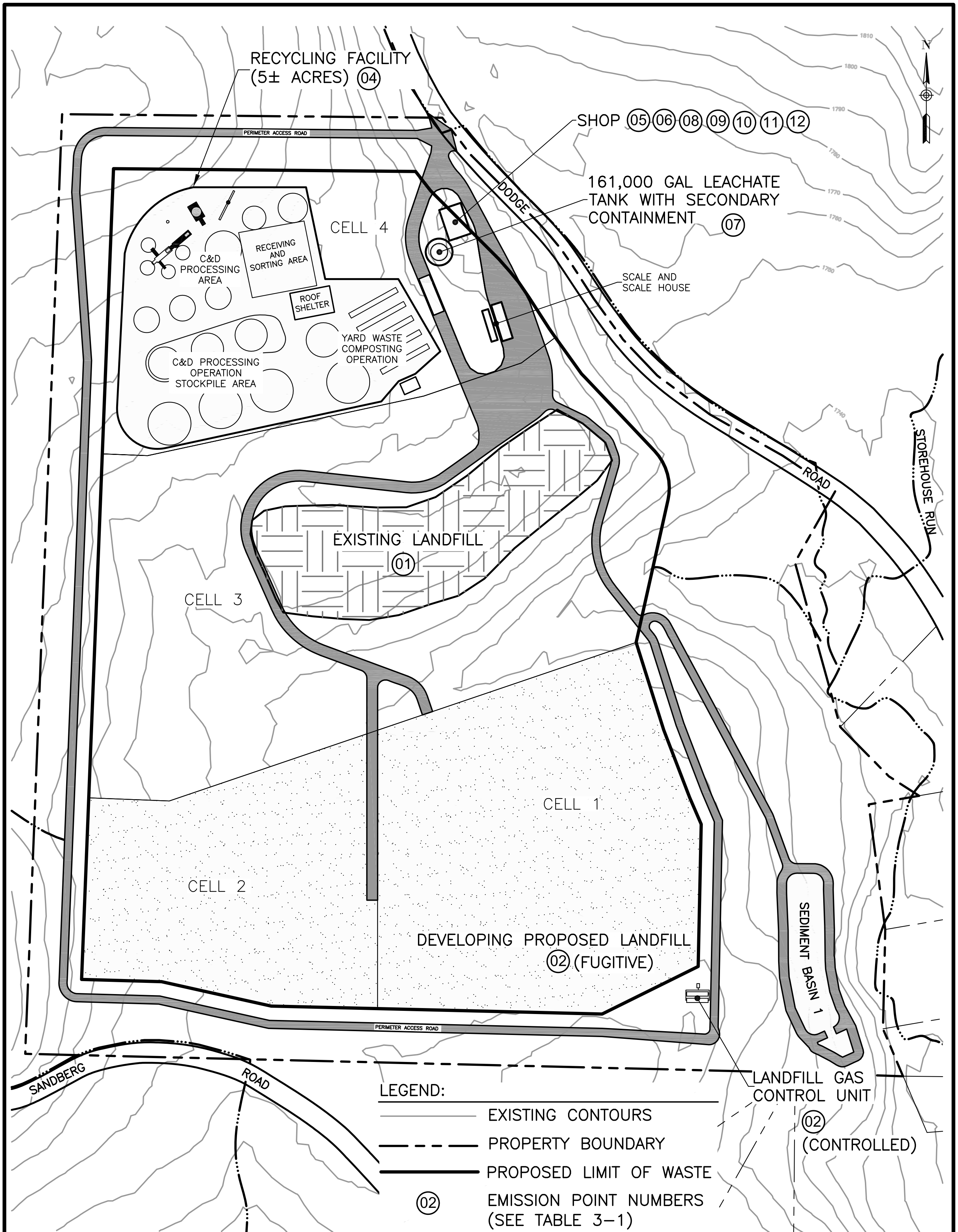
In support of landfill operations, the proposed solid waste management facility will also include C&D waste processing operations and yard waste composting to manage source separated yard waste delivered to the site. Other ancillary operations will include the excavation and placement of onsite structural fill soils, the screening of onsite soils for liner and leachate collection system construction, and the import of drainage aggregate for a portion of the leachate collection system drainage layer. These operations are to be conducted within the final waste footprint of the proposed landfill.

3 EMISSIONS SOURCES

A summary of the emissions sources for the Carroll Landfill as proposed is provided in Table 3-1. Figure 3-1 is a site plan for the proposed Carroll Landfill. The locations of all stationary emissions sources, existing and proposed, are identified. Each source or source category is discussed in detail below.

TABLE 3-1: SUMMARY OF EMISSIONS SOURCES

EMISSION POINT	CAPACITY	DESCRIPTION
01	0 Mg/yr (Closed)	Existing 142,350 yd^3 C&D Debris Land Disposal Unit – Fugitive Emissions
02	111,640 Mg/yr	Proposed 5,448,710 yd^3 C&D Debris Land Disposal Unit – Control Unit Outlet and Fugitive Emissions (beyond the collection efficiency of the gas collection system)
03	307 operating days/yr	Particulates from Facility Operations - Fugitive Emissions
04	1103 kW (combined)	Stationary Compression Ignition Internal Combustion Engines (4) – Fugitive Emissions
05	0.60 MBTU/hr	Combined Exhaust from (2) Waste Oil Space Heaters - Stack
06	96 lb/year	Electric Arc Welder - Vent
07	161,000 gal	Landfill Leachate Above Ground Storage Tank - Vent
08 09 10 11 12	1,500 gal 500 gal 500 gal 300 gal 8,000 gal	Waste Oil Above Ground Storage Tank – Vent Diesel Motor Oil Above Ground Storage Tank – Vent Hydraulic Oil Above Ground Storage Tank – Vent Gasoline Above Ground Storage Tank – Vent Diesel Fuel Above Ground Storage Tank – Vent



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2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

AIR FACILITIES SITE PLAN CARROLL LANDFILL EXPANSION APPLICATION			FIGURE 3-1
SEALAND WASTE, LLC			
TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	
February 2015	SCALE: 1 : 250	REVISION # 2	

3.1 C&D LANDFILL GASES

Gases are generated within landfills due to the biodegradation of the waste they contain. The greater the amount of organic waste or putrescibles within the waste, the more biodegradation occurs. A typical municipal solid waste (MSW) landfill will contain a significant fraction of biodegradable, organic waste. Landfill gas will consist largely of methane, carbon dioxide, and other organic gases. Landfill gas emission rates produced by a typical MSW landfill can be adequately modeled using the US Environmental Protection Agency (US EPA)'s Landfill Gas Emissions Model (LandGEM). The factors used in this model (AP-42 Inventory) were developed based on extensive field testing of MSW landfills.

The typical waste composition of a C&D debris landfill, as shown in Table 3-2, contains a much smaller fraction of easily biodegradable waste.

TABLE 3-2: TYPICAL WASTE COMPOSITION FROM A C&D DEBRIS LANDFILL

Waste Type	% by Volume[1]	% by Mass[2]
Concrete & Mixed Rubble	1-20%	40-50%
Wood	20-35%	20-30%
Drywall	5-20%	5-15%
Asphalt Roofing	1-8%	1-10%
Metals	1-8%	1-5%
Bricks	1-5%	1-5%
Plastics	1-5%	1-5%

[1] Source: ICF Incorporated (1995)
[2] Source: Sandler (2003)

Therefore, C&D debris landfills will not generate appreciable quantities of landfill gas as compared to a MSW landfill. According to the LandGEM manual (US EPA, 2005), the model may still be considered a valid estimate of methane generation for C&D landfills as long as the input parameters are adjusted to account for the non-biodegradable portion of the waste. In 2009, the US EPA promulgated 40 CFR 98, the *Mandatory Greenhouse Gas Reporting Rule for Municipal Solid Waste Landfills* (November 29, 2013). Guidelines for calculating methane generation for municipal solid waste landfills are provided in Subpart HH. Factors are provided for calculation of methane generation by waste type in Table HH-1. Values for methane generation rate (*k*) and degradable organic carbon (*DOC*) specific to C&D waste are provided. A range of *k* in C&D waste of 0.2 to 0.4/year is listed in Table HH-1 to Subpart HH of 40 CFR Part 98. A footnote provides further direction on which rate to use based on local precipitation and leachate recirculation rates. Ten years worth of data from the National Oceanic and Atmospheric Association (NOAA), at the Jamestown, NY weather station, the closest official weather station from the property, were evaluated for the period between 2004 and 2014. The average annual precipitation excepted at the site is approximately 44 inches/year. Further, the proposed landfill operation includes leachate recirculation. Therefore, based on footnote b to Table HH-1, the approximate methane generation rate for a C&D landfill that uses leachate recirculation and experiences an annual precipitation rate of greater than 40 inches/year, is 0.04/year.

The methane generation equation presented in 40 CFR 98, Subpart HH is slightly different from that used in LandGEM, therefore methane generation potential, $L_{o,}$ for C&D waste was not directly provided in Table HH-1. Instead, L_o was derived from the *DOC* factor for C&D waste which was provided in Table HH-1. The *DOC* for C&D waste was given as 0.08 metric tons of carbon/metric tons of C&D waste. The conversion of this factor to L_o in cubic meters/Megagrams C&D waste is presented in Appendix A. The resulting L_o is 32.1 m^3/Mg.

One component of landfill gas that is uniquely different in C&D debris landfills is hydrogen sulfide (H_2S). Although MSW landfills will produce some H_2S gas, H_2S concentrations generated during C&D debris landfilling operations are significantly higher. The culprit has been identified as the large quantities of gypsum drywall, which can be up to one quarter of the waste disposed of in C&D debris landfills. Gypsum drywall is composed of approximately 90% $CaSO_4 \cdot 2\ H_2O$ and 10% paper (Yang *et al.*, 2006). Under wet, anaerobic conditions, sulfate reducing bacteria will use the sulfate in the gypsum to produce H_2S gas. Based purely on the stoichiometery of the reaction, 35 tons of H_2S gas can be produced from every 100 tons of sulfate (Bogner and Heguy, 2004).

Measured concentrations of H_2S gas from MSW landfills receiving a significant volume of C&D waste and from C&D debris monofills vary greatly. Hot spots of H_2S associated with C&D waste have been reported with concentrations as high as 8% or 80,000 ppm (Flynn, 1998). The conditions under which this concentration was measured were not disclosed. Bogner and Heguy

(2004) reported a study of nine MSW landfills that received a large influx of C&D waste following a natural disaster. Concentrations of H_2S measured within a few months of receiving the C&D debris ranged from 0.4 to 116 ppmv.

Lee *et al*. (2006) collected and analyzed landfill gas from gas wells screened directly in the waste and soil vapor samples taken with soil probes at the soil-waste interface from ten C&D debris landfills in Florida. Their results are summarized in Table 3-3.

TABLE 3-3: HYDROGEN SULFIDE CONCENTRATIONS IN C&D DEBRIS LANDFILL GAS*

Site	Number of Samples	Samples with Detections	Minimum (ppm)	Maximum (ppm)	Average (ppm)	Standard Deviation (ppm)	Median (ppm)
A	21	19	ND	470	26	100	0.013
B	116	77	ND	920	8.1	85	0.007
C	8	8	0.013	12,000	30	5,400	25
D	26	25	ND	7,000	2,110	2,200	1,800
E	72	62	ND	2,500	360	295	0.02
F	24	16	ND	49	5.9	0.024	0.004
G	24	19	ND	0.64	0.007	0.16	0.005
H	22	20	ND	3,300	151	700	0.025
I	23	22	ND	11,000	1,200	2,800	23
J	26	26	ND	530	26	100	0.35
TOTAL	362	294	ND	12,000	660		0.023

ND = less than detection limit of 3 ppbv
*Recreated from Lee *et al*., 2006

As shown, H_2S concentration measurements varied widely from less than 3 ppbv to 12,000 ppmv (Lee *et al*., 2006). The authors attributed the variability to heterogeneities in waste composition and soil cover properties, weather conditions at the time of sampling, and different site management practices. The samples collected from the gas wells were thought to be more representative of C&D debris landfill gas because mixing with ambient air was not an issue as it was with the soil probe samples. The H_2S concentrations in samples collected from the gas wells screened within waste were also much more consistent as demonstrated by the similar average and median concentrations found at Site D whose data was predominantly from gas collection wells installed within the waste. Of the ten C&D landfills included in the Lee *et al*. (2006) study, Site D also has the highest average concentration, 2,110 ppm. Still, Lee *et al*. (2006) noted intra-site variability in "the measured [H_2S] concentrations ranged over many orders of magnitude" and average concentrations for most sites "were much higher than median concentrations, as a result of a few very high concentration measurements." Because of this internal variability, Lee *et al.* (2006) suggested using the median concentration as a better measure of central tendency since the average concentration overestimates the overall emissions. The percent methane collected from Site D was 38% on average with a range of 15.4 to 44.9%.

Anderson *et al*. (2010) tested landfill gases from nine MSW landfills with beneficial use determination permits to use C&D debris fines as alternative cover materials. Their study also included one site where C&D debris were segregated from MSW as monofill and further segregated into areas of bulky C&D debris containing no fines (i.e., residuals from C&D debris processing) and an area consisting mostly of C&D fines. Hydrogen sulfide concentrations reported by Anderson *et al*. (2010) were normalized to 50% methane; however, the methane concentrations were not discussed. Gas pulled from wells installed in the C&D fines area was consistently elevated to concentrations of 20,000 ppmv or more. By comparison, gas pulled from wells installed in the bulky C&D debris had much lower H_2S concentrations of between 100 and 1,000 ppmv. A baseline concentration of 200 to 400 ppmv was suggested for emissions from a C&D debris landfill containing mostly bulky materials with limited amounts of C&D fines.

Hydrogen sulfide emission rates for the purposes of this air emissions inventory were modeled using a user specified H_2S concentration in the LandGEM model. The LandGEM model was also used to estimate the emission rates of other parameters of concern from landfill gases, including carbon monoxide, volatile organic compounds, hazardous air pollutants, ozone depleting chemicals, non-methane organic compounds (NMOCs), and greenhouse gases (methane and carbon dioxide). The following model parameters were used in the LandGEM model.

- Methane generation rate, k = 0.04/year (40 CFR 98, Subpart HH, Table HH-1);
- Potential methane generation capacity, L_o = 32.1 m^3/Mg (derived from 40 CFR 98, Subpart HH, Table HH-1 (Appendix A));
- NMOC concentration = 600 ppmv as hexane (inventory, no or unknown co-disposal);

- Methane content = 40% by volume (user-specified). The LandGEM default for this parameter is 50% by volume as listed in the Clean Air Act for MSW landfills. Recent analysis indicated that the percent methane by volume is much lower in gas from a C&D debris landfill (Lee *et al*., 2006). The average percentage of methane measured in their study was 38%. However, entering a user-specified input below 40% prompts the LandGEM model to warn of improper use of the model. Therefore, the user-specified value for methane content was rounded up to 40%; and,

- Hydrogen sulfide concentration = 4,310 ppmv (user-specified). The default concentration for H_2S in the LandGEM model, 36 ppmv, is based on the AP-42 Inventory. As discussed above, the concentration of H_2S in a C&D debris landfill is usually higher than that of a typical MSW landfill. A H_2S concentration of 2,110 ppmv, the maximum average concentration measured by Lee *et al*. (2006), was selected as the most conservative, supportable concentration to apply sitewide. According to AP-42 (page 2.4-4), when using site-specific values for the concentration of an individual pollutant in LandGEM, the measured pollutant concentration must be corrected for air infiltration based on site-specific measured concentrations for carbon dioxide, methane, oxygen, and nitrogen. This data was not available so an additional factor of safety, one standard deviation calculated using the same data set (2,200 ppmv), was added to the average value, resulting in a highly conservative site wide concentration of 4,310 ppmv.

The results from the LandGEM model for the existing Jones-Carroll Landfill and the proposed Carroll Landfill are presented below.

3.1.1 Existing Landfill – Emission Point 01

The Jones-Carroll Landfill opened in 1990 and closed in 2007. The final year of waste acceptance was 2006. The existing landfill is three acres in size and is estimated to contain approximately 106,760 ton[1] of C&D debris based on a review of annual reports over the operating time period.

[1] 142,350 cubic yards multiplied by an assumed waste density of 0.75 ton/cy. Assumed waste density was taken from NYSDEC, 2010.

3.1.1.1 Uncontrolled Emissions

Uncontrolled emissions were estimated with the LandGEM model. User inputs are as described above. Emissions were modeled for two years of interest; the current conditions (2015) and the year 2029 which, as discussed below, is the assumed closing year for the proposed Carroll Landfill and, therefore, the year of maximum landfill emissions. Sometime before year 2029 the existing landfill waste mass will be excavated and relocated to the proposed lined landfill. However, modeling of the emissions from the existing waste mass will still be performed separately because the characteristics of their emissions will be significantly different than the new waste given its age.

A summary of uncontrolled air emissions for the two years of interest is presented in Table 3-4. Details of the calculations are provided in Appendix A.

TABLE 3-4: ESTIMATED UNCONTROLLED EMISSIONS FROM THE EXISTING JONES-CARROLL LANDFILL

Pollutant	Current Year 2015			Anticipated Year of Maximum Landfill Gas Emissions 2029		
	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY
Hydrogen Sulfide	0.89	0.22	0.98	0.51	0.13	0.56
Non-Methane Organic Compounds (NMOCs)	0.31	0.08	0.34	0.18	0.05	0.20
VOCs	0.09	0.02	0.10	0.05	0.01	0.06
HAPs	0.06	0.02	0.07	0.04	0.01	0.04
CO	0.02	0.01	0.03	0.01	< 0.01	0.01
Ozone-Depleting Compounds	0.02	<0.01	0.02	0.01	< 0.01	0.01
Greenhouse Gases:						
CH_4	38.8	9.73	42.6	22.1	5.56	24.4
CO_2	160	40.1	175	91.1	22.9	100

The waste in the existing Jones-Carroll Landfill is already a minimum of nine up to 25 years old. Correspondingly, the aged waste which is already producing minimal emissions is declining in emission rates. By the year of maximum landfill emissions, the contribution from the existing waste is nearly negligible.

3.1.1.2 Controlled Emissions

The Jones-Carroll Landfill has been closed reportedly in accordance with NYSDEC regulations. The final cover system mandated by the NYSDEC consists of a minimum of 18 inches of clay barrier, a 24-inch thick soil barrier layer, and a six inch topsoil layer. The existing landfill does not have a gas venting system, therefore any air emissions coming from the waste would have to diffuse up through the final cover system. Within the *Mandatory Greenhouse Gas Reporting Rule for Municipal Solid Waste Landfills* (40 CFR §98.348; November 29, 2013), the US EPA established a procedure for determining the amount of methane oxidation expected from diffusion through soil cover material. Using this procedure it was estimated that approximately 35% of methane emissions will be oxidized as it diffuses through the Jones-Carroll final cover system (see Appendix A for the calculation). This oxidation factor was applied to all pollutants with the exception of H_2S. Research on H_2S emissions from C&D landfills by Durno (2006) indicates that clayey cover materials can effectively reduce diffusive H_2S emissions by 77% to as much as 98%. Therefore controlled H_2S emissions were conservatively assumed to undergo a 75% reduction from uncontrolled emissions as they diffuse through the final cover system. The estimated controlled emission rates from the Jones-Carroll Landfill in the current year (2015) are presented in Table 3-5.

TABLE 3-5: ESTIMATED CURRENT CONTROLLED EMISSIONS FROM THE EXISTING JONES-CARROLL LANDFILL

Pollutant	Current Year 2015		
	Mg/yr	lbs/hr	TPY
Hydrogen Sulfide	0.22	0.06	0.24
Non-Methane Organic Compounds (NMOCs)	0.20	0.05	0.22
VOCs	0.06	0.02	0.07
HAPs	0.04	0.01	0.05
CO	0.02	< 0.01	0.02
Ozone-Depleting Compounds	0.01	< 0.01	0.01
Greenhouse Gases:			
CH_4	25.2	6.33	27.7
CO_2	104	26.0	114

Actual air monitoring of the existing landfill was recently conducted during an investigation of the existing waste. The existing waste investigation that occurred on August 31, 2011 through September 6, 2011 involved test pitting through the existing waste to define the horizontal and vertical extent of the waste and its characteristics. It should be noted that no drywall waste was identified during this investigation.

Total volatile organics, H_2S, carbon monoxide, percent oxygen, and lower explosive limit (LEL) were measured using a MultiRAE Plus gas meter. Readings taken while the waste was exposed in the working zone just outside the test pits showed minimal air emissions. At no time were measurable levels of H_2S concentrations detected. However, the detection limit of the meter for H_2S was 1.0 ppm, two orders of magnitude above the limit. Ambient air measurements made at other C&D landfill sites reported by Lee *et al*. (2006) resulted in a wide range of H_2S concentrations from below 3 ppbv to greater than 50 ppmv. The concentration of H_2S measured onsite during the existing waste investigation, < 1.0 ppm, is consistent with this range.

The detection limits for CO and VOCs were 1.0 and 0.1 ppm, respectively. The percent oxygen remained at background level, a steady 20.9%, and %LEL was zero. Two of four test pits had low VOC measurements of 0.1 to 1.0 ppm. A peak measurement of 1.2 ppm VOCs was taken directly within the waste. Carbon monoxide was detected at l ppm at one test pit.

By the year 2029, when total landfill gas emissions are expected to be at their maximum, the existing landfill will have been relocated to the new lined landfill, the landfill will have reached capacity, and received final cover for facility closure. At that time the existing waste will be subject to the proposed active gas collection and H_2S control system, as described in detail in Section 3.1.2.2. Therefore, controlled emissions from the existing landfill in 2029 as presented in Table 3-7 were calculated using the assumptions regarding the collection and control efficiencies detailed below.

3.1.2 Proposed Landfill – Emission Point 02

The proposed Carroll Landfill has an estimated total waste volume of 5,448,710 cubic yards (cy). At some time during Phase 5 of the proposed landfill's phasing plan, the waste from the existing landfill will be excavated and relocated to the proposed lined landfill. Thus, the total volume available for new waste was calculated by subtracting the modeled volume of the existing Jones-Carroll Landfill from the estimated total design waste volume of the proposed landfill. The application seeks an approved design waste capacity of 1,000 tons per day. The estimated year of opening is assumed to be 2016. The waste acceptance rate used in the models was assumed to be the proposed design waste capacity. Calculations of the waste acceptance rates for the proposed Carroll Landfill are included in Appendix A.

3.1.2.1 Uncontrolled Emissions

Uncontrolled emissions were estimated with the LandGEM model. User inputs are as described above. Maximum emissions will occur the same year the facility reaches capacity. This year is calculated to be 2029. Therefore, emissions were modeled for the year 2029 to provide the worst-case scenario. A summary of uncontrolled air emissions for 2029 is presented in Table 3-6. Details of the calculations are provided in Appendix A.

TABLE 3-6: ESTIMATED UNCONTROLLED EMISSIONS FROM THE PROPOSED CARROLL LANDFILL

Pollutant	Anticipated Year of Maximum Landfill Gas Emissions 2029		
	Mg/yr	lbs/hr	TPY
Hydrogen Sulfide	55.6	14.0	61.2
Non-Methane Organic Compounds (NMOCs)	19.6	4.91	21.5
VOCs	5.87	1.47	6.45
HAPs	4.01	1.01	4.41
CO	1.48	0.37	1.63
Ozone-Depleting Compounds	0.94	0.24	1.03
Greenhouse Gases:			
CH_4	2,430	610	2,670
CO_2	9,990	2,510	11,000

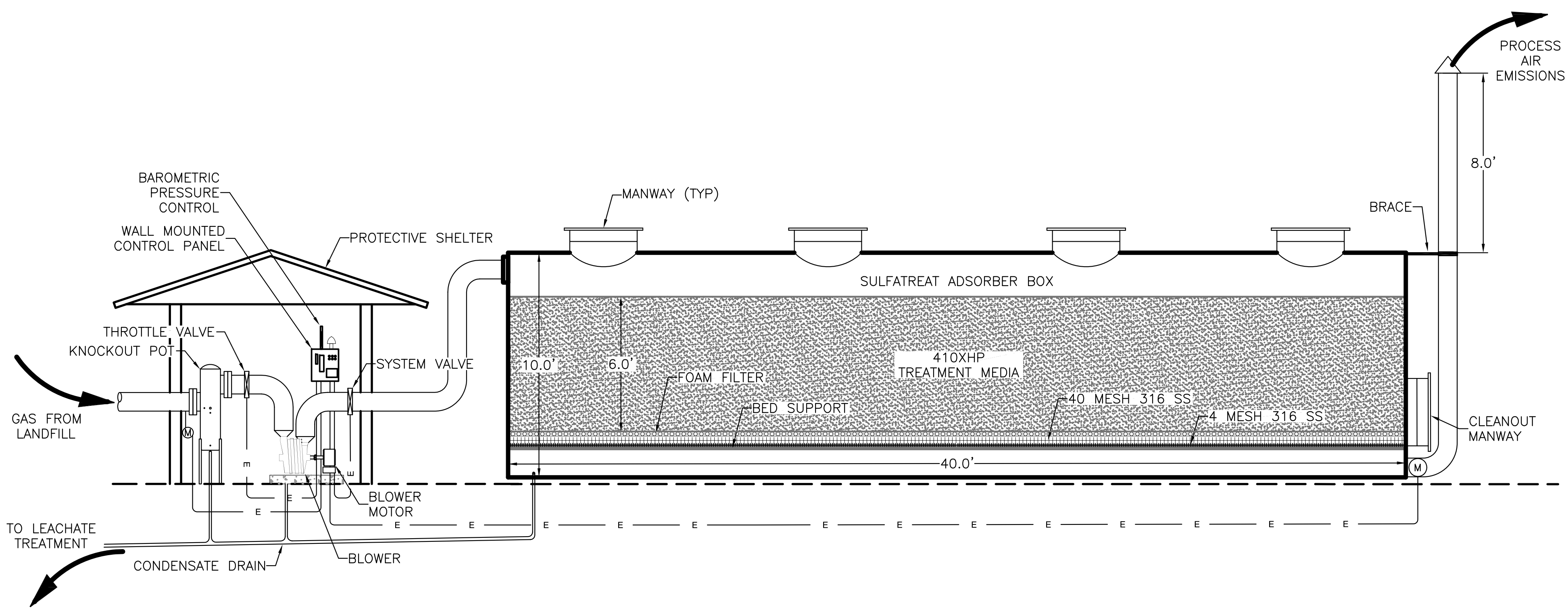
Landfills are targeted emitters of greenhouse gases, including methane and carbon dioxide. See Section 3.10 for a complete discussion of greenhouse gas implications from the facility as a whole, including landfill gases.

3.1.2.2 Controlled Emissions

As waste is placed in the proposed landfill, discretionary cover materials will be placed over the waste on an as needed basis. It is assumed that the environmental conditions of uncovered waste are not ideal for landfill gas production as the young, freshly-placed waste will have sufficient oxygen levels to prevent anaerobic degradation. Daily cover materials will provide some control of landfill gas as the waste ages and anaerobic conditions suitable for degradation processes develop. Subdivision 360-2.15(e), requires among other things the control of objectionable odors. Since there is reasonable concern for H_2S odor associated with C&D landfills, an active gas collection and control system has been incorporated into the proposed landfill design.

Preliminary design of the landfill gas collection field consists of horizontal collection trenches connected to a closed loop header pipe that is outside the waste, embedded either within the landfill's liner system or the perimeter embankment. The landfill gas collection system also will be connected to the leachate cleanout piping to pull landfill gas from the leachate collection system. This will minimize odors at leachate cleanouts and manholes. While a horizontal collection system is highly effective in the near term, their efficiency is known to decrease overtime. Therefore, it is expected that the horizontal collectors will eventually be abandoned for a system of vertical collectors for long-term control. Condensate traps (i.e., P-traps) will be installed at low points in the collection system as necessary.

A process schematic of the proposed landfill gas control system is shown in Figure 3-2. The landfill gas control system will contain a condensate knockout, one or more blowers, two SulfaTreat Adsorber Vessels in a lead-lag arrangement, and process control and monitoring systems. For clarity, only the lag vessel is shown in the schematic on Figure 3-2 and the system is also not shown in the proposed orientation. A previous evaluation of hydrogen sulfide treatment systems for a similar C&D landfill application concluded that the SulfaTreat System was the most cost effective option in terms of dollars per ton of hydrogen sulfide removed (J.A. Daigler and Associates, 2004). SulfaTreat 410 XHP media, currently produced by MiSWACO, a Schlumberger Company based in Chesterfield, Missouri, is a solid, H_2S scavenger media comprised of a proprietary blend of iron oxides and an activator oxide impregnated onto an inert ceramic based, granular media. Analysis of the unreacted media by scanning electron microscopy revealed the activator oxide, mostly an oxide copper, at low levels and iron oxides (Fe_2O_3, Fe_3O_4) embedded within a highly porous calcined montmorillonite matrix (Truong and Abatzoglou, 2005). This active media is physically attached to supportive, nonporous silica matrix particles containing small amounts of aluminum oxide. The silica particles are between 4.0 and 6.5 mm in diameter (Truong and Abatzoglou, 2005). Truong and Abatzoglou (2005) caution against excess handling of the media, reporting that the active ingredients easily loosen from the silica support forming a dust-like powder.



LEGEND

(M)	METER (BOTH FLOW AND 4–GAS INCLUDING H_2S)
—— E ——	ELECTRIC LINE

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2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

SEALAND WASTE, LLC		LANDFILL GAS CONTROL SYSTEM SCHEMATIC CARROLL LANDFILL EXPANSION APPLICATION			FIGURE 3-2
SCALE: NOT TO SCALE	REVISION # 1				
February 2015		TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	

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The process is a fixed bed system for treatment of gaseous waste streams that are high in H_2S. Hydrogen sulfide chemically adsorbs onto the SulfaTreat media primarily through the following reaction: $Fe_2O_3 + 3H_2S \rightarrow Fe_2S_3 + 3H_2O$ (GC Environmental, Inc., 2010). The ferric sulfide (Fe_2S_3) in the reacted media is inert, i.e., non-biodegradable and non-pyrophoric (Civili, 2014). Scanning electron microscopy of the reacted material shows a relatively uniform distribution of adsorbed sulfur over the support particles (Truong and Abatzoglou, 2005). Handling of the spent media did not release any detectable hydrogen sulfide odors. This evidence corroborates the manufacturer's claims that the reaction is non-reversible under normal environmental conditions.

Oxygen in the landfill gas has been reported to provide limited regeneration of the iron oxide in the following reaction: $Fe_2S_3 + 3O \rightarrow Fe_2O_3 + 3S$. However, the elemental sulfur produced in the reaction will eventually coat the media blinding the iron oxide from the landfill gas reducing effectiveness. Buildup of elemental sulfur will also cause a cementing of the bed which reduces gas flow rates or increases the pressure drop across the media bed and complicates the change out process. Therefore, the media works best at low oxygen concentrations and the manufacturer does not suggest introducing air into the process to increase oxygen content.

Removal efficiencies for the SulfaTreat System are generally well over 99% for H_2S. The spent SulfaTreat media is environmentally safe and non-hazardous. It is chemically stable and can be disposed of directly in a landfill without the threat of H_2S redeveloping. The spent media can be disposed of in an MSW landfill.

SulfaTreat's representative provided a list of references. All three referenced installations were treating landfill gas from municipal solid waste facilities located in the northeast United States. In general, the SulfaTreat systems were successful and the operators of the systems were satisfied with the performance. Two of the three installations were upstream of electric generators and were installed to control SO_2 emissions from the generators. These installations were designed only to knock the H_2S down to concentrations near 100 – 200 ppm. The third installation was used in a direct pipeline application. This system was required to maintain H_2S at non-detectable levels.

One of the three references was no longer directly involved with the SulfaTreat system, although it was still in operation by others in New Hampshire, and provided no specifics on the installation itself. This individual provided the most critical review of the SulfaTreat system. In hindsight he recalled that while the system worked as expected, the change out frequency was underestimated due to channeling of the gas within the reactor. This led to earlier breakthrough and incomplete use of the media before change out was necessary to maintain performance. The other two references agreed that some channeling was observed, but did not feel it was as significant a problem and reported that time between change outs was similar to design. They had the following experiences to offer:

- Massachusetts Installation:
  - SulfaTreat system was recently upgraded to four vertical vessels, each 30-foot tall by 20-foot diameter;
  - Vessels are operated in parallel, but believes a lead-lag system would increase efficiency and has been talking to the design engineers about re-piping the system to allow for a lead-lag arrangement;
  - System treats 1200 scfm from 600 ppm H_2S at the inlet to non-detectable levels at the outlets;
  - Each vessel holds 19 - 2,000-lb bags of SulfaTreat 410XHP media;
  - Last year when the system included only 3 vessels the change out frequency was every other month (6 times in one year);
  - Their permit requirements are 200 ppm for a 30-day rolling average at the outlet, with a one time maximum no greater than 500 ppm;
  - Testing on the spent media has indicated they are getting only 60-70% reactivity out of the media before change out is necessary; and,
  - Higher operating temperatures (140 - 93ºF) increases the moisture content of the gas, making the system less efficient. They recently added a cooler upstream of the SulfaTreat system to help lower inlet temperatures and moisture levels in the gas. The effect on efficiency of the system has yet to be evaluated.

- Ohio Installation:
  - SulfaTreat system consists of one vessel which holds 7.5 - 2,000-lbs bags of SulfaTreat media;
  - System treats 300-500 scfm from 180 ppm H_2S at the inlet to non-detectable levels at the outlet;
  - Change out frequency has been twice per year;
  - Monitor outlet for detectable levels of H_2S. Once breakthrough is observed, media must be exchanged within one week before concentrations at the outlet are near inlet concentrations; and,
  - Delaying change out once breakthrough occurs will make the procedure more difficult due to hardening of the media.

Sizing of a solid media H_2S removal system like SulfaTreat is fairly straightforward in that the volume of media or frequency of replacement scales linearly with the gas flow and H_2S concentration (Bogner and Heguy, 2004). This is convenient in that it lends easily to a modular installation. The dimensions of the SulfaTreat units proposed for the Carroll Landfill Expansion as shown in Figure 3-2, were determined by the manufacturer using their customized modeling software given a maximum flow rate with initial and target H_2S concentrations.

To minimize initial capital costs associated with the system, the control units will be installed in phases. The initial phase is expected to last up to five years. Maximum inlet concentrations of approximately 4,000 ppm of H_2S (rounded down from 4,310ppm, the concentration used in the LandGEM model) and a maximum gas flow rate of 250 scfm (rounded up from the results generated by the LandGEM model for year 2020; 223 cfm)[*] were used as the design basis of the initial SulfaTreat unit. This initial system will consist of one set of lead-lag units both 8-foot by 40-foot box reactors with a 6-foot bed depth. While initial H_2S outlet concentrations are

[*] Proposed Carroll results only. It is assumed that the existing Jones-Carroll Landfill will still be in place at this time.

expected to be at non-detectable levels, concentrations of H_2S are estimated to reach 3.0 ppm in approximately 213 days under the maximum anticipated conditions after approximately four years of operation.

After the first four or five years of operation, the SulfaTreat system will be expanded to two lead-lag units operating in parallel. This setup will last through full-build out (year 2029). A maximum gas flow rate of 800 cfm was used in the design (LandGEM model results for year 2029; 617 cfm multiplied by a factor of safety of 1.3)[**]. The expected H_2S concentrations and target effluent concentration remain the same. Under the maximum flow rate, the system will operate at the expected performance for 133 days before media replacement is necessary.

The lead-lag configuration is advantageous in that is allows for continuous operation of the system without downtime for media change out. The lead unit provides the primary treatment while the lag unit provides polishing or acts as a backup. When the lead unit is expended, the lag unit becomes the lead unit and after the media is replaced, what was formerly the lead unit is placed back in operation as the lag unit. Some disadvantages to the lead-lag configuration are that media replacement may be more frequent, but since only the lead unit is changed at any one time, the volume of media required is less. The system requires additional valving to allow for the changes in landfill gas flow between the lead and lag units. Also, the lead-lag configuration results in a greater pressure drop than a parallel configuration which must be overcome with the use of a more powerful blower. The manufacturer's estimated performance sheets for the initial and final SulfaTreat System configurations are included in Appendix A.

Assuming that the spent media is replaced once outlet concentrations reach 3.0 ppm, the H_2S removal efficiency is no less than 99.925%. Note that the SulfaTreat control unit is specific for control of H_2S gas emissions only. According to the manufacturer, all other LandGEM estimated emissions will pass through the unit unreacted.

The first field of horizontal collectors will be installed at a minimum of ten feet above the liner system for Cell 1. The piping will be aligned parallel with the direction of waste placement. A minimum of 20 feet of waste must be in place over the collectors before startup of the gas

[**] Sum of existing Jones-Carroll LandGEM results for year 2029 (5.67 cfm) and proposed Carroll Landfill LandGEM results for year 2029 (611.4 cfm).

extraction system. Once the minimum thickness of waste has been reached the passive system will be monitored for H_2S. Once concentrations of H_2S begin to approach permissible limits the active system including the H_2S central unit, will be brought online. The applied vacuum will be adjusted upon startup to minimize the amount of air intrusion into the system.

During the year of maximum emissions, 2029, the landfill will have reached capacity. Figure 3-3 shows the estimated cover conditions during the final year of operation. Under this scenario, the majority of the side slope area, approximately 60% of the landfill, will already be under final cover and another approximate 36% of the landfill will be under intermediate cover, including the area under the access road and upper elevations of the side slope. It is estimated that only a small area (approximately 4% of the landfill) will be active with daily cover during the final year of operation. According to Table HH-3 in 40 CFR §98.348 *Mandatory Greenhouse Gas Reporting Rule for Municipal Solid Waste Landfills* (November 29, 2013), the accepted landfill gas collection efficiencies of final cover, intermediate cover, and daily cover are 95, 75, and 60%, respectively. Using 3D cover areas and these efficiencies, a weighted average landfill gas collection efficiency of 86.35% was calculated for the year of maximum emissions (2029). This calculation is provided in Appendix A. Therefore, 86.35% of the uncontrolled gases will be routed through the control unit where H_2S will be reduced by 99.925% and the remaining gas components will be vented directly to the atmosphere with no attenuation. With the exception of H_2S, the remaining 13.65% will be subject to 25% reduction by oxidation through the soil cover materials based on the procedure described in Table HH-4 of 40 CFR §98.348. This calculation is also provided in Appendix A. H_2S will be reduced by 75% by diffusion through the cover soils as discussed in Section 3.1.1.2. Under these assumptions the estimated controlled landfill gas emissions are as shown in Table 3-7.

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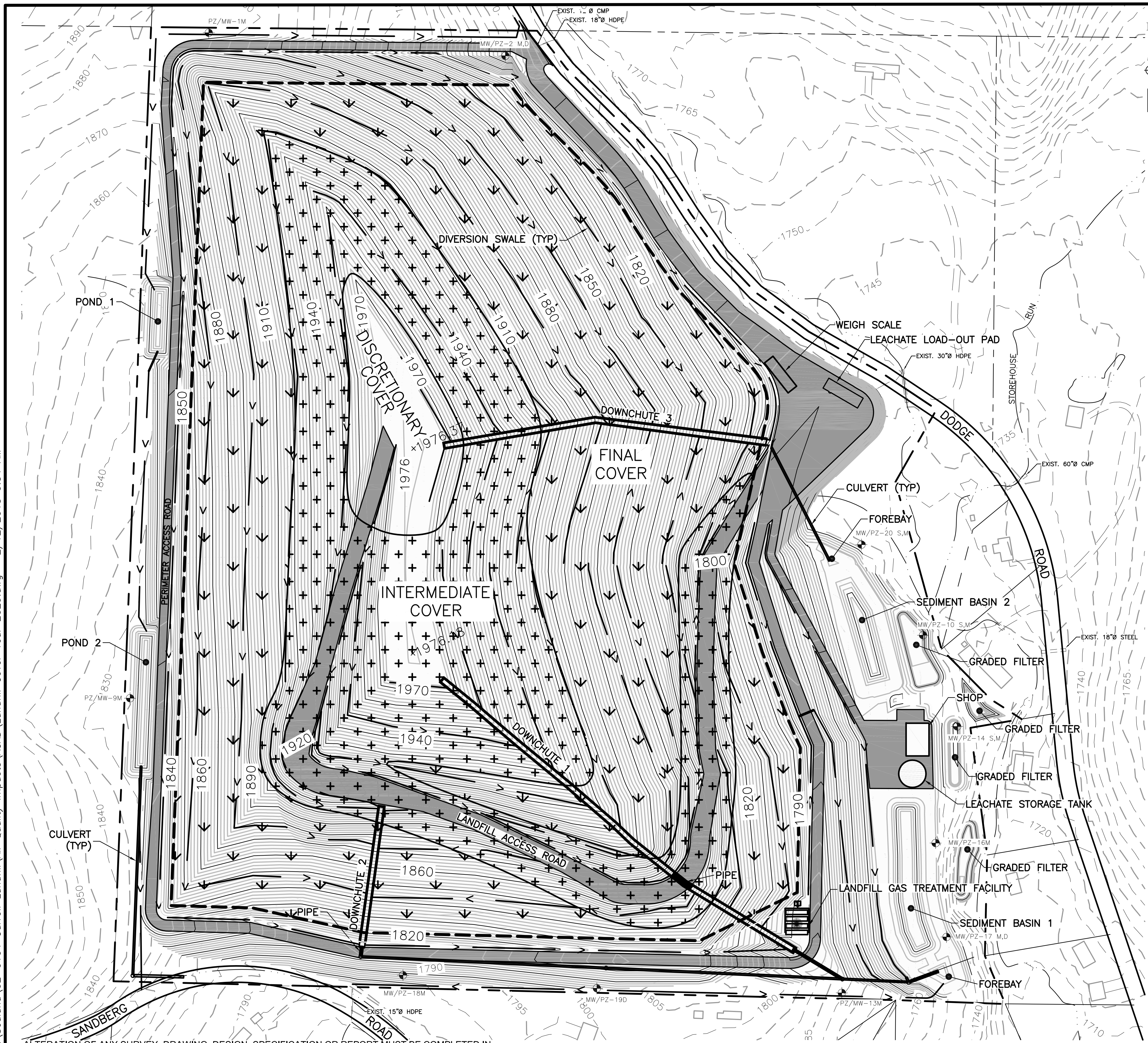


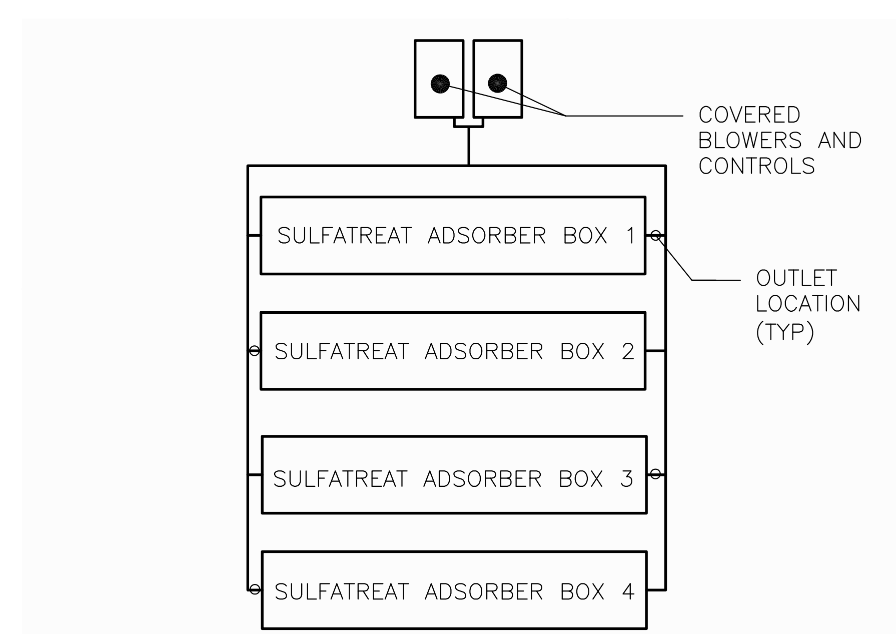
LEGEND

- 1750 — EXISTING GROUND CONTOUR
- 1740 — PROPOSED CONTOUR
- PROPERTY BOUNDARY
- LIMIT OF WASTE
- GRAVEL SURFACE
- DRAINAGE CHANNEL WITH FLOW DIRECTION

HYDROGEN SULFIDE EMISSION SOURCES:

AREA SOURCES	AREA (ACRES)
DISCRETIONARY COVER	1.66
INTERMEDIATE COVER	12.64
FINAL COVER	20.62

POINT SOURCE	STACK RELEASE HEIGHT
MODELED LOCATION OF SULFATREAT CONTROL UNIT OUTLETS	18 FEET



LANDFILL GAS TREATMENT FACILITY SCHEMATIC
1" = 20'

ALTERATION OF ANY SURVEY, DRAWING, DESIGN, SPECIFICATION OR REPORT MUST BE COMPLETED IN ACCORDANCE WITH SECTION 7209 PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NO.	REVISION	BY	DATE

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2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

JAMES A. DAIGLER, P.E. NYSPE NO. 061689

DATE: February 2015

SCALE: 1" = 200'

PREPARED FOR: SEALAND WASTE, LLC
DES. BY: | DRW. BY: | CHK. BY:
DWG: Landfill Cover Year 2029.dwg

COVER CONDITIONS DURING FINAL YEAR OF OPERATION
CARROLL LANDFILL EXPANSION APPLICATION
TOWN OF CARROLL | CHAUTAUQUA COUNTY | NEW YORK

FIGURE 3-3

TABLE 3-7: ESTIMATED CONTROLLED EMISSIONS FROM THE ANTICIPATED YEAR OF MAXIMUM LANDFILL GAS EMISSIONS (2029)

Pollutant	Existing Jones-Carroll Landfill			Proposed Carroll Landfill		
	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY
Hydrogen Sulfide	0.02	<0.01	0.02	1.93	0.49	2.13
Non-Methane Organic Compounds (NMOCs)	0.17	0.04	0.19	18.9	4.75	20.8
VOCs	0.05	0.01	0.06	5.67	1.42	6.23
HAPs	0.04	0.01	0.04	3.87	0.97	4.26
CO	0.01	<0.01	0.01	1.43	0.36	1.58
Ozone-Depleting Compounds	0.01	<0.01	0.01	0.91	0.23	1.00
Greenhouse Gases:						
CH_4	21.4	5.37	23.5	2,345	589	2,580
CO_2	88.0	22.1	96.8	9,653	2,424	10,618

3.2 Facility Operations – Emission Point 03

Fugitive dust or particulate matter emissions arise from general operations at the proposed C&D landfill and recycling facility. Calculation of fugitive emissions was performed for a conceptual worse-case year during which the majority of the site is being utilized and all major activities associated with site operations are occurring. The major sources of fugitive particulate emissions include activities such as the use of unpaved roads by waste delivery trucks and onsite vehicles, waste placement and compaction, and excavation, movement, and handling of soil/cover material and drainage layer stone as part of liner construction. C&D processing operations which produce fugitive particulate emissions include crushing, screening, and materials handling.

The equipment list assumed for the Carroll Landfill is provided in Table 3-8. The equipment list is key to the calculation of fugitive dust from facility operations. An assumed load factor and equipment usage estimates are shown in Table 3-8 as well. These values are based on firsthand knowledge of operations at working landfill facilities and the proposed waste acceptance rates.

Waste delivery trucks will consist of a combination of dump trucks, roll-off dumpsters, and tarp-covered, open trailers such as walking floor, live floor, hopper bottom, or dump trailers. Such a wide variety of transfer methods results in a wide variety of capacities from 130 cubic yards down to 10 cubic yard roll-off containers and a wide variety of load weight. This makes estimation of the number of waste delivery truck trips and average weight of a waste delivery truck quite difficult. For the purpose of this calculation, it was assumed the majority (approximately 75%) of waste delivery trucks would be large transfer trailers and the remaining 25% of waste delivery trucks would be tandem triaxle dump trucks. This is consistent with assumptions made for site traffic generation estimates.

TABLE 3-8: CARROLL C&D LANDFILL AND PROCESSING OPERATION EQUIPMENT LIST

Equipment	Empty Weight	Gross Operating Weight	Fuel Type	Load Factor	Equipment Use		
	(tons)	(tons)			(% per d)	(d/yr)	(hrs/yr)
Cat 826 Landfill Compactor	41	41	Diesel	High	0.73	307	2,126
D25 Off-Road Dump	18	43	Diesel	Medium	0.55	307	1,602
D25 Off-Road Dump	18	43	Diesel	Medium	0.55	307	1,602
D6 Bulldozer	23	23	Diesel	High	0.73	307	2,126
D6 Bulldozer	23	23	Diesel	Medium	0.36	307	1,048
IR SD-100 Soil Compactor	11	11	Diesel	Medium	0.5	120	569
336D Excavator	39	41	Diesel	High	0.75	307	2,184
416E Backhoe	7.5	11	Diesel	Medium	0.5	100	474
962 Loader	11	21	Diesel	Medium	0.55	307	1,602
2,000 Gallon Water Truck	5	13	Diesel	Low	0.55	164	856
Equipment Maintenance Truck	10	17	Diesel	Low	0.18	260	444
Tool Truck	10	12	Diesel	Low	0.18	260	444
Fuel/Lube Truck	9	17	Diesel	Low	0.3	307	874
Tractor (JD 5105M)	4	4	Diesel	Low	0.18	130	222
Vacuum Sweeper	3	4	Diesel	Medium	0.36	260	888
Tub Grinder	37	37	Diesel	High	0.5	52	247
Impact Crusher	40	40	Diesel	High	0.68	104	671
Shaker Screen	26	26	Diesel	High	0.32	156	474
Stacking Conveyor	8	8	Diesel	Medium	0.44	307	1,281
Pickup Truck	2	3	Gasoline	Low	0.91	307	2,650
Pickup Truck	2	3	Gasoline	Low	0.36	260	888

The information and equations provided in AP-42, Section 13.2.2 Unpaved Roads, November 2006, Section 13.2.3 Heavy Construction Operations, January 1995, Section 13.2.4 Aggregate Handling and Storage Piles, November 2006, and Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing, August 2004 were used to calculate fugitive particulate emissions. These calculations complete with a figure showing the active areas of the site are detailed in Appendix B. Table 3-9 contains a summary of the estimated maximum fugitive particulate emissions from operations at the proposed Carroll Landfill facility.

TABLE 3-9: SUMMARY OF MAXIMUM FUGITIVE PARTICULATE EMISSIONS (EMISSION POINT 03)

Source	Proposed Average Emission Rates						Potential-to-Emit Emission Rates					
	PM		PM-10		PM-2.5		PM		PM-10		PM-2.5	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
A. Unpaved Roads	10.0	21.0	2.78	5.84	0.28	0.58	63.7	120	17.7	33.4	1.77	3.34
B. Active Landfilling	2.45	3.56	0.43	0.62	0.26	0.37	3.41	4.96	0.60	0.87	0.36	0.52
C. Liner Construction	25.3	3.10	7.03	0.86	2.65	0.32	25.5	3.10	7.10	0.86	2.67	0.32
D. Borrow/ Fill Activities	24.7	1.53	7.42	0.85	2.60	0.16	24.8	1.53	7.45	0.85	2.60	0.16
E. C&D Processing	0.07	0.10	0.02	0.04	0.00	0.01	1.54	1.66	0.56	0.60	0.56	0.61
TOTAL	**62.5**	**29.3**	**17.7**	**8.2**	**5.79**	**1.45**	**119**	**131**	**33.4**	**36.6**	**7.97**	**4.95**

Mitigation of these emissions can be achieved in part through watering of unpaved roads and work areas. The increase in moisture content will temporarily conglomerate particles making them less likely to become airborne. All the roadways on site will be unpaved. Also, the proposed design of the C&D processing operation includes a dust suppression system which covers the processing equipment. The number of watering days was estimated at 164 days per year assuming approximately 80% of all non-rain days will require watering.

3.3 STATIONARY COMPRESSION IGNITION INTERNAL COMBUSTION ENGINES – EMISSION POINT 04

The Carroll Landfill's proposed Recycling Facility includes several pieces of equipment that employ combustion ignition internal combustion engines. The proposed equipment is listed in Table 3-8 and includes the tub grinder, the impact crusher, the shaker screen, and the staking conveyor. The tub grinder (Diamond Z Model 1460BTK, or equivalent) will be used to process large woody yard waste prior to composting. It will also be used to process clean and other wood waste that is separated from the waste stream. The impact crusher (Screen Machine Industries, Inc. Model 4043T or equivalent) will be used largely to process concrete aggregate. The shaker screen (Screen Machine Industries, Inc. Spyder 512T or equivalent) will be used to separate processed materials into product stockpiles by size categories. Finally, the stacking conveyor proposed for use onsite (Screen Machine Industries, Inc. Model TH60-36 or equivalent) will be used where needed to reach maximum height on product stockpiles, assist in loading product into haul trucks, move stockpiles, etc. These machines and the engines they contain are mobile or portable and will be moved throughout the Recycling Facility to be used where needed. Therefore, their emission estimates are combined into an area source over the entire Recycling Facility.

The primary pollutants from diesel engines are the by-product of incomplete combustion, including carbon monoxide, oxides of nitrogen (NO_x), organic compounds (mostly non-methane hydrocarbons), and particulates, both in the visible and nonvisible ranges. Internal combustion engines also emit oxides of sulfur, mainly sulfur dioxide (SO_2) which is directly related to the percentage of sulfur in the fuel used.

Standard protocol for the determination of emissions using AP-42 is no longer applicable for stationary internal combustion engines. AP-42 Chapters 3.3 and 3.4 have not been updated since 1996 and therefore do not account for the significant reductions in emissions afforded by the newer New Source Performance Standards (NSPS) Regulations on internal combustion engines. Therefore, for most pollutants the applicable tiered emissions standards from NSPS Regulations were used to estimate emissions from the equipment used in the recycling facility. The estimated equipment usage is shown in Table 3-8. A maximum equipment usage of 50%, greater than that proposed in Table 3-8, was used to calculate a potential-to-emit emission rate. The details of the calculations are provided in Appendix C. A summary of the results is shown in Table 3-10.

TABLE 3-10: EMISSIONS ESTIMATES FOR STATIONARY INTERNAL COMBUSTION ENGINES (EMISSIONS POINT 04)

Pollutant	Hourly Emission Rate	Annual Emission Rate	
		Proposed Average	Potential-to-Emit
	lbs/hr	TPY	TPY
CO	8.87	2.92	4.28
NOx	6.56	1.15	1.72
PM-10	0.08	0.02	0.03
PM-2.5	0.08	0.02	0.03
SOx	0.53	0.20	0.29
NMHC (Assumed = total VOCs)	0.02	0.01	0.01
Total Hazardous Air Pollutants	0.06	0.02	0.03

3.4 WASTE OIL SPACE HEATERS – EMISSION POINT 05

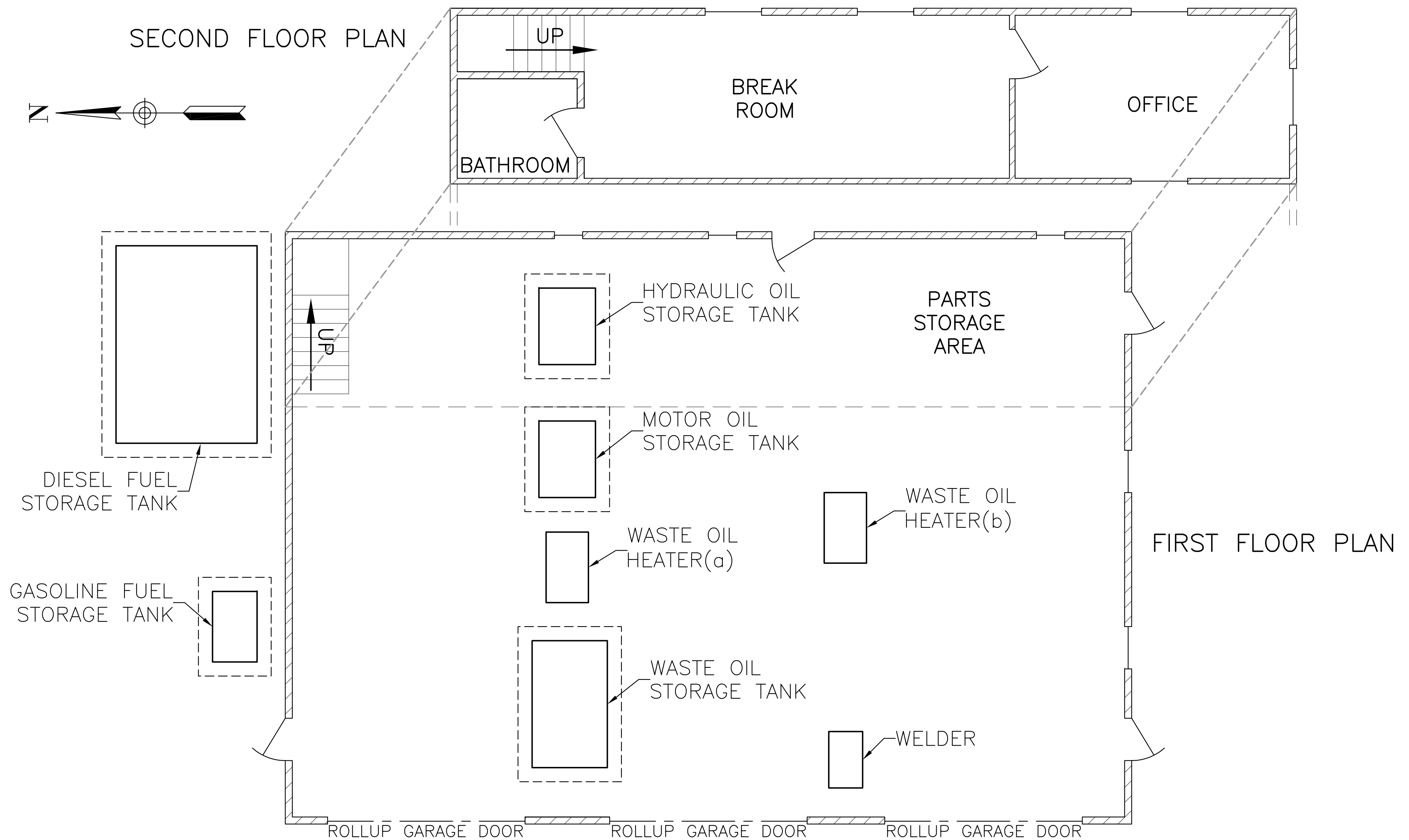
It is anticipated that the shop onsite will be heated with waste oil space heaters, as shown in the shop floor plan and profiles (Figure 3-4 thru Figure 3-6). Given the cold climate location of the landfill and an assumption of poor insulation due to the garage doors, it is estimated that the building will require approximately 546,000 BTU/hr to heat to a reasonable temperature. To achieve this, two waste oil heaters each with 300,000 BTU/hr output are specified (EconoHeat OWH-350 or equivalent). The heaters specified for this application have an atomizing oil (air) type of burner. The combustion units will be vented through stacks located on the roof of the shop. The stacks/emission points for the space heaters are shown in Figure 3-5 and Figure 3-6. Potential emissions from these point sources include carbon monoxide, sulfur oxides, nitrogen oxides, particulate matter (both total PM and PM-10), trace hazardous air pollutants (mostly toxic metals), and carbon dioxide. It is estimated that space heat would be required approximately 5,088 hours per year; however, maximum estimates conservatively assume year-round operation (8,760 hr/yr). Emission rates from the waste oil space heaters were estimated using the emission factors presented in AP-42, Section 1.11 Waste Oil Combustion, October 1996 and the calculations are provided in Appendix D.

Table 3-11 summarizes the average and maximum emissions estimated from operation of the waste oil space heaters in the shop of the proposed Carroll Landfill.

TABLE 3-11: EMISSIONS ESTIMATED FROM WASTE OIL HEATERS (EMISSIONS POINT 05)

Pollutant	Emission Factor	Hourly Emission Rate	Annual Emission Rate	
			Proposed Average	Potential-to-Emit
	lbs/1,000gal	lbs/hr	TPY	TPY
CO	2.1	0.0101	0.03	0.04
NOx	16	0.0768	0.20	0.34
PM	42.9	0.2059	0.52	0.90
PM-10	37.05	0.1778	0.45	0.78
SOx	53.5	0.2568	0.65	1.12
TOC (Assumed = total VOCs)	1	0.0048	0.01	0.02
Total Hazardous Air Pollutants	†	0.003	0.009	0.015
CO2	22,000	106	269	463

†See Appendix D for individual components and their associated emission factors.



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CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

SEALAND WASTE, LLC		EQUIPMENT MAINTENANCE & REPAIR SHOP PLAN CARROLL LANDFILL EXPANSION APPLICATION			FIGURE 3-4
SCALE: 1"=10'	REVISION # 0				
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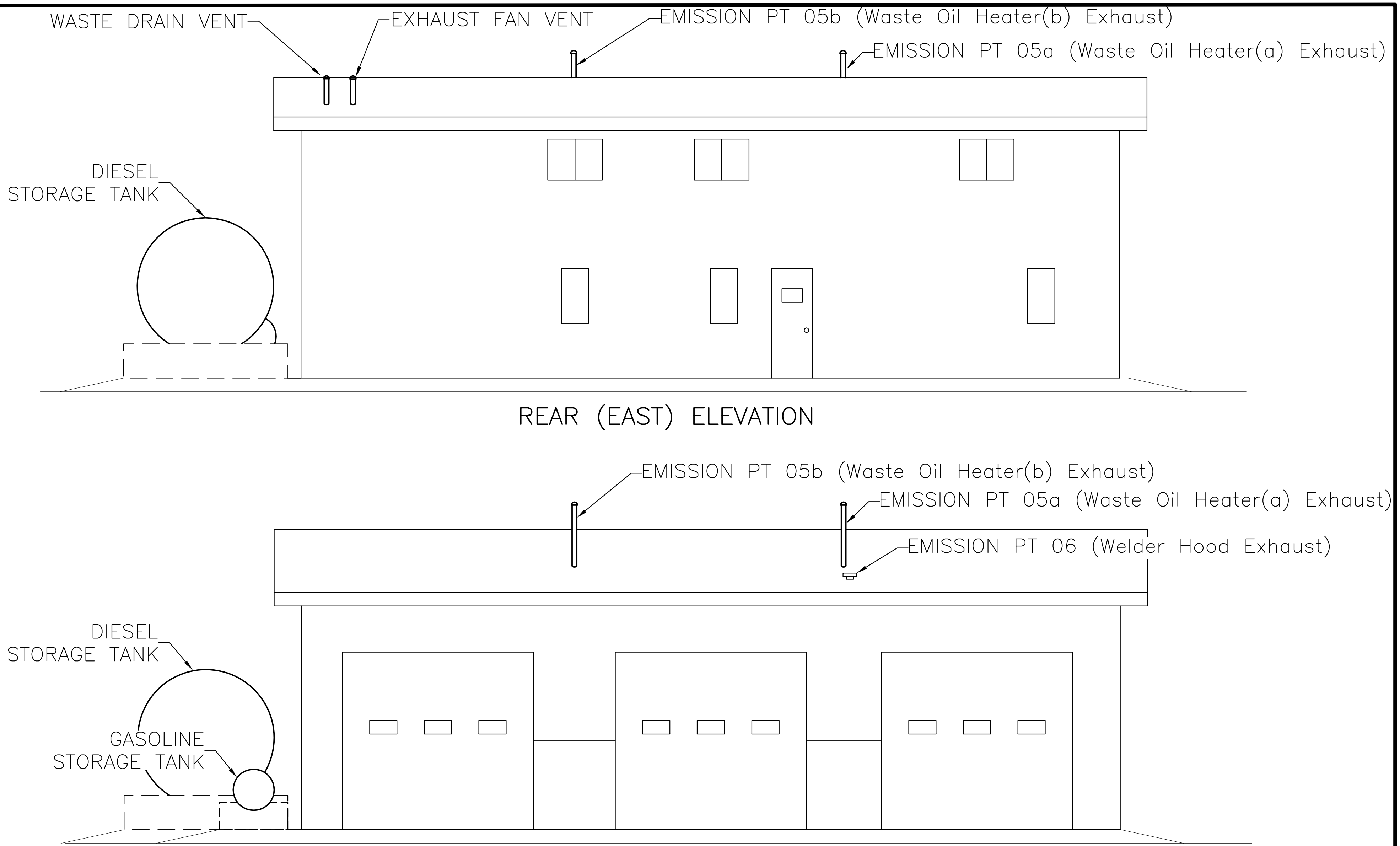

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SEALAND WASTE, LLC		EQUIPMENT MAINTENANCE & REPAIR SHOP ELEVATIONS CARROLL LANDFILL EXPANSION APPLICATION		FIGURE 3-5
SCALE: 1"=10'	REVISION # 0			
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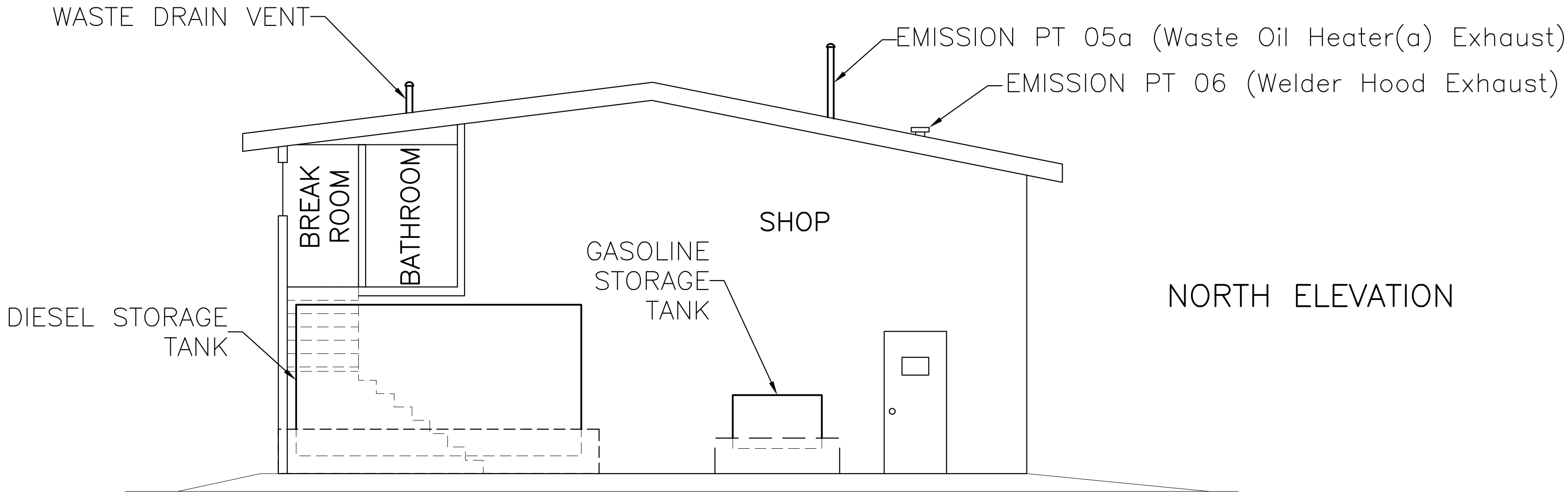
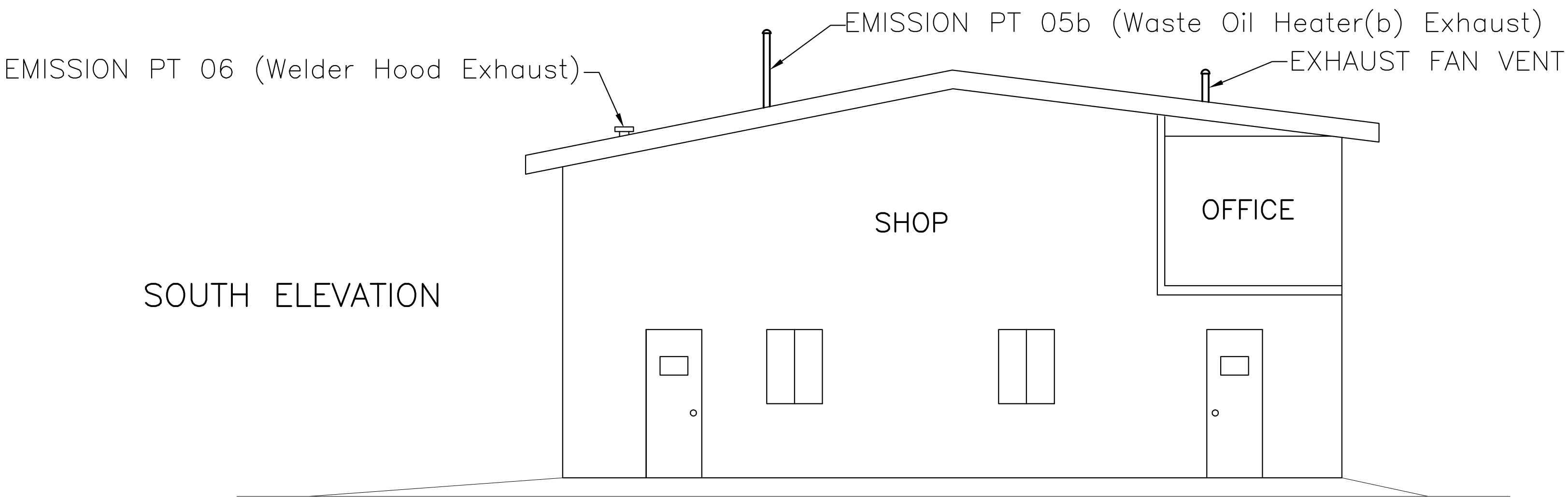


NORTH ELEVATION



SOUTH ELEVATION

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SEALAND WASTE, LLC		EQUIPMENT MAINTENANCE & REPAIR SHOP ELEVATIONS CARROLL LANDFILL EXPANSION APPLICATION		FIGURE 3-6
SCALE: 1"=10'	REVISION # 0			
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3.5 Electric Arc Welder - Emission Point 06

Welding operations are an integral part of operations at a typical landfill. A manually-operated, shielded metal electric arc welder is proposed for use at the Carroll Landfill. The types of electrodes used are job specific and, therefore, welding operations will vary from year to year. For the purpose of this inventory a hypothetical electrode composition and consumption was used based on reported usage at another facility with a landfill. In total, it was assumed that 96 lbs/yr of electrodes will be consumed. The assumed electrode composition consisted primarily of E7018 electrodes. Shielded metal arc welding using E7018 electrodes releases micron-sized particulates (PM-10) and particulate hazardous air pollutants, including chromium, manganese, and nickel.

The welder will be housed in the shop. A hood will be installed to vent emissions from the welding operation to outside the shop. The probable locations of the welder and hood vent are shown on Figure 3-4 thru Figure 3-6. Due to the relatively low rate of operation, no control of welding fumes is proposed. Emission rates from the welder were estimated using the emission factors presented in AP-42, Section 12.19 Electric Arc Welding, January 1995, and the calculations are provided in Appendix E.

The emissions estimated from operation of the shielded metal electric arc welder in the shop of the proposed Carroll Landfill are minimal. Annual emissions of chromium and cobalt are negligible. Total particulates, assumed to be under 10 microns in size, are 2.06 lbs/year. Particulate manganese and nickel emissions are estimated at 0.95 and 0.01 lbs/year, respectively.

3.6 Landfill Leachate Tank – Emission Point 07

Leachate composition is largely water with trace compounds collected as precipitation percolates through the landfilled waste. Similar to landfill gas, the leachate composition will change overtime based on the waste composition, total mass of waste, and waste age. A hypothetical C&D landfill leachate composition was created using concentration data from the literature. The two references from which the majority of data was taken include ICF (1995) and Townsend *et al*. (2000). Details on how the hypothetical composition was calculated are described in Appendix F. The volatile composition of C&D debris landfill leachate was estimated to be primarily p-cresol, acetone, methyl ethyl ketone, toluene, and isopropanol. Most of the volatile compounds are VOCs; however, several of the volatile compounds are specifically exclude from the definition of VOCs in subdivision 200.1(cg), namely, acetone, methylene chloride, and tetrachloroethylene. Many of the volatile compounds are also listed as HAPs under 6 NYCRR 200.1(ag). Therefore, the leachate tank emissions will include both VOCs and HAPs.

The proposed design of the Carroll Landfill includes a leachate collection system which ends with a 161,000 gallon leachate storage tank. The selected tank is a typical vertical, fixed-roof tank. Changes in temperature, pressure, and liquid level will promote volatilization of volatile compounds within the leachate. These emissions are then vented to the atmosphere. Based on estimates of leachate generation, the leachate tank (29 feet (height) × 31 feet (diameter)) will have an estimated maximum throughput of 8.4 million gallons per year. Emission rates of volatile compounds were estimated using the TANKS 4.0.9d software program. Additional input parameters that influenced the estimation of these rates were the selection of Erie, Pennsylvania as the closest major city listed, and the tank color and condition. The actual tank color will be cobalt blue with a gray domed roof and is assumed to be in good condition. As blue is not a listed option in the software program for tank color, a medium shade of gray was selected as a reasonable representation.

The total annual load and hourly emissions of VOCs estimated from the leachate storage tank are 0.0.03 tons/year and 0.007 lbs/hour. The total annual load and hourly emissions of HAPs estimated from the leachate storage tank are 0.03 tons/year and 0.008 lbs/hour. Acetone, methyl ethyl ketone, and methylene chloride were estimated to be the most abundant components emitted. A speciated listing of estimated emissions and the TANKS 4.0.9d output report are included in Appendix F.

3.7 Storage of Petroleum Liquids – Emission Points 08 thru 12

Table 3-8 contains a list of the equipment anticipated for use at the proposed Carroll Landfill. Estimates of fuel motor oil and hydraulic oil usage were made as detailed in Appendix G. The proposed Carroll Landfill is expected to have five storage tanks for petroleum liquids as listed in Table 3-1 and shown in Figure 3-4 thru Figure 3-6. Tank sizes were approximated based on the anticipated usage estimates and a minimum time between refills at no less than once every other week for fuels and once every other month for oils, with the exception of the waste oil tank. Since waste oil generated onsite will be used to fuel the shop heater, the waste oil tank must be sized to hold the waste oils (motor oil and hydraulic oil) generated during the summer months (assumed to be mid May through mid September) while the heater is not in use. Therefore, the total monthly usage rates were multiplied by four.

Estimates of the VOC emission rates from the petroleum liquids storage tanks were calculated using the TANKS 4.0.9d software program. A summary of the model inputs and output from the TANKS 4.0.9d software program is provided for each tank in Appendix G. The resulting emissions estimates of total VOCs estimated from the sum of all petroleum liquids storage tanks is 0.15 tons/year or 0.03 lbs/hour.

3.8 CONSTRUCTION AND OFF-ROAD VEHICLES AND EQUIPMENT

The equipment list in Table 3-8 summarizes the anticipated construction and off-road vehicles and equipment that will be employed to conduct facility operations at the proposed Carroll Landfill. The reciprocating internal combustion engines in these vehicles and equipment will emit some pollutants in their exhaust. The typical pollutants from a reciprocating internal combustion engine include nitrogen oxides, carbon monoxide, sulfur dioxide, total organic carbon, particulate matter, aldehydes, and polycyclic aromatic hydrocarbons. With the exception of the four pieces of equipment discussed in Section 3.3, most of the equipment/vehicles listed qualify as non-road engines per the definition in 40 CFR §1068.30 and, therefore, considered trivial activities. For this reason, emissions from these engines were not inventoried.

3.9 SMALL & EMERGENCY INTERNAL COMBUSTION ENGINES

The following list summarizes the anticipated emergency and small engine powered tools and equipment that may be employed at the Carroll Landfill facility. The tools/equipment listed are mobile, unnamed emission points.

- 540 kilowatt emergency backup diesel generator;
- Three-inch centrifugal trash pump;
- Six-inch centrifugal trash pump;

- 15 kilowatt diesel generator;
- 4.0 bhp gas powered blower;
- 23.5 hp diesel powered 65 cfm/100 psi air compressor; and,
- 100 GPH - 200 psi liquid propane-fired steam cleaner-pressure washer.

Use of the equipment listed will be intermittent and on an emergency or as needed basis across the site. Due to their small size and/or intermittent usage, emissions from these sources are considered insignificant. Quantification of estimated emissions from the small and emergency internal combustion engine powered tools/ equipment was not performed.

3.10 Greenhouse Gas Emissions

Direct greenhouse gas (GHG) emissions will be produced by stationary sources and non-stationary sources associated with the proposed project. Direct emissions from stationary sources at the proposed Carroll Landfill will include landfill gases from the decomposition of waste in both the existing and the proposed landfill, emissions from the decomposition of yard waste in the proposed composting operation, and carbon dioxide emissions from the two waste oil space heaters. Direct GHG emissions from non-stationary sources at the proposed Carroll Landfill include combustion of carbon containing fuels in fleet vehicles, equipment, and machinery used onsite as is presented in Table 3-8. The NYSDEC *Policy for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements* was followed in developing the direct GHG emissions estimates for the proposed Carroll Landfill. These calculations are detailed in Appendix H.

Greenhouse gases are typically reported on a carbon dioxide equivalent basis (CO_2-e). The emissions rate or total mass of non-carbon dioxide GHGs can be converted to CO_2-e by multiplying by their global warming potential. The global warming potentials used herein are consistent with NYSDEC, Section 231-13.9 Table 9. Total facility direct GHG impacts are summarized in Section 3.11.

3.10.1 Landfill Gases

As shown in Section 3.1, the existing and proposed landfills have the potential to emit significant quantities of GHGs, namely carbon dioxide and methane. Landfilling produces significant quantities of carbon dioxide which is associated with decomposition of waste. This carbon dioxide is biogenic in origin.[2] While the US EPA does not consider carbon dioxide from biogenic sources in federal GHG emissions inventories, the NYSDEC has not embraced this exemption and, therefore, all carbon dioxide emissions have been inventoried. Methane emissions from anaerobic decomposition of biogenic carbon compounds contribute to a GHG inventory even on a federal level because it is the human activity of landfilling the waste which creates the anaerobic conditions that lead to methane generation. The global warming potential of methane is 21. Using the uncontrolled LandGEM results, landfill gas from the existing Jones-Carroll Landfill will have the potential to emit 1,070 and 612 TPY of GHG, CO_2-e in 2015 and 2029, respectively, while the maximum, potential-to-emit GHG, CO_2-e emission rate of the proposed Carroll Landfill in 2029 is estimated to be 67,100 TPY. The supporting calculations can be found in Appendix H, A.1 and A.2.

While the landfill design includes a landfill gas collection and control system, the control system will not affect concentrations of greenhouse gases. Therefore, controlled emissions will be very similar to uncontrolled emissions with a small fraction of the diffusive emissions being reduced by the final cover system as described in Section 3.1.1.2. Again using the results presented in Tables 3-5 and 3-7, controlled GHG, CO_2-e emissions of landfill gas from the existing Jones-Carroll Landfill and proposed Carroll Landfill in 2029 were estimated to be 582 TPY and 63,900 TPY, respectively.

3.10.2 Composting Operation

According to the Carroll Landfill Engineering Report, the facility anticipates a maximum composting capacity of approximately 400 TPY of yard waste. The majority of greenhouse gas emissions related to composting are biogenic carbon dioxide. However, research indicates that even the most well managed composting operations will release some methane. Emission factors for carbon dioxide and methane were found in the literature. Komilis and Ham (2006) measured

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[2] The United Nations Framework Convention on Climate Change (UNFCCC) of which the United States is a party, has agreed that the focus of greenhouse gas emissions reduction efforts should be on anthropogenic sources (US EPA, 2012). Biogenic sources of carbon dioxide are those that are removed from the atmosphere by photosynthesis and returned to the atmosphere to complete the natural carbon cycle. Yard trimmings, discarded wood products, and other vegetative materials that would be included in a composting operation at the Carroll Landfill are considered biogenic. Therefore, any carbon dioxide emissions from decomposition are not counted in federal greenhouse gas emissions inventories. However, according to the more stringent New York State policy, these emissions are included in this inventory.

the carbon dioxide yield associated with composting of yard waste, food waste, and mixed paper waste. The yield was sensitive to the type of waste being composted. Food waste produced the highest yield of carbon dioxide. Yard waste produced a moderate yield of carbon dioxide, 220 g C/dry kg waste. This emission factor was multiplied by the proposed maximum acceptance rate to estimate a potential-to-emit carbon dioxide emission rate.

Methane emissions from a composting pile are the net result of methane production at the middle of the pile and methane oxidation which occurs at the surface of the composting pile according to research by Jäckel *et al*. (2005). They calculated methane emissions with age from a composting pile of 70% communal bio-waste, presumed to be primarily food waste, and 30% yard waste. Methane emissions were highest, 2,500 mg CH_4 per m^2 per day, when the compost windrow was mature. This emission factor is assumed to be conservative for a composting operation involving 100% yard waste. Assuming an uncompacted density of yard waste of 375 lbs/cy and a trapezoidal windrow shape with dimensions estimated based on a windrow turning attachment for the tractor specified in Table 3-8, the methane emissions were estimated by multiplying the methane emissions factor by the surface area of the composting windrows. Overall, the composting operation proposed for the Carroll Landfill is estimated to have the potential to emit approximately 375 TPY of GHG.

3.10.3 Other Stationary Sources

In addition to the landfill and composting operations, six other stationary sources of GHG emissions have been identified and quantified in this inventory. The waste oil space heaters as detailed in Section 3.4, emit some carbon dioxide. These GHG emissions are accounted for in the summary Table 3-12 below. Additionally the four pieces of equipment proposed for use in the C&D recycling facility will emit GHGs. Although they do not qualify as non-stationary under the EPA's definition of a non-road engine, GHG emissions from these equipment were estimated in the same manner as the non-stationary vehicle fleet as detailed in Section 3.10.4.

3.10.4 Non-Stationary Direct GHG Emissions

The facility operations, landfilling and landfill liner construction, C&D debris processing, and composting, all require the use of equipment and machinery. The majority of the onsite fleet vehicles are fueled by the combustion of diesel fuel. Direct GHG emissions from these non-stationary sources have been estimated using a similar approach to that taken in estimating fugitive particulate matter emissions from operation of these vehicles as described in Section 3.2. The proposed Carroll Landfill onsite vehicle fleet list is presented in Table 3-8. Institutional knowledge of landfill operations along with the proposed facility operating hours and waste acceptance rate were used to estimate the usage of each vehicle in the onsite fleet. The approach presented in FAO (1992) was used to estimate fuel usage in gallons per hour. Carbon dioxide emissions were estimated using emission factors published by the U.S. Energy Information Administration (US EIA, 2011). Methane and nitrous oxide emissions from combustion of carbon containing fuels were also estimated as outlined in Appendix H, Section B. Overall direct non-stationary sources proposed for the Carroll Landfill are expected to have the potential to emit approximately 3,240 TPY of GHG in CO_2-e.

3.11 FACILITY EMISSIONS TOTALS

A summary of the estimated maximum annual average and potential-to-emit emissions totals from the landfill and all facility operations for each pollutant is provided in Table 3-12. Note that maximum emissions for each pollutant will not occur in the same year. For example, maximum particulate emissions will occur during the worse-case scenario year which is at a point well before the landfill closes, while H_2S and most other emissions will be at their maximum values during the final year of operation. The summary is broken down by source in the tables found in Appendix I. The numbers in Table 3-12 include all inventoried emissions even those considered fugitive, trivial, and exempt.

TABLE 3-12: TOTAL FACILITY MAXIMUM EMISSIONS SUMMARY

Pollutant	Expected/Controlled Emissions		PTE Emissions	
	(lb/hr)	(TPY)	(lbs/hr)	(TPY)
CO	9.24	4.51	9.26	5.98
GHG (in CO_2-e)	4,510 (16,253)	15,653 (67,066)	5,535 (17,873)	17,826 (71,778)
H_2S	0.49	2.15	14.1	61.7
HAPs	1.05	4.36	1.09	4.52
NOx	6.64	1.35	6.64	2.05
Pb[1]	0.00	0.00	0.00	0.01
PM	62.8	29.8	92.0	132
PM-10	17.94	8.68	29.8	37.4
PM-2.5	5.87	1.47	3.80	5.0
SOx	0.27	0.66	.27	1.13
VOCs	2.02	6.68	2.07	7.01

[1]Lead is also included in the total HAPs

4 REGULATORY ANALYSIS

New York State is only partially delegated under the federal Clean Air Act Regulations. Therefore, several federal and state regulations may apply to the facility as currently designed.

4.1 FEDERAL REGULATIONS

The following is a summary of federal air regulations that were reviewed for compliance.

4.1.1 40 CFR 50 – National Ambient Air Quality Standards

The governing ambient air quality standards are state standards where New York State has adopted the current federal standards. However, there are some instances where New York State has not yet officially adopted the federal standard. In these cases the federal standard applies. The applicable federal standards include lead, particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}) and particulate matter particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), the one hour standards for nitrogen dioxide and sulfur dioxide, and the recent 2008 revision to the ozone standard. Table 4-1 contains a summary of the National Ambient Air Quality Standards applicable to the proposed Carroll Landfill.

TABLE 4-1: APPLICABLE NATIONAL AMBIENT AIR QUALITY STANDARDS

Regulation	Pollutant	Averaging Period	Primary Standard		Secondary Standard	
			Level	Statistic	Level	Statistic
50.6	PM_{10}	24-hour	150 $\mu g/m^3$	Maximum	Same as Primary	
50.7	$PM_{2.5}$	Annual	12 $\mu g/m^3$	Arithmetic Mean	15 $\mu g/m^3$	Arithmetic Mean
50.13		24-hour	35 $\mu g/m^3$	3-year average[1]	Same as Primary	
50.11	Nitrogen Dioxide	1-hour	100 ppb	3-year average[2]	53 ppb	Arithmetic Mean
50.15	Ozone	8-hour	75 ppb	3-year average[3]	Same as Primary	
50.16	Lead	Rolling 3-month	0.15 $\mu g/m^3$	Maximum[4]	Same as Primary	
50.17	Sulfur Dioxide	1-hour	75 ppb	3-year average[5]	None	

NOTES:
[1] Average of the 98th percentile of the daily maximum 1-hour average value for a period of 3 years.
[2] Average of the 98th percentile of the daily 24-hour average value for a period of 3 years.
[3] Average of the annual fourth-highest daily maximum 8-hour average O_3 concentration for a period of 3 years.
[4] Maximum arithmetic 3-month mean concentration for a period of 3 years.
[5] Average of the 99th percentile of the daily maximum 1-hour average value for a period of 3 years.

Of the pollutants listed in Table 4-1, only ozone is unlikely to be emitted from the site as proposed. However, the estimated emission rates of the other pollutants are relatively low such that dispersion and dilution will be sufficient to mitigate the emitted pollutants without affecting the ambient air concentrations regulated by these standards.

4.1.2 40 CFR 52.21 – Prevention of Significant Deterioration of Air Quality

New York's state run New Source Review (NSR) program is authorized by the USEPA. Prevention of Significant Deterioration (PSD) is handled under the State's NSR program. Therefore, this federal regulation does not apply to the proposed Carroll Landfill.

4.1.3 40 CFR 60 Subpart Ka – Standards for Petroleum Liquid Storage Vessels

This Subpart contains the (NSPS) for storage vessels containing petroleum liquids with a storage capacity of 40,000 gallons or greater. Although the proposed Carroll Landfill is expected to require five storage vessels of petroleum liquids, none of the proposed tanks will exceed this storage capacity. Therefore, the above ground, petroleum storage tanks are not subjected to federal regulation.

4.1.4 40 CFR 60 Subpart Kb – Standards for Volatile Organic Liquid Storage Vessels

This Subpart contains the NSPS for storage vessels containing volatile organic liquids with a storage capacity of:

- 151 m^3 (39,890 gallons) or greater when storing a liquid with a maximum true vapor pressure of 3.5 kPa (0.5076 psi) or greater; or,
- 75 m^3 (19,813 gallons) but less than 151 m^3 when storing a liquid with a maximum true vapor pressure of less than 15.0 kPa.

Storage vessels which meet one of these two conditions are subject to specified monitoring and reporting requirements. Additionally, vapor control design criteria are required for storage vessels containing more volatile liquids (5.2 kPa for volumes of 151 m^3 or greater and 26.7 kPa for volumes between 75 m^3 and 151 m^3).

The only tank proposed for the Carroll Landfill with a capacity large enough to be subject to this regulation is the 161,000 gallon leachate collection tank (Emission Pt. 07). Leachate from a non-hazardous, C&D debris waste landfill, as is proposed in the Carroll Landfill solid waste application, is not likely to have a maximum true vapor pressure greater than 3.5 kPa. The maximum vapor pressure of the leachate estimated by TANKS 4.0.9d, as detailed in Appendix F, is 2.6 kPa (0.3828 psi). This puts the tank below the cutoffs for both monitoring (3.5 kPa) and controls (5.2 kPa).

4.1.5 40 CFR 60 Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants

This Subpart contains the NSPS applicable to fixed or portable nonmetallic mineral processing plant utilizing equipment such as crushers, grinding mills, screening operations, and belt conveyors. The proposed Carroll Landfill Recycling facility proposes to use this type of equipment in the processing of C&D waste, primarily wood waste and concrete aggregate, as well as yard waste for the composting operating. However, this Subpart includes a definition of nonmetallic mineral and the types of wastes proposed for processing at the facility are not listed nor does the definition include any open ended verbiage that would allow for it's inclusion. Therefore, this Subpart is not applicable to the proposed Carroll Landfill.

4.1.6 40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

This Subpart contains NSPS for stationary compression ignition internal combustion engines. It is our understanding that the equipment used in the proposed recycling facility (i.e., the tub grinder, impact crusher, shaker screen, and stacking conveyor) may be considered stationary for the purposes of permitting. While these pieces of equipment are mobile and will be moved around the recycling facility to be used where needed, they are not self-propelled, nor are they propelled while performing their function, and will not be moved offsite for a period of time exceeding 12 consecutive months. Therefore, according to the definition in 40 CFR 1068.30 these equipment cannot be defined as nonroad engines, but instead are considered "stationary" engines with respect to the facility. These four pieces of equipment run on compression ignition internal combustion engines. Per Subpart IIII, an owner/operator of a stationary compression ignition internal combustion engine that commences construction after a specific deadline must comply with the most recent emission standards. The Subpart defines "commences construction" as the date the engine is ordered. The opening year for the landfill is assumed to be 2016. Therefore, the year the recycling facility will be constructed and commence operation is approximately 2017. By 2017, all applicable Final Tier 4 emission standards will be in effect. Thus, the equipment Sealand purchases for the recycling facility, assuming the equipment is purchased new from the manufacturer[3], will have Final Tier 4 compatible engines.

Additional compliance requirements for owners/operators under Subpart IIII are generally common sense. They include:

- Operate and maintain the engine/equipment according to the manufacturer's instructions;
- Prohibit tampering with any emissions related settings unless permitted by the manufacturer;
- Voluntarily comply with any manufacturer's recalls or related inspections; and,
- Maintain a record of sale, including the buyer's contact information, should the manufacturer require a future recall.

4.1.7 40 CFR 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

As shown in the equipment list (Table 3-8), the only spark ignition internal combustions engines proposed for the site include two pickup trucks. The pickup trucks are not stationary and therefore, are not subject to the NSPS contained in this Subpart.

4.1.8 40 CFR 63 – National Emissions Standards for Source Categories

While municipal solid waste landfills are a listed source category, C&D debris landfills are not. Therefore, no national emissions standards apply specifically to the proposed landfill. However, the equipment proposed for operation in the Recycling Facility will be subject to 40 CFR 63 Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. According to Section §63.6590, any new stationary compression ignition reciprocating internal combustion engine which commenced operation on or after June 12, 2006 that is not defined as a non-road engine and is located at an area source of hazardous air pollutants must meet the Part by meeting the requirements of 40 CFR 60 Subpart

[3] Should Sealand purchase used equipment instead of new equipment, additional requirements under this Subpart may apply depending on the model year of the equipment purchased.

IIII. Paragraph (c) within this section specifically states that, "no further requirements apply for such engines under this Part."

4.1.9 40 CFR 70 & 71 – Operating Permit Programs (Title V Permitting)

The Title V permit program run by New York State recently received final EPA authorization. Therefore, federal regulations regarding Title V (Part 71) do not apply to facilities in New York State.

4.1.10 40 CFR 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices

New York State has a Resource Conservation and Recovery Act (RCRA) authorized program, therefore, federal regulations listed in this Part do not apply to the Carroll Landfill. Equivalent state regulations found in 6 NYCRR Part 360 will apply in lieu of the federal regulations found in 40 CFR 257.

4.1.11 Greenhouse Gas Tailoring Rule

The US EPA issued the final Greenhouse Gas Tailoring Rule on May 13, 2010 and was published in the June 3, 2010 Federal Register (Vol. 75, No. 106). The rule sets up permitting of GHG emissions within the existing framework of the NSR and Title V programs. The US EPA had announced a three year deferral of the rule for biogenic sources (including landfills) in the July 20, 2011 Federal Register (Vol. 76, No. 139). However, in the wake of a U.S. Supreme Court decision issued on June 23, 2014 that struck down key elements in the GHG Tailoring Rule, the deferral was allowed to expire on July 1, 2014. In the meantime, New York State issued its own regulation concerning greenhouse gas emissions. As upheld in the June 23, 2014 U.S. Supreme Court decision, under the Clean Air Act, any state may elect to enact regulations that are more stringent than the federal government. Therefore, the proposed Carroll Landfill will not be subject to this federal regulation as the state's regulation will take precedence.

4.2 State Regulations

4.2.1 6 NYCRR 201-3 Permit Exempt and Trivial Activities

Many of the emissions sources at the proposed Carroll Landfill will fall into either the exempt or trivial activity categories. Exempt and trivial activities are exempt from state registration and permitting requirements. However, emissions from exempt and trivial activities need to be accounted for in calculations prepared for determining whether an emission source is subject to Title V permitting requirements.

The emissions from solid waste handling equipment and associated activities are considered trivial under paragraph 201-3.3(c)(41). This paragraph specifically lists (but is not limited to) wood chippers, recycling operations, composting operations, tub grinders, and construction and demolition waste crushers and associated activity. Thus, the equipment and activities proposed for the CDPO and yard waste composting facility will be considered trivial sources for permitting purposes. The landfill compactor is also exclusively solid waste handling equipment and is considered trivial. The remaining onsite equipment may be used for soils handling or other purposes and therefore will not be excluded as trivial.

The petroleum liquid storage tanks proposed for the Carroll Landfill will fall into either the exempt or trivial category. Per paragraph 201-3.3(c)(44), storage vessels, tanks, and containers with a capacity of less than 750 gallons are trivial activities. Only two of the five anticipated petroleum storage tanks will be above this limit, as shown in Table 3-1. These two remaining tanks however, will be exempt per paragraph 201-3.2(c)(26), horizontal petroleum storage tanks.

Also listed as trivial activities are engine exhaust emissions and/or refueling emissions generated from construction vehicles and equipment powered by non-road engines that are operated outdoors for their design and intended use (201-3.3(c)(10)), engine exhaust emissions from small engine powered tools and equipment that are operated indoors and vented (201-3.3(c)(11)), and manually operated welding equipment (201-3.3(c)(54)).

Further, from the definition of major source provided in 6 NYCRR 201-2.1(b)(21), fugitive emissions are not considered when determining whether a facility is major. Particulate emissions from facility operations are fugitive emissions. While they must be included in emissions estimates of Title V facilities, they are not subject to regulation in and of themselves similar to exempt activities. This leaves the non-fugitive C&D landfill gases, the two waste oil space heaters, and the landfill leachate tank as sources that must be evaluated for possible regulation under the state air program.

4.2.2 6 NYCRR 201-4 Minor Facility Registrations & 201-5 State Facility Permits

Owners or operators of any sources not considered trivial or exempt which have the potential-to-emit *any* regulated air contaminant, regardless of the actual rate of emission, must either apply for a minor facility registration or a state facility permit under Subparts 201-4 or 201-5, respectively. All three of the non-trivial or non-exempt sources proposed for the Carroll Landfill have the potential-to-emit regulated air contaminants. The deciding factor between minor facility registration and state facility permit that applies to the Carroll Landfill facility is emissions limitations listed in section 201-4.5. The emissions limitations are 50% of the level required to classify the source as a major facility.

The state definition of a major source is dependant on whether the facility is located in an attainment or a nonattainment area. The area surrounding the proposed Carroll Landfill site is represented by Jamestown, Chautauqua County, New York. Currently, Jamestown, New York is listed as an attainment area for five of the six criteria pollutants, with ozone being the exception. However, on July 31, 2009 the NYSDEC petitioned the US EPA to re-designate Jamestown, New York based on new monitoring data that showed attainment with the 8-hour ozone National Ambient Air Quality Standard. By way of Federal Register on December 7, 2009, the US EPA accepted the data provided by the state, but would not re-designate the area's classification because other requirements of the regulation, including an approved air quality maintenance plan had yet to be completed. Nearly two years later in October 2011, the NYSDEC revised their designation recommendations to the US EPA by way of letter. In the revised recommendations, NYSDEC proposed to the US EPA that Chautauqua County maintain its nonattainment designation. Therefore, Chautauqua County is listed with a marginal nonattainment classification on the current map of ozone nonattainment areas in New York State (US EPA, 2012).

Unfortunately, according to the definition of nonattainment within paragraph 231-4.1(b)(31), all of New York State is within the ozone transport region and must be treated as nonattainment for ozone and its precursors, specifically VOCs and nitrous oxides. Therefore, the location of the site is most accurately described as a nonattainment area within the ozone transport region.

Under this classification, the definition of a major source is any facility with the potential to emit:

- 100 TPY or more of any regulated air pollutant, except for VOCs and GHGs;
- 50 TPY or more of VOCs;
- 10 TPY of any single hazardous air pollutant; or,
- 25 TPY of any combination of hazardous air pollutants.

For GHG emissions, the definition of a major source is a facility that directly emits or has the potential to emit 100 TPY of greenhouse gases and 100,000 TPY or more CO_2-e. According to subparagraph 201-2.1(b)(21)(i), fugitive emissions are not considered in determining whether a source is major with some listed exceptions, none of which apply to the Carroll Landfill facility. Therefore, the thresholds above which a state facility permit is required and below which a registration is sufficient are 50 TPY of any regulated air pollutant, with the exception of VOCs which is 25 TPY, 5 TPY of any single hazardous air pollutant, or 12.5 TPY of total hazardous air pollutants. Lists of regulated and hazardous air pollutants are provided in 6 NYCRR 200.1(bu) and (ag), respectively. Table 4-2 is a summary of the evaluation and comparisons discussed in this section.

Based on this air emissions inventory, the potential-to-emit emissions for the regulated air pollutant H_2S will exceed the 50 TPY minor facility maximum, but fall well under the major facility threshold. When only regulated air emissions are considered, the estimated potential-to-emit emissions are just above the minor facility threshold. Thus, the facility will be subject to an Air State Facility Permit under 201-5 for H_2S.

The GHG emissions are well above the major facility threshold of 100 TPY even when only regulated sources are included. However, in terms of CO_2-e, GHGs are considerably less than the major facility threshold, but do exceed the minor facility maximum. Since both parts of this standard exceed the minor facility maximum emissions, the proposed facility will also require an Air State Facility Permit under 201-5 for GHGs.

TABLE 4-2: COMPARISON OF FACILITY EMISSIONS TO PERTINENT THRESHOLDS

Pollutant	Major Facility Threshold (TPY)	Minor Facility Maximum (TPY)	Total Carroll Facility PTE Emissions (TPY)	Regulated* Carroll Facility PTE Emissions (PTE)
CO	100	50	5.98	4.87
GHG, Total**	100	50	17,800	14,600
GHG, CO_2-e**	100,000	50,000	71, 800	61,200
H_2S	100	50	61.7	53.3
HAP, total	25	12.5	4.52	3.89
HAP, single	10	5	1.51†	1.31†
NOx	100	50	2.05	0.34
Lead (Pb)	10	5	0.005	0.005
PM-10	100	50	37.4	0.78
PM-2.5	100	50	4.98	0.00
SOx	100	50	1.13	1.12
VOCs	50	25	7.01	5.83

*Excluded fugitive emissions, trivial and exempt sources. Assumes the landfill gas collection system is in place with no control unit.
**Both GHG thresholds must be exceeded.
†Estimated emissions of toluene.

The total facility particulate matter emissions, PM-10 and PM-2.5, while elevated, are below the minor facility maximum emissions limit. Further, both PM emissions are primarily from the fugitive dust estimates from facility operations. When fugitive emissions are omitted as allowed, the potential-to-emit PM rates also decrease significantly.

The sum of all hazardous air pollutants is less than half of the 12.5 TPY minor facility maximum. Inspection of the summary tables presented in Appendix I will show that the greatest potential to emit of any single hazardous air pollutant is that of toluene at approximately 1.51 TPY, which again is less than half of the minor facility maximum. CO, lead, NOx, and SOx emission estimates for the facility totals are also well below their minor facility maximum emission limits.

To summarize, an Air State Facility Permit will be required for the proposed Carroll Landfill Expansion based on emission estimates of H_2S and GHGs. Once obtained, an Air State Facility Permit is valid for a period not to exceed ten years according to subdivision 201-5.3(a).

4.2.3 6 NYCRR 201-6 Title V Facility Permits

The proposed Carroll Landfill will not require a Title V facility permit. C&D debris landfills are not a regulated source category, nor is the facility categorized as a major stationary source for any pollutant, as discussed in the previous section.

4.2.4 6 NYCRR 211 General Prohibitions

Section 211.1 states that emissions of air contaminants that "unreasonably interfere with the comfortable enjoyment of life or property" including odors, are prohibited. Should H_2S emissions become problematic, this regulation will apply. The current version on the proposed Carroll Landfill's Contingency Plan contains an Offensive Odor Action and Response Plan to handle odors from the facility. Odor prevention is also discussed in the current version of the facility's Operation and Maintenance Manual. It is proposed that ambient air monitoring for H_2S be performed on a regular basis to help ensure the procedures in place are adequate.

4.2.5 6 NYCRR 215 Open Fires

Open fires are prohibited at the proposed Carroll Landfill. None of the exceptions noted in Paragraph 215.3 would apply to this facility.

4.2.6 6 NYCRR 225-2 Fuel Composition and Use – Waste Fuel

According to this Subpart and the assumed waste fuel oil properties used in the emissions estimations, the waste oil space heaters proposed for the shop will run on waste fuel A. In order to burn waste fuel A in a stationary combustion unit with a maximum heat input of 350,000 BTU/hr as specified herein, an application for a certificate to operate must be submitted to the NYSDEC in accordance with Part 201. One exception that could apply to the situation at the Carroll Landfill is for waste fuel derived from mobile emissions sources located at the same site as the waste oil heater in which it is burned (paragraph 225-2.5(b)(2)). Should this be the case, the waste oil heater will also fall into the exempt category for Part 201-4 and 201-5. However, given the assumed usage of the waste oil heaters, the fuel consumption of the specified units, and the estimated lubricant oils usage onsite, the amount of waste oil produced onsite will be insufficient without supplementation. Therefore, at this time it is assumed that the facility will accept used crankcase oils from other sources, such as household do-it-yourself oil changers, farmers, and other facilities under the owner/operator's control. Thus, the waste oil space heaters will be included in the Air State Facility Permit application under Part 201[4] to be submitted to the NYSDEC.

4.2.7 6 NYCRR 227-1 Stationary Combustion Installations

This subpart regulates particulate emissions from stationary combustion installations, like the waste oil space heaters proposed for the shop at the Carroll Landfill. Numerical particulate limitations will not apply to the proposed waste oil space heaters due to their size. Only sources in excess of 50 million BTU per hour heat input capacity are considered. The two specified waste oil heaters proposed for the Carroll Landfill have a rated heat input capacity of 300,000 BTU per hour each, or 0.6 million BTU per hour combined.

The emissions from the space heaters will be regularly observed to ensure compliance with the percent opacity limitations presented in Section 227-1.1. Namely, the heater emissions will not exceed 20% opacity "(six minute average), except for one six-minute period per hour of not more than 27% opacity."

4.2.8 6 NYCRR 227-2 Reasonably Available Control Technology (RACT) for Major Facilities of Oxides of Nitrogen (NOx)

The stationary internal combustion engines proposed for the Carroll Landfill's recycling facility would apply to this Subpart if it was determined that the Carroll Landfill was a major source for NOx, meaning the facility as a whole was estimated to emit 25 TPY or greater of NOx. While engines of stationary machinery are typically known for significant NOx emissions, the new "cleaner" engines required under Tier 4 final regulations are strictly limited to the amount of NOx allowed in the exhaust. As a result, NOx emissions from the facility are projected to be relatively low, 2.05 TPY (potential-to-emit), as seen in Table 3-12.

[4] Additional non-air related, regulatory requirements for the burning, collection, transport, and storage of waste fuel may apply under the solid waste regulations.

4.2.9 6 NYCRR 229 Petroleum and Volatile Organic Liquid Storage and Transfer

Although there are several storage tanks of petroleum and volatile liquids proposed for the operation of the Carroll Landfill, only the leachate storage tank is not specifically excluded as a trivial or exempt activity. This regulation is not applicable to the leachate storage tank because its estimated vapor pressure (0.38 psia) is lower than 1.0 psia (299.1(e)(5)).

4.2.10 6 NYCRR Part 231 New Source Review for New and Modified Facilities

Permits are required under this regulation for all new major stationary sources or major modifications to existing sources. A major source is subject to New Source Review under this regulation if it has the potential to emit any nonattainment contaminant at levels that equal or exceed major facility thresholds. Since the Carroll Landfill is located in an attainment area within the ozone transport region, the applicable thresholds are 100 TPY for nitrous oxides and 50 TPY for VOCs. As shown in Table 3-11, the proposed Carroll Landfill does not approach these levels. Therefore, the proposed Carroll Landfill will not be subject to the New Source Review provisions of this Part.

For all other regulated contaminants the location of the proposed Carroll Landfill is within an attainment area. The applicable major facility threshold for regulated contaminants and their precursors in attainment areas is 250 TPY, with the exception of GHG emissions for which the threshold is 100,000 TPY. The only pollutant in Table 3-12 that exceeds this level is PM. Table 3-12 includes the fugitive emissions from facility operations. Fugitive emissions are not considered in determining whether a non-listed source is major. If the fugitive emissions from facility operations are not included, then the PM facility total potential-to-emit emissions estimate falls well below the 250 TPY threshold. Further, only the PM-10 and PM-2.5 size classifications are regulated, not total PM. Therefore, the facility is not subject to the prevention of significant deterioration requirements under this Part.

4.2.11 6 NYCRR Parts 256 and 257 Air Quality Classifications and Standards

The air quality classifications for Chautauqua County are described in Part 265. The site of the proposed Carroll Landfill is located in a Level I classified area. A Level I area is characterized by sparse habitation and industry, according to Part 256. Although some historic State Ambient

Air Quality Standards were based on the air quality classification of the location in question, every current state standard applies to all classes. Table 4-2 contains a list of State Ambient Air Quality Standards.

TABLE 4-3: AMBIENT AIR QUALITY STANDARDS FOR NEW YORK STATE

Subpart #	Pollutant	Averaging Period	Level	Statistic[1]
257-2	Sulfur Dioxide	Annual	0.03 ppm	Arithmetic Mean
		24-hour	0.14 ppm	Maximum
		3-hour	0.50 ppm	Maximum
257-3	Total Suspended Particulates	--[2]	--	--
257-4	Carbon Monoxide	8-hour	9 ppm	Maximum
		1-hour	35 ppm	Maximum
257-5	Photochemical Oxidants (Ozone)	--[3]	--	--
257-6	Non-Methane Hydrocarbons	3-hour (6-9 am)	0.24 ppm	Maximum
257-7	Nitrogen Dioxide	Annual	0.05 ppm	Arithmetic Mean
257-8	Fluorides, total[4]	Growing Season (not to exceed 6 consecutive months)	40 ppm	Arithmetic Mean
		60-day	60 ppm	Arithmetic Mean
		30-day	80 ppm	Arithmetic Mean
	Fluorides, gaseous	12-hour	4.5 ppb	Maximum
		24-hour	3.5 ppb	Maximum
		1-week	2.0 ppb	Maximum
		1-month	1.0 ppb	Maximum
257-9	Beryllium	Monthly	0.01 $\mu g/m^3$	Maximum
257-10	Hydrogen Sulfide	1-hour	0.01 ppm	Maximum

Notes: [1] All maximum value statistics are concentrations that must not be exceeded more than once in any given calendar year.
[2] This standard has been superseded by federal particulate matter standards.
[3] This standard has been superseded by the federal ozone standard which was lowered in 2008.
[4] These standards apply in and on forage for consumption by grazing ruminants.

Notable absences from Table 4-3 are lead, PM_{10}, and $PM_{2.5}$. New York State has yet to officially adopt these federal standards and, therefore, the federal standards apply directly as noted in Section 4.1.1. The total suspended particulate standards in Subpart 257-3, were superseded when the federal government changed there standards to the size based criteria, PM_{10} (1980s) and $PM_{2.5}$ (added in 1997). Therefore, while this standard is still on the books, it is no longer enforced. State Policy CP-33 *Assessing and Mitigating Impacts of Fine Particulate Matter Emissions* (12/29/2003), describes the state's position on the enforcement of national ambient air quality particulate standards. Other federal standards enforced in New York State with no state equivalent include the 1-hour averaging period standards for nitrogen dioxide and sulfur dioxide, and the relatively recent 2008 ozone standard.

New York State has expanded the ambient air quality standards beyond the six federal criteria pollutants by four additional pollutants; non-methane hydrocarbons, fluorides, beryllium, and H_2S. Based on the relatively low to moderate estimated emission rates and the effects of dispersion and diffusion once the emissions are emitted, the proposed facility is not expected to affect these standards in any significant way.

4.2.12 6 NYCRR Part 360-1.14 Operational Requirements for all Solid Waste Management Facilities

This section of the solid waste regulation has several subdivisions with air related restrictions. Subdivisions (k) and (m) require dust and odors, respectively, to "be effectively controlled so that they do not constitute nuisances or hazards to health, safety or property". The Carroll Landfill's Operation and Maintenance Manual and/or Contingency Plan will include measures such as watering for dust control and application of additional cover soils for odor control.

Subdivision (q) bans open burning of wastes at any solid waste facility, including C&D landfills. As discussed above open fires are prohibited under Part 215, as well. The Carroll Landfill Operation and Maintenance Manual will ban open burning for C&D debris wastes.

4.2.13 6 NYCRR Part 360-7.4 C&D Debris Landfills Greater Than Three Acres

A landfill gas control system will be required for the Carroll Landfill as a C&D landfill over three acres in size under subdivision (p) of this section. The gas collection and control system "must prevent the accumulation of gas at greater than 25 percent of the lower explosive limit in structures on-site and off-site; prevent damage to vegetation both on the final cover and off-site; and control objectionable odors due to any gas emissions." Concentrations of explosive gases, namely methane, are relatively low at C&D landfills as compared to municipal solid waste landfills. Control of landfill gas emissions will be provided at the proposed Carroll Landfill through use of daily cover materials and an active gas collection system which will terminate in a H_2S control unit, as described in Section 3.1.2.2 in greater detail.

This section, under paragraph (a)(6), also covers the control of landfill fires. Landfill fires have the potential to emit large quantities of carbon monoxide and trace toxic gases. Landfill fires are possible at C&D debris landfills and have been documented at at least two facilities (US EPA, 2007). Therefore, control of landfill fires is required to protect air quality among other reasons. The Operation and Maintenance Manual for the proposed Carroll Landfill will contain provisions to prevent landfill fires. Such provisions include examination of incoming waste for "hot loads" to eliminate one source of ignition, and good compaction practices and application of cover materials to limit the amount of available oxygen. Recognizing that even the best prevention practices can fail, the Carroll Landfill's Contingency Plan will cover emergency procedures in the case of a landfill fire.

5 SUMMARY AND CONCLUSIONS

The proposed Carroll C&D Landfill facility is estimated to contain twelve individually numbered air emissions sources. The most significant sources are gases from the proposed landfill, fugitive dust from facility operations, and emissions from the equipment specified for the proposed recycling facility. Eight of the twelve air emissions sources will fall into either the exempt or trivial activity categories under the state air quality regulations. Even if all sources are included, emissions from the facility are below all major facility thresholds for an attainment area within the ozone transport region.

Based on the regulatory assessment presented in Section 4, the facility will require regulation under the state air program. An Air State Facility Permit application under 6 NYCRR Part 201 will be required based primarily on the conservatively estimated potential-to-emit H_2S emissions and GHG emissions. The waste oil space heaters are also required to be covered under the permit as it is currently expected that the facility will accept used crankcase oils from offsite for use in the heaters. Should this change and actual operating conditions limit the waste fuel to only that derived from mobile emissions sources located at the same site as the waste oil heaters in which it is burned, the waste oil heaters will fall into the exempt category for Part 201.

Beyond specific permitting requirements, this air emissions inventory and ensuing regulatory assessment has identified several other areas of commitment that have been made by the owners/operators of the proposed Carroll Landfill. These commitments are summarized as follows:

- C&D landfills are known to produce relatively high concentrations of H_2S gas. Control of landfill gas emissions will be provided at the proposed Carroll Landfill through use of daily cover materials and an active gas collection and control system. Therefore, the Operation and Maintenance Manual and the Contingency Plan for the proposed Carroll Landfill contain respectively, measures to take to control odors and an Offensive Odor Action and Response Plan to handle odors from the facility should they become noxious;

- The equipment obtained for use in the proposed recycling facility must employ an engine that complies with the emissions limits in effect at the time of purchase. It is anticipated that Tier 4 final emissions standards will be in effect at that time. If used equipment is purchased instead of new as assumed herein, the equipment shall be evaluated for compliance with applicable regulations (e.g., 40 CFR 60 Subpart IIII, 40 CFR 63 Subpart ZZZZ, and 6 NYCRR 227-2). In addition, Sealand must commit to operating and maintaining this equipment per the manufacturer's instructions;

- The Carroll Landfill Operation and Maintenance Manual will ban open burning for C&D debris wastes;

- The Operation and Maintenance Manual for the proposed Carroll Landfill contains provisions to prevent landfill fires which have the potential to emit significant quantities of air pollutants. Such provisions include examination of incoming waste for "hot loads" to eliminate one source of ignition, and good compaction practices and application of cover materials to limit the amount of available oxygen. Recognizing that even the best prevention practices can occasionally fail, the Carroll Landfill's Contingency Plan covers emergency procedures in the case of a landfill fire; and,

- Fugitive dust emissions from the proposed facility operations have the potential to become a nuisance or hazard to health, safety, or property if not properly controlled based on the estimated emissions. The dust control measure assumed in the calculation of emissions herein is watering of unpaved roadways. Watering was assumed to occur for 80% of all non-rain days of operation. The Carroll Landfill's Operation and Maintenance Manual and/or Contingency Plan must include such strict measures for dust control.

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APPENDIX A

Landfill Gas Emissions Calculations

(Emission Points 01 & 02)

SUBJECT Conversion of DOC to L_o

Find: L_o in $m^3\,CH_4/Mg$ C&D Waste for use in LandGEM by converting DOC in metric tons carbon/metric tons C&D waste reported in 40 CFR Part 98 Subpart H-H for use in the methane generation equation

Given: $L_o = MCF \times DOC \times DOC_F \times F \times 16/12$

where: MCF = methane correction factor
= 1 when waste within the landfill is not actively aerated ✓

DOC = degradable organic carbon fraction
= 0.08 metric ton carbon / metric ton C&D waste ✓
from Table HH-1 in 40 CFR 98

DOC_F = fraction of carbon dissimilated
= 0.5; default value per 40 CFR 98 ✓

F = fraction by volume of CH_4 in the landfill gas
= 0.4; assumed, based on average percentage of methane in C&D landfill gas (rounded up from 38%) from Lee et al., 2006)

16/12 = conversion of metric ton carbon to metric ton methane

Solution: $L_o = 1 \times 0.08 \times 0.5 \times 0.4 \times 16/12$

= 0.0213 metric tons CH_4/metric tons C&D waste ✓

- Use ideal gas law @ STP to convert weight into volume of methane

- $V = \frac{nRT}{P}$ (STP = 20°C (293K) and 1 atm)

$$= \frac{(0.0213\ \text{metric ton})\left(\frac{1{,}000{,}000\,g}{\text{metric ton}}\right)(0.08206\ L\cdot atm/mol\cdot K)(293\ K)}{(16\ g/mol)(1\ atm)}$$

= 32058.11 L of CH_4/metric ton C&D waste ✓

× 1 metric ton / 1 Mg × 1 m^3 / 1,000 L

L_o = 32.1 $m^3\,CH_4$/Mg of C&D waste ✓

Existing Jones-Carroll Landfill

Uncontrolled Emissions

for 2015 & 2029

JONES-CARROLL LANDFILL ACTUAL ANNUAL WASTE ACCEPTANCE*

DATE	ACCEPTED		RECOVERED		LANDFILLED	
	(CY)	(TONS)	(CY)	(TONS)	(CY)	(TONS)
JAN 1 THRU DEC 14, 1990	**6052.0**	4539.0			6052.0	4539.0
DEC 15 1990 THRU DEC 31, 1991	**16737.0**	12552.8			16737.0	12552.8
JAN. 1 THRU DEC. 31, 1992	17509.7	**13132.3**			17509.7	13132.3
JAN. 1 THRU DEC. 31, 1993	**16296.3**	12222.2			16296.3	12222.2
JAN. 1 THRU DEC. 31, 1994	**16167.8**	12125.8	160.1	**120.1**		
			200.0	150.0	15807.7	11855.8
JAN. 1 THRU DEC. 31, 1995	**13526.0**	10144.5	162.1	**121.6**	13363.9	10022.9
JAN. 1 THRU DEC. 31, 1996	**11173.0**	8379.8	131.0	**98.3**		
			100.0	75.0	10942.0	8206.5
JAN. 1 THRU DEC. 31, 1997	**16505.0**	12378.8	**170.0**	127.5		
			160.3	**120.3**		
			40.0	30.0	16134.7	12101.0
JAN. 1 THRU DEC. 31, 1998	**10102.0**	7576.5	156.3	**117.2**		
			60.0	45.0	9885.7	7414.3
JAN. 1 THRU DEC. 31, 1999	**3611.0**	2708.3	129.3	**97.0**		
			60.0	45.0	3421.7	2566.3
JAN. 1 THRU DEC. 31, 2000	**2531.0**	1898.3	42.4	**31.8**		
			60.0	45.0	2428.6	1821.4
JAN. 1 THRU DEC. 31, 2001	**3179.0**	2384.3	**440.0**	330.0	2739.0	2054.3
JAN. 1 THRU DEC. 31, 2002	**3108.0**	2331.0	**250.0**	187.5	2858.0	2143.5
JAN. 1 THRU DEC. 31, 2003	**1953.5**	1465.1	**110.0**	82.5	1843.5	1382.6
JAN. 1 THRU DEC. 31, 2004	2600.0	**1950.0**	130.7	**98.0**	2469.3	1852.0
JAN. 1 THRU DEC. 31, 2005	3658.7	**2744.0**	109.3	**82.0**	3549.3	2662.0
JAN. 1 THRU DEC. 31, 2006	334.7	**251.0**	26.7	**20.0**	308.0	231.0
				TOTAL:	142,346	106,760

LandGEM Input

Year	Tons Landfilled
1990	4,539.00
1991	12,552.75
1992	13,132.31
1993	12,222.19
1994	11,855.75
1995	10,022.91
1996	8,206.50
1997	12,101.00
1998	7,414.30
1999	2,566.25
2000	1,821.42
2001	2,054.25
2002	2,143.50
2003	1,382.63
2004	1,852.00
2005	2,662.00
2006	231.00
Total	**106,759.76**

***BOLD** = reported units; density assumed herein to be 0.75 ton/cy; density assumed in reports (when used) is unknown.

Q:\Sealand\02-0104 Carroll Landfill\Air Quality Impacts\Calculations\Jones-Carroll Annual Waste Acceptance.xls

Summary Report

Landfill Name or Identifier: Existing Jones-Carroll Landfill

Date: Thursday, January 22, 2015

Description/Comments:

Waste acceptance values were calculated from Jones-Carroll Annual Reports as waste received - waste recovered. Most reported numbers were in units of cubic yards. A density of 0.75 ton/cy was assumed for the C&D waste.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*year^{-1}*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1990**	
Landfill Closure Year (with 80-year limit)	**2006**	
Actual Closure Year (without limit)	***2006***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*year* $^{-1}$
Potential Methane Generation Capacity, L_o	**32**	m^3 */Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**40**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Hydrogen sulfide**
Gas / Pollutant #3:	**Methane**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1990	4,126	4,539	0	0
1991	11,412	12,553	4,126	4,539
1992	11,938	13,132	15,538	17,092
1993	11,111	12,222	27,476	30,224
1994	10,778	11,856	38,587	42,446
1995	9,112	10,023	49,365	54,302
1996	7,460	8,207	58,477	64,325
1997	11,001	12,101	65,938	72,531
1998	6,740	7,414	76,939	84,632
1999	2,333	2,566	83,679	92,047
2000	1,656	1,821	86,012	94,613
2001	1,868	2,054	87,668	96,434
2002	1,949	2,144	89,535	98,489
2003	1,257	1,383	91,484	100,632
2004	1,684	1,852	92,741	102,015
2005	2,420	2,662	94,424	103,867
2006	210	231	96,844	106,529
2007	0	0	97,054	106,760
2008	0	0	97,054	106,760
2009	0	0	97,054	106,760
2010	0	0	97,054	106,760
2011	0	0	97,054	106,760
2012	0	0	97,054	106,760
2013	0	0	97,054	106,760
2014	0	0	97,054	106,760
2015	0	0	97,054	106,760
2016	0	0	97,054	106,760
2017	0	0	97,054	106,760
2018	0	0	97,054	106,760
2019	0	0	97,054	106,760
2020	0	0	97,054	106,760
2021	0	0	97,054	106,760
2022	0	0	97,054	106,760
2023	0	0	97,054	106,760
2024	0	0	97,054	106,760
2025	0	0	97,054	106,760
2026	0	0	97,054	106,760
2027	0	0	97,054	106,760
2028	0	0	97,054	106,760
2029	0	0	97,054	106,760

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2030	0	0	97,054	106,760
2031	0	0	97,054	106,760
2032	0	0	97,054	106,760
2033	0	0	97,054	106,760
2034	0	0	97,054	106,760
2035	0	0	97,054	106,760
2036	0	0	97,054	106,760
2037	0	0	97,054	106,760
2038	0	0	97,054	106,760
2039	0	0	97,054	106,760
2040	0	0	97,054	106,760
2041	0	0	97,054	106,760
2042	0	0	97,054	106,760
2043	0	0	97,054	106,760
2044	0	0	97,054	106,760
2045	0	0	97,054	106,760
2046	0	0	97,054	106,760
2047	0	0	97,054	106,760
2048	0	0	97,054	106,760
2049	0	0	97,054	106,760
2050	0	0	97,054	106,760
2051	0	0	97,054	106,760
2052	0	0	97,054	106,760
2053	0	0	97,054	106,760
2054	0	0	97,054	106,760
2055	0	0	97,054	106,760
2056	0	0	97,054	106,760
2057	0	0	97,054	106,760
2058	0	0	97,054	106,760
2059	0	0	97,054	106,760
2060	0	0	97,054	106,760
2061	0	0	97,054	106,760
2062	0	0	97,054	106,760
2063	0	0	97,054	106,760
2064	0	0	97,054	106,760
2065	0	0	97,054	106,760
2066	0	0	97,054	106,760
2067	0	0	97,054	106,760
2068	0	0	97,054	106,760
2069	0	0	97,054	106,760

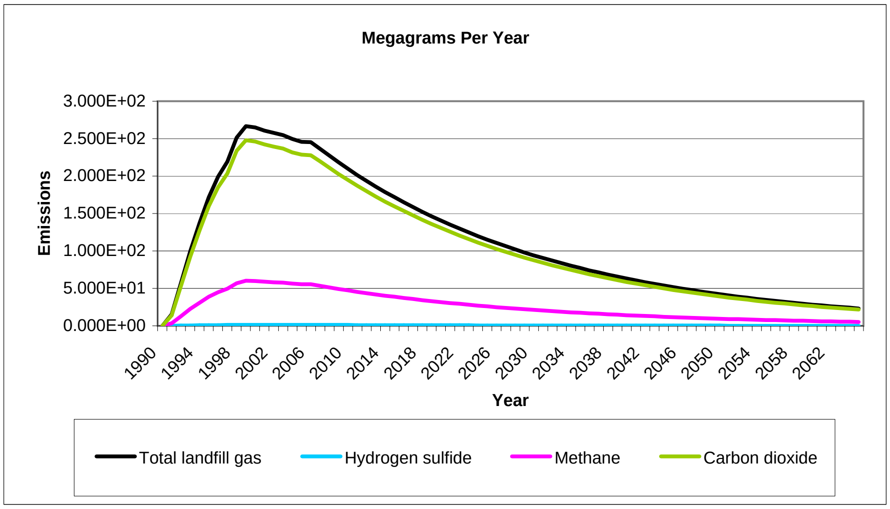
Pollutant Parameters

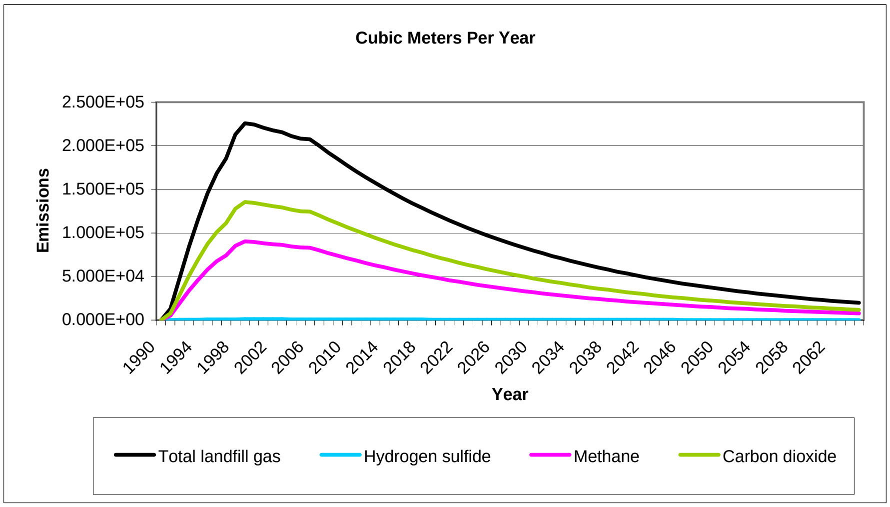
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

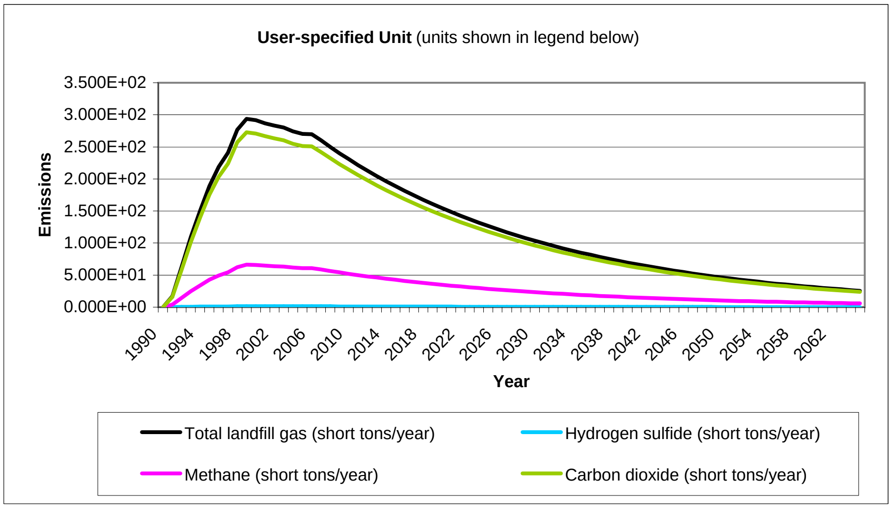
Pollutant Parameters (Continued)

	Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08	4310.00	
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
Emissions
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Year
Total landfill gas
Hydrogen sulfide
Methane
Carbon dioxide


Cubic Meters Per Year
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
Emissions
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Year
Total landfill gas
Hydrogen sulfide
Methane
Carbon dioxide


User-specified Unit (units shown in legend below)
3.500E+02
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
Emissions
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Year
Total landfill gas (short tons/year)
Hydrogen sulfide (short tons/year)
Methane (short tons/year)
Carbon dioxide (short tons/year)

Results

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
1990	0	0	0	0	0	0
1991	1.538E+01	1.301E+04	1.692E+01	7.948E-02	5.607E+01	8.743E-02
1992	5.731E+01	4.848E+04	6.304E+01	2.962E-01	2.089E+02	3.258E-01
1993	9.956E+01	8.422E+04	1.095E+02	5.145E-01	3.630E+02	5.660E-01
1994	1.371E+02	1.160E+05	1.508E+02	7.084E-01	4.997E+02	7.792E-01
1995	1.719E+02	1.454E+05	1.890E+02	8.882E-01	6.266E+02	9.770E-01
1996	1.991E+02	1.684E+05	2.190E+02	1.029E+00	7.259E+02	1.132E+00
1997	2.191E+02	1.853E+05	2.410E+02	1.132E+00	7.988E+02	1.245E+00
1998	2.515E+02	2.128E+05	2.766E+02	1.300E+00	9.170E+02	1.430E+00
1999	2.668E+02	2.257E+05	2.934E+02	1.379E+00	9.726E+02	1.517E+00
2000	2.650E+02	2.242E+05	2.915E+02	1.370E+00	9.662E+02	1.506E+00
2001	2.608E+02	2.206E+05	2.869E+02	1.348E+00	9.508E+02	1.482E+00
2002	2.575E+02	2.178E+05	2.833E+02	1.331E+00	9.389E+02	1.464E+00
2003	2.547E+02	2.154E+05	2.801E+02	1.316E+00	9.285E+02	1.448E+00
2004	2.494E+02	2.110E+05	2.743E+02	1.289E+00	9.092E+02	1.418E+00
2005	2.459E+02	2.080E+05	2.705E+02	1.271E+00	8.964E+02	1.398E+00
2006	2.452E+02	2.075E+05	2.698E+02	1.267E+00	8.942E+02	1.394E+00
2007	2.364E+02	2.000E+05	2.601E+02	1.222E+00	8.620E+02	1.344E+00
2008	2.271E+02	1.922E+05	2.499E+02	1.174E+00	8.282E+02	1.291E+00
2009	2.182E+02	1.846E+05	2.401E+02	1.128E+00	7.957E+02	1.241E+00
2010	2.097E+02	1.774E+05	2.306E+02	1.084E+00	7.645E+02	1.192E+00
2011	2.015E+02	1.704E+05	2.216E+02	1.041E+00	7.345E+02	1.145E+00
2012	1.936E+02	1.637E+05	2.129E+02	1.000E+00	7.057E+02	1.100E+00
2013	1.860E+02	1.573E+05	2.046E+02	9.611E-01	6.781E+02	1.057E+00
2014	1.787E+02	1.512E+05	1.965E+02	9.234E-01	6.515E+02	1.016E+00
2015	1.717E+02	1.452E+05	1.888E+02	8.872E-01	6.259E+02	9.760E-01
2016	1.649E+02	1.395E+05	1.814E+02	8.524E-01	6.014E+02	9.377E-01
2017	1.585E+02	1.341E+05	1.743E+02	8.190E-01	5.778E+02	9.009E-01
2018	1.523E+02	1.288E+05	1.675E+02	7.869E-01	5.551E+02	8.656E-01
2019	1.463E+02	1.238E+05	1.609E+02	7.561E-01	5.334E+02	8.317E-01
2020	1.406E+02	1.189E+05	1.546E+02	7.264E-01	5.125E+02	7.990E-01
2021	1.350E+02	1.142E+05	1.485E+02	6.979E-01	4.924E+02	7.677E-01
2022	1.297E+02	1.098E+05	1.427E+02	6.706E-01	4.731E+02	7.376E-01
2023	1.247E+02	1.055E+05	1.371E+02	6.443E-01	4.545E+02	7.087E-01
2024	1.198E+02	1.013E+05	1.317E+02	6.190E-01	4.367E+02	6.809E-01
2025	1.151E+02	9.735E+04	1.266E+02	5.947E-01	4.196E+02	6.542E-01
2026	1.106E+02	9.353E+04	1.216E+02	5.714E-01	4.031E+02	6.286E-01
2027	1.062E+02	8.986E+04	1.169E+02	5.490E-01	3.873E+02	6.039E-01
2028	1.021E+02	8.634E+04	1.123E+02	5.275E-01	3.721E+02	5.802E-01
2029	9.806E+01	8.295E+04	1.079E+02	5.068E-01	3.575E+02	5.575E-01
2030	9.422E+01	7.970E+04	1.036E+02	4.869E-01	3.435E+02	5.356E-01
2031	9.052E+01	7.658E+04	9.957E+01	4.678E-01	3.300E+02	5.146E-01
2032	8.697E+01	7.357E+04	9.567E+01	4.495E-01	3.171E+02	4.944E-01
2033	8.356E+01	7.069E+04	9.192E+01	4.319E-01	3.047E+02	4.750E-01
2034	8.029E+01	6.792E+04	8.831E+01	4.149E-01	2.927E+02	4.564E-01
2035	7.714E+01	6.525E+04	8.485E+01	3.987E-01	2.812E+02	4.385E-01
2036	7.411E+01	6.270E+04	8.152E+01	3.830E-01	2.702E+02	4.213E-01
2037	7.121E+01	6.024E+04	7.833E+01	3.680E-01	2.596E+02	4.048E-01
2038	6.841E+01	5.788E+04	7.526E+01	3.536E-01	2.494E+02	3.889E-01
2039	6.573E+01	5.561E+04	7.231E+01	3.397E-01	2.397E+02	3.737E-01

Results (Continued)

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
2040	6.315E+01	5.343E+04	6.947E+01	3.264E-01	2.303E+02	3.590E-01
2041	6.068E+01	5.133E+04	6.675E+01	3.136E-01	2.212E+02	3.450E-01
2042	5.830E+01	4.932E+04	6.413E+01	3.013E-01	2.126E+02	3.314E-01
2043	5.601E+01	4.738E+04	6.161E+01	2.895E-01	2.042E+02	3.184E-01
2044	5.382E+01	4.553E+04	5.920E+01	2.781E-01	1.962E+02	3.059E-01
2045	5.171E+01	4.374E+04	5.688E+01	2.672E-01	1.885E+02	2.940E-01
2046	4.968E+01	4.203E+04	5.465E+01	2.568E-01	1.811E+02	2.824E-01
2047	4.773E+01	4.038E+04	5.250E+01	2.467E-01	1.740E+02	2.714E-01
2048	4.586E+01	3.879E+04	5.045E+01	2.370E-01	1.672E+02	2.607E-01
2049	4.406E+01	3.727E+04	4.847E+01	2.277E-01	1.606E+02	2.505E-01
2050	4.233E+01	3.581E+04	4.657E+01	2.188E-01	1.544E+02	2.407E-01
2051	4.067E+01	3.441E+04	4.474E+01	2.102E-01	1.483E+02	2.312E-01
2052	3.908E+01	3.306E+04	4.299E+01	2.020E-01	1.425E+02	2.222E-01
2053	3.755E+01	3.176E+04	4.130E+01	1.940E-01	1.369E+02	2.135E-01
2054	3.607E+01	3.052E+04	3.968E+01	1.864E-01	1.315E+02	2.051E-01
2055	3.466E+01	2.932E+04	3.813E+01	1.791E-01	1.264E+02	1.970E-01
2056	3.330E+01	2.817E+04	3.663E+01	1.721E-01	1.214E+02	1.893E-01
2057	3.200E+01	2.707E+04	3.519E+01	1.654E-01	1.167E+02	1.819E-01
2058	3.074E+01	2.601E+04	3.381E+01	1.589E-01	1.121E+02	1.748E-01
2059	2.954E+01	2.499E+04	3.249E+01	1.526E-01	1.077E+02	1.679E-01
2060	2.838E+01	2.401E+04	3.122E+01	1.467E-01	1.035E+02	1.613E-01
2061	2.726E+01	2.306E+04	2.999E+01	1.409E-01	9.941E+01	1.550E-01
2062	2.620E+01	2.216E+04	2.882E+01	1.354E-01	9.551E+01	1.489E-01
2063	2.517E+01	2.129E+04	2.769E+01	1.301E-01	9.176E+01	1.431E-01
2064	2.418E+01	2.046E+04	2.660E+01	1.250E-01	8.817E+01	1.375E-01
2065	2.323E+01	1.965E+04	2.556E+01	1.201E-01	8.471E+01	1.321E-01
2066	2.232E+01	1.888E+04	2.455E+01	1.154E-01	8.139E+01	1.269E-01
2067	2.145E+01	1.814E+04	2.359E+01	1.108E-01	7.820E+01	1.219E-01
2068	2.061E+01	1.743E+04	2.267E+01	1.065E-01	7.513E+01	1.171E-01
2069	1.980E+01	1.675E+04	2.178E+01	1.023E-01	7.218E+01	1.126E-01
2070	1.902E+01	1.609E+04	2.092E+01	9.831E-02	6.935E+01	1.081E-01
2071	1.828E+01	1.546E+04	2.010E+01	9.445E-02	6.663E+01	1.039E-01
2072	1.756E+01	1.485E+04	1.932E+01	9.075E-02	6.402E+01	9.983E-02
2073	1.687E+01	1.427E+04	1.856E+01	8.719E-02	6.151E+01	9.591E-02
2074	1.621E+01	1.371E+04	1.783E+01	8.377E-02	5.910E+01	9.215E-02
2075	1.557E+01	1.317E+04	1.713E+01	8.049E-02	5.678E+01	8.854E-02
2076	1.496E+01	1.266E+04	1.646E+01	7.733E-02	5.456E+01	8.507E-02
2077	1.438E+01	1.216E+04	1.581E+01	7.430E-02	5.242E+01	8.173E-02
2078	1.381E+01	1.168E+04	1.519E+01	7.139E-02	5.036E+01	7.853E-02
2079	1.327E+01	1.123E+04	1.460E+01	6.859E-02	4.839E+01	7.545E-02
2080	1.275E+01	1.079E+04	1.403E+01	6.590E-02	4.649E+01	7.249E-02
2081	1.225E+01	1.036E+04	1.348E+01	6.331E-02	4.467E+01	6.965E-02
2082	1.177E+01	9.957E+03	1.295E+01	6.083E-02	4.292E+01	6.691E-02
2083	1.131E+01	9.567E+03	1.244E+01	5.845E-02	4.123E+01	6.429E-02
2084	1.087E+01	9.192E+03	1.195E+01	5.615E-02	3.962E+01	6.177E-02
2085	1.044E+01	8.831E+03	1.148E+01	5.395E-02	3.806E+01	5.935E-02
2086	1.003E+01	8.485E+03	1.103E+01	5.184E-02	3.657E+01	5.702E-02
2087	9.637E+00	8.152E+03	1.060E+01	4.980E-02	3.514E+01	5.479E-02
2088	9.259E+00	7.833E+03	1.018E+01	4.785E-02	3.376E+01	5.264E-02
2089	8.896E+00	7.525E+03	9.785E+00	4.598E-02	3.243E+01	5.057E-02
2090	8.547E+00	7.230E+03	9.402E+00	4.417E-02	3.116E+01	4.859E-02

Results (Continued)

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
2091	8.212E+00	6.947E+03	9.033E+00	4.244E-02	2.994E+01	4.668E-02
2092	7.890E+00	6.674E+03	8.679E+00	4.078E-02	2.877E+01	4.485E-02
2093	7.581E+00	6.413E+03	8.339E+00	3.918E-02	2.764E+01	4.310E-02
2094	7.283E+00	6.161E+03	8.012E+00	3.764E-02	2.656E+01	4.141E-02
2095	6.998E+00	5.920E+03	7.698E+00	3.617E-02	2.551E+01	3.978E-02
2096	6.723E+00	5.688E+03	7.396E+00	3.475E-02	2.451E+01	3.822E-02
2097	6.460E+00	5.465E+03	7.106E+00	3.339E-02	2.355E+01	3.672E-02
2098	6.206E+00	5.250E+03	6.827E+00	3.208E-02	2.263E+01	3.528E-02
2099	5.963E+00	5.044E+03	6.559E+00	3.082E-02	2.174E+01	3.390E-02
2100	5.729E+00	4.847E+03	6.302E+00	2.961E-02	2.089E+01	3.257E-02
2101	5.505E+00	4.657E+03	6.055E+00	2.845E-02	2.007E+01	3.129E-02
2102	5.289E+00	4.474E+03	5.818E+00	2.733E-02	1.928E+01	3.007E-02
2103	5.081E+00	4.299E+03	5.590E+00	2.626E-02	1.853E+01	2.889E-02
2104	4.882E+00	4.130E+03	5.370E+00	2.523E-02	1.780E+01	2.776E-02
2105	4.691E+00	3.968E+03	5.160E+00	2.424E-02	1.710E+01	2.667E-02
2106	4.507E+00	3.813E+03	4.957E+00	2.329E-02	1.643E+01	2.562E-02
2107	4.330E+00	3.663E+03	4.763E+00	2.238E-02	1.579E+01	2.462E-02
2108	4.160E+00	3.519E+03	4.576E+00	2.150E-02	1.517E+01	2.365E-02
2109	3.997E+00	3.381E+03	4.397E+00	2.066E-02	1.457E+01	2.272E-02
2110	3.840E+00	3.249E+03	4.224E+00	1.985E-02	1.400E+01	2.183E-02
2111	3.690E+00	3.121E+03	4.059E+00	1.907E-02	1.345E+01	2.098E-02
2112	3.545E+00	2.999E+03	3.900E+00	1.832E-02	1.293E+01	2.015E-02
2113	3.406E+00	2.881E+03	3.747E+00	1.760E-02	1.242E+01	1.936E-02
2114	3.273E+00	2.768E+03	3.600E+00	1.691E-02	1.193E+01	1.860E-02
2115	3.144E+00	2.660E+03	3.459E+00	1.625E-02	1.146E+01	1.788E-02
2116	3.021E+00	2.556E+03	3.323E+00	1.561E-02	1.101E+01	1.717E-02
2117	2.903E+00	2.455E+03	3.193E+00	1.500E-02	1.058E+01	1.650E-02
2118	2.789E+00	2.359E+03	3.068E+00	1.441E-02	1.017E+01	1.585E-02
2119	2.679E+00	2.267E+03	2.947E+00	1.385E-02	9.769E+00	1.523E-02
2120	2.574E+00	2.178E+03	2.832E+00	1.330E-02	9.386E+00	1.464E-02
2121	2.473E+00	2.092E+03	2.721E+00	1.278E-02	9.018E+00	1.406E-02
2122	2.376E+00	2.010E+03	2.614E+00	1.228E-02	8.664E+00	1.351E-02
2123	2.283E+00	1.931E+03	2.512E+00	1.180E-02	8.325E+00	1.298E-02
2124	2.194E+00	1.856E+03	2.413E+00	1.134E-02	7.998E+00	1.247E-02
2125	2.108E+00	1.783E+03	2.318E+00	1.089E-02	7.685E+00	1.198E-02
2126	2.025E+00	1.713E+03	2.228E+00	1.047E-02	7.383E+00	1.151E-02
2127	1.946E+00	1.646E+03	2.140E+00	1.006E-02	7.094E+00	1.106E-02
2128	1.869E+00	1.581E+03	2.056E+00	9.661E-03	6.816E+00	1.063E-02
2129	1.796E+00	1.519E+03	1.976E+00	9.282E-03	6.548E+00	1.021E-02
2130	1.726E+00	1.460E+03	1.898E+00	8.918E-03	6.292E+00	9.810E-03

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
1990	0	0	0	0	0	0
1991	3.472E+00	5.204E+03	3.819E+00	1.429E+01	7.806E+03	1.572E+01
1992	1.294E+01	1.939E+04	1.423E+01	5.325E+01	2.909E+04	5.857E+01
1993	2.248E+01	3.369E+04	2.472E+01	9.250E+01	5.053E+04	1.017E+02
1994	3.094E+01	4.638E+04	3.404E+01	1.273E+02	6.957E+04	1.401E+02
1995	3.880E+01	5.815E+04	4.268E+01	1.597E+02	8.723E+04	1.756E+02
1996	4.494E+01	6.737E+04	4.944E+01	1.850E+02	1.010E+05	2.035E+02
1997	4.946E+01	7.413E+04	5.440E+01	2.036E+02	1.112E+05	2.239E+02
1998	5.677E+01	8.510E+04	6.245E+01	2.337E+02	1.277E+05	2.570E+02
1999	6.022E+01	9.026E+04	6.624E+01	2.478E+02	1.354E+05	2.726E+02
2000	5.982E+01	8.967E+04	6.580E+01	2.462E+02	1.345E+05	2.708E+02
2001	5.887E+01	8.824E+04	6.476E+01	2.423E+02	1.324E+05	2.665E+02
2002	5.813E+01	8.714E+04	6.395E+01	2.393E+02	1.307E+05	2.632E+02
2003	5.749E+01	8.618E+04	6.324E+01	2.366E+02	1.293E+05	2.603E+02
2004	5.630E+01	8.438E+04	6.193E+01	2.317E+02	1.266E+05	2.549E+02
2005	5.550E+01	8.320E+04	6.106E+01	2.284E+02	1.248E+05	2.513E+02
2006	5.536E+01	8.299E+04	6.090E+01	2.279E+02	1.245E+05	2.506E+02
2007	5.337E+01	8.000E+04	5.871E+01	2.197E+02	1.200E+05	2.416E+02
2008	5.128E+01	7.686E+04	5.641E+01	2.110E+02	1.153E+05	2.321E+02
2009	4.927E+01	7.385E+04	5.419E+01	2.028E+02	1.108E+05	2.230E+02
2010	4.734E+01	7.095E+04	5.207E+01	1.948E+02	1.064E+05	2.143E+02
2011	4.548E+01	6.817E+04	5.003E+01	1.872E+02	1.023E+05	2.059E+02
2012	4.370E+01	6.550E+04	4.807E+01	1.798E+02	9.824E+04	1.978E+02
2013	4.198E+01	6.293E+04	4.618E+01	1.728E+02	9.439E+04	1.901E+02
2014	4.034E+01	6.046E+04	4.437E+01	1.660E+02	9.069E+04	1.826E+02
2015	3.875E+01	5.809E+04	4.263E+01	1.595E+02	8.714E+04	1.755E+02
2016	3.724E+01	5.581E+04	4.096E+01	1.532E+02	8.372E+04	1.686E+02
2017	3.578E+01	5.362E+04	3.935E+01	1.472E+02	8.044E+04	1.620E+02
2018	3.437E+01	5.152E+04	3.781E+01	1.415E+02	7.728E+04	1.556E+02
2019	3.302E+01	4.950E+04	3.633E+01	1.359E+02	7.425E+04	1.495E+02
2020	3.173E+01	4.756E+04	3.490E+01	1.306E+02	7.134E+04	1.436E+02
2021	3.049E+01	4.570E+04	3.353E+01	1.255E+02	6.854E+04	1.380E+02
2022	2.929E+01	4.390E+04	3.222E+01	1.205E+02	6.586E+04	1.326E+02
2023	2.814E+01	4.218E+04	3.096E+01	1.158E+02	6.327E+04	1.274E+02
2024	2.704E+01	4.053E+04	2.974E+01	1.113E+02	6.079E+04	1.224E+02
2025	2.598E+01	3.894E+04	2.858E+01	1.069E+02	5.841E+04	1.176E+02
2026	2.496E+01	3.741E+04	2.746E+01	1.027E+02	5.612E+04	1.130E+02
2027	2.398E+01	3.595E+04	2.638E+01	9.870E+01	5.392E+04	1.086E+02
2028	2.304E+01	3.454E+04	2.534E+01	9.483E+01	5.180E+04	1.043E+02
2029	2.214E+01	3.318E+04	2.435E+01	9.111E+01	4.977E+04	1.002E+02
2030	2.127E+01	3.188E+04	2.340E+01	8.754E+01	4.782E+04	9.629E+01
2031	2.044E+01	3.063E+04	2.248E+01	8.410E+01	4.595E+04	9.251E+01
2032	1.963E+01	2.943E+04	2.160E+01	8.081E+01	4.414E+04	8.889E+01
2033	1.886E+01	2.828E+04	2.075E+01	7.764E+01	4.241E+04	8.540E+01
2034	1.812E+01	2.717E+04	1.994E+01	7.459E+01	4.075E+04	8.205E+01
2035	1.741E+01	2.610E+04	1.916E+01	7.167E+01	3.915E+04	7.884E+01
2036	1.673E+01	2.508E+04	1.840E+01	6.886E+01	3.762E+04	7.574E+01
2037	1.607E+01	2.409E+04	1.768E+01	6.616E+01	3.614E+04	7.277E+01
2038	1.544E+01	2.315E+04	1.699E+01	6.356E+01	3.473E+04	6.992E+01
2039	1.484E+01	2.224E+04	1.632E+01	6.107E+01	3.336E+04	6.718E+01

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
2040	1.426E+01	2.137E+04	1.568E+01	5.868E+01	3.206E+04	6.454E+01
2041	1.370E+01	2.053E+04	1.507E+01	5.638E+01	3.080E+04	6.201E+01
2042	1.316E+01	1.973E+04	1.448E+01	5.417E+01	2.959E+04	5.958E+01
2043	1.264E+01	1.895E+04	1.391E+01	5.204E+01	2.843E+04	5.725E+01
2044	1.215E+01	1.821E+04	1.336E+01	5.000E+01	2.732E+04	5.500E+01
2045	1.167E+01	1.750E+04	1.284E+01	4.804E+01	2.624E+04	5.284E+01
2046	1.122E+01	1.681E+04	1.234E+01	4.616E+01	2.522E+04	5.077E+01
2047	1.078E+01	1.615E+04	1.185E+01	4.435E+01	2.423E+04	4.878E+01
2048	1.035E+01	1.552E+04	1.139E+01	4.261E+01	2.328E+04	4.687E+01
2049	9.947E+00	1.491E+04	1.094E+01	4.094E+01	2.236E+04	4.503E+01
2050	9.557E+00	1.432E+04	1.051E+01	3.933E+01	2.149E+04	4.327E+01
2051	9.182E+00	1.376E+04	1.010E+01	3.779E+01	2.064E+04	4.157E+01
2052	8.822E+00	1.322E+04	9.704E+00	3.631E+01	1.984E+04	3.994E+01
2053	8.476E+00	1.271E+04	9.324E+00	3.488E+01	1.906E+04	3.837E+01
2054	8.144E+00	1.221E+04	8.958E+00	3.352E+01	1.831E+04	3.687E+01
2055	7.824E+00	1.173E+04	8.607E+00	3.220E+01	1.759E+04	3.542E+01
2056	7.518E+00	1.127E+04	8.269E+00	3.094E+01	1.690E+04	3.403E+01
2057	7.223E+00	1.083E+04	7.945E+00	2.973E+01	1.624E+04	3.270E+01
2058	6.940E+00	1.040E+04	7.634E+00	2.856E+01	1.560E+04	3.142E+01
2059	6.668E+00	9.994E+03	7.334E+00	2.744E+01	1.499E+04	3.019E+01
2060	6.406E+00	9.602E+03	7.047E+00	2.637E+01	1.440E+04	2.900E+01
2061	6.155E+00	9.226E+03	6.770E+00	2.533E+01	1.384E+04	2.786E+01
2062	5.914E+00	8.864E+03	6.505E+00	2.434E+01	1.330E+04	2.677E+01
2063	5.682E+00	8.516E+03	6.250E+00	2.338E+01	1.277E+04	2.572E+01
2064	5.459E+00	8.183E+03	6.005E+00	2.247E+01	1.227E+04	2.471E+01
2065	5.245E+00	7.862E+03	5.769E+00	2.159E+01	1.179E+04	2.374E+01
2066	5.039E+00	7.553E+03	5.543E+00	2.074E+01	1.133E+04	2.281E+01
2067	4.842E+00	7.257E+03	5.326E+00	1.993E+01	1.089E+04	2.192E+01
2068	4.652E+00	6.973E+03	5.117E+00	1.915E+01	1.046E+04	2.106E+01
2069	4.469E+00	6.699E+03	4.916E+00	1.839E+01	1.005E+04	2.023E+01
2070	4.294E+00	6.437E+03	4.724E+00	1.767E+01	9.655E+03	1.944E+01
2071	4.126E+00	6.184E+03	4.538E+00	1.698E+01	9.276E+03	1.868E+01
2072	3.964E+00	5.942E+03	4.360E+00	1.631E+01	8.913E+03	1.795E+01
2073	3.809E+00	5.709E+03	4.189E+00	1.567E+01	8.563E+03	1.724E+01
2074	3.659E+00	5.485E+03	4.025E+00	1.506E+01	8.227E+03	1.657E+01
2075	3.516E+00	5.270E+03	3.867E+00	1.447E+01	7.905E+03	1.592E+01
2076	3.378E+00	5.063E+03	3.716E+00	1.390E+01	7.595E+03	1.529E+01
2077	3.245E+00	4.865E+03	3.570E+00	1.336E+01	7.297E+03	1.469E+01
2078	3.118E+00	4.674E+03	3.430E+00	1.283E+01	7.011E+03	1.412E+01
2079	2.996E+00	4.491E+03	3.296E+00	1.233E+01	6.736E+03	1.356E+01
2080	2.878E+00	4.315E+03	3.166E+00	1.185E+01	6.472E+03	1.303E+01
2081	2.766E+00	4.145E+03	3.042E+00	1.138E+01	6.218E+03	1.252E+01
2082	2.657E+00	3.983E+03	2.923E+00	1.094E+01	5.974E+03	1.203E+01
2083	2.553E+00	3.827E+03	2.808E+00	1.051E+01	5.740E+03	1.156E+01
2084	2.453E+00	3.677E+03	2.698E+00	1.010E+01	5.515E+03	1.110E+01
2085	2.357E+00	3.532E+03	2.592E+00	9.699E+00	5.299E+03	1.067E+01
2086	2.264E+00	3.394E+03	2.491E+00	9.319E+00	5.091E+03	1.025E+01
2087	2.175E+00	3.261E+03	2.393E+00	8.954E+00	4.891E+03	9.849E+00
2088	2.090E+00	3.133E+03	2.299E+00	8.602E+00	4.700E+03	9.463E+00
2089	2.008E+00	3.010E+03	2.209E+00	8.265E+00	4.515E+03	9.092E+00
2090	1.929E+00	2.892E+03	2.122E+00	7.941E+00	4.338E+03	8.735E+00

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
2091	1.854E+00	2.779E+03	2.039E+00	7.630E+00	4.168E+03	8.393E+00
2092	1.781E+00	2.670E+03	1.959E+00	7.331E+00	4.005E+03	8.064E+00
2093	1.711E+00	2.565E+03	1.882E+00	7.043E+00	3.848E+03	7.747E+00
2094	1.644E+00	2.465E+03	1.809E+00	6.767E+00	3.697E+03	7.444E+00
2095	1.580E+00	2.368E+03	1.738E+00	6.502E+00	3.552E+03	7.152E+00
2096	1.518E+00	2.275E+03	1.670E+00	6.247E+00	3.413E+03	6.871E+00
2097	1.458E+00	2.186E+03	1.604E+00	6.002E+00	3.279E+03	6.602E+00
2098	1.401E+00	2.100E+03	1.541E+00	5.766E+00	3.150E+03	6.343E+00
2099	1.346E+00	2.018E+03	1.481E+00	5.540E+00	3.027E+03	6.094E+00
2100	1.293E+00	1.939E+03	1.423E+00	5.323E+00	2.908E+03	5.855E+00
2101	1.243E+00	1.863E+03	1.367E+00	5.114E+00	2.794E+03	5.626E+00
2102	1.194E+00	1.790E+03	1.313E+00	4.914E+00	2.684E+03	5.405E+00
2103	1.147E+00	1.719E+03	1.262E+00	4.721E+00	2.579E+03	5.193E+00
2104	1.102E+00	1.652E+03	1.212E+00	4.536E+00	2.478E+03	4.990E+00
2105	1.059E+00	1.587E+03	1.165E+00	4.358E+00	2.381E+03	4.794E+00
2106	1.017E+00	1.525E+03	1.119E+00	4.187E+00	2.288E+03	4.606E+00
2107	9.775E-01	1.465E+03	1.075E+00	4.023E+00	2.198E+03	4.425E+00
2108	9.392E-01	1.408E+03	1.033E+00	3.865E+00	2.112E+03	4.252E+00
2109	9.024E-01	1.353E+03	9.926E-01	3.714E+00	2.029E+03	4.085E+00
2110	8.670E-01	1.300E+03	9.537E-01	3.568E+00	1.949E+03	3.925E+00
2111	8.330E-01	1.249E+03	9.163E-01	3.428E+00	1.873E+03	3.771E+00
2112	8.003E-01	1.200E+03	8.804E-01	3.294E+00	1.799E+03	3.623E+00
2113	7.689E-01	1.153E+03	8.458E-01	3.165E+00	1.729E+03	3.481E+00
2114	7.388E-01	1.107E+03	8.127E-01	3.041E+00	1.661E+03	3.345E+00
2115	7.098E-01	1.064E+03	7.808E-01	2.921E+00	1.596E+03	3.214E+00
2116	6.820E-01	1.022E+03	7.502E-01	2.807E+00	1.533E+03	3.088E+00
2117	6.552E-01	9.822E+02	7.208E-01	2.697E+00	1.473E+03	2.966E+00
2118	6.296E-01	9.436E+02	6.925E-01	2.591E+00	1.415E+03	2.850E+00
2119	6.049E-01	9.066E+02	6.654E-01	2.489E+00	1.360E+03	2.738E+00
2120	5.812E-01	8.711E+02	6.393E-01	2.392E+00	1.307E+03	2.631E+00
2121	5.584E-01	8.369E+02	6.142E-01	2.298E+00	1.255E+03	2.528E+00
2122	5.365E-01	8.041E+02	5.901E-01	2.208E+00	1.206E+03	2.429E+00
2123	5.154E-01	7.726E+02	5.670E-01	2.121E+00	1.159E+03	2.333E+00
2124	4.952E-01	7.423E+02	5.447E-01	2.038E+00	1.113E+03	2.242E+00
2125	4.758E-01	7.132E+02	5.234E-01	1.958E+00	1.070E+03	2.154E+00
2126	4.571E-01	6.852E+02	5.029E-01	1.881E+00	1.028E+03	2.070E+00
2127	4.392E-01	6.584E+02	4.831E-01	1.808E+00	9.875E+02	1.988E+00
2128	4.220E-01	6.325E+02	4.642E-01	1.737E+00	9.488E+02	1.910E+00
2129	4.055E-01	6.077E+02	4.460E-01	1.669E+00	9.116E+02	1.836E+00
2130	3.896E-01	5.839E+02	4.285E-01	1.603E+00	8.759E+02	1.764E+00

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill
Reference Number: 001
Carroll Landfill Expansion Application

Existing Uncontrolled Emissions Summary
LandGEM 3.02 Results
Inventory for Year 2015

Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							38.75	9.73	42.63
Carbon dioxide							159.50	40.06	175.45
Non-Methane Organic Compounds (NMOC)							0.312	0.078	0.344
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0004	0.0001	0.0004	0.00039	0.00010	0.00043
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0011	0.0003	0.0012	0.0011	0.0003	0.0012			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0014	0.0004	0.0016	0.0014	0.0004	0.0016			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.00012	0.00003	0.00013	0.00012	0.00003	0.00013			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.00025	0.00006	0.00027	0.00025	0.00006	0.00027			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.00012	0.00003	0.00014	0.00012	0.00003	0.00014			
2-Propanol (isopropyl alcohol) - VOC	0.0182	0.0046	0.0200						
* Acetone							0.0025	0.0006	0.0027
Acrylonitrile - HAP/VOC	0.0020	0.0005	0.0022	0.0020	0.0005	0.0022			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0009	0.0002	0.0010	0.0009	0.0002	0.0010			
Bromodichloromethane - VOC	0.0031	0.0008	0.0034						
Butane - VOC	0.0018	0.0004	0.0019						
Carbon disulfide - HAP/VOC	0.00027	0.00007	0.00029	0.00027	0.00007	0.00029			
Carbon monoxide							0.0237	0.0059	0.0261
Carbon tetrachloride - HAP/VOC/ODC	0.000004	0.000001	0.000004	0.000004	0.000001	0.000004	0.000004	0.000001	0.000004
Carbonyl sulfide - HAP/VOC	0.00018	0.00004	0.00020	0.00018	0.00004	0.00020			
Chlorobenzene - HAP/VOC	0.00017	0.00004	0.00019	0.00017	0.00004	0.00019			
* Chlorodifluoromethane - HCFC-22							0.00068	0.00017	0.00075
Chloroethane (ethyl chloride) - HAP/VOC	0.00051	0.00013	0.00056	0.00051	0.00013	0.00056			
Chloroform - HAP/VOC	0.00002	0.00001	0.00002	0.00002	0.00001	0.00002			
Chloromethane (methyl chloride) - HAP/VOC	0.00037	0.00009	0.00040	0.00037	0.00009	0.00040			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.00019	0.00005	0.00021	0.00019	0.00005	0.00021			
* Dichlorodifluoromethane - CFC-12							0.0117	0.0029	0.0129
Dichlorofluoromethane - VOC/HCFC-21	0.0016	0.0004	0.0018				0.0016	0.0004	0.0018
* Dichloromethane (methylene chloride) - HAP				0.0072	0.0018	0.0079			
Dimethyl sulfide (methyl sulfide) - VOC	0.0029	0.0007	0.0032						
* Ethane							0.1617	0.0406	0.1778
Ethanol - VOC	0.0075	0.0019	0.0083						
Ethyl mercaptan (ethanethiol) - VOC	0.00086	0.00022	0.00095						
Ethylbenzene - HAP/VOC	0.0029	0.0007	0.0032	0.0029	0.0007	0.0032			
Ethylene dibromide - HAP/VOC	0.000001	0.000000	0.000001	0.000001	0.000000	0.000001			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.00063	0.00016	0.00069
Hexane - HAP/VOC	0.0034	0.0009	0.0038	0.0034	0.0009	0.0038			
Hydrogen sulfide							0.8872	0.2228	0.9760
Mercury (total) - HAP				3.51E-07	8.83E-08	3.87E-07			
Methyl ethyl ketone - HAP/VOC	0.0031	0.0008	0.0034	0.0031	0.0008	0.0034			
Methyl isobutyl ketone - HAP/VOC	0.0011	0.0003	0.0013	0.0011	0.0003	0.0013			
Methyl mercaptan - VOC	0.00073	0.00018	0.00080						
Pentane - VOC	0.0014	0.0004	0.0016						
* Perchloroethylene (tetrachloroethylene) - HAP				0.0037	0.0009	0.0041			
Propane - VOC	0.0029	0.0007	0.0032						
* t-1,2-Dichloroethene							0.0016	0.0004	0.0018
Toluene - No or Unknown Co-disposal - HAP/VOC	0.0217	0.0055	0.0239	0.0217	0.0055	0.0239			
Trichloroethylene (trichloroethene) - HAP/VOC	0.0022	0.0006	0.0024	0.0022	0.0006	0.0024			
Vinyl chloride - HAP/VOC	0.0028	0.0007	0.0030	0.0028	0.0007	0.0030			
Xylenes - HAP/VOC	0.0077	0.0019	0.0085	0.0077	0.0019	0.0085			
TOTALS	0.09	0.02	0.10	0.06	0.02	0.07	199.66	50.14	219.63

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.

[2] Emission Rate in lbs/hr is based on 8,760 hours per year

ODC = Classified ozone depleting chemical (SUM = 0.0150 Mg/yr, 0.0038 lbs/hr, 0.0165 TPY)

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill | **Existing Uncontrolled Emissions Summary**
Reference Number: 001 | LandGEM 3.02 Results
Carroll Landfill Expansion Application | Inventory for Year 2029

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Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							22.14	5.56	24.35
Carbon dioxide							91.11	22.88	100.22
Non-Methane Organic Compounds (NMOC)							0.178	0.045	0.196
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0002	0.0001	0.0002	0.00022	0.00006	0.00024
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0006	0.0002	0.0007	0.0006	0.0002	0.0007			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0008	0.0002	0.0009	0.0008	0.0002	0.0009			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.00007	0.00002	0.00007	0.00007	0.00002	0.00007			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.00014	0.00004	0.00015	0.00014	0.00004	0.00015			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.00007	0.00002	0.00008	0.00007	0.00002	0.00008			
2-Propanol (isopropyl alcohol) - VOC	0.0104	0.0026	0.0114						
* Acetone							0.0014	0.0004	0.0015
Acrylonitrile - HAP/VOC	0.0012	0.0003	0.0013	0.0012	0.0003	0.0013			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0005	0.0001	0.0006	0.0005	0.0001	0.0006			
Bromodichloromethane - VOC	0.0018	0.0004	0.0019						
Butane - VOC	0.0010	0.0003	0.0011						
Carbon disulfide - HAP/VOC	0.00015	0.00004	0.00017	0.00015	0.00004	0.00017			
Carbon monoxide							0.0135	0.0034	0.0149
Carbon tetrachloride - HAP/VOC/ODC	0.000002	0.000001	0.000002	0.000002	0.000001	0.000002	0.000002	0.000001	0.000002
Carbonyl sulfide - HAP/VOC	0.00010	0.00003	0.00011	0.00010	0.00003	0.00011			
Chlorobenzene - HAP/VOC	0.00010	0.00002	0.00011	0.00010	0.00002	0.00011			
* Chlorodifluoromethane - HCFC-22							0.00039	0.00010	0.00043
Chloroethane (ethyl chloride) - HAP/VOC	0.00029	0.00007	0.00032	0.00029	0.00007	0.00032			
Chloroform - HAP/VOC	0.00001	0.000003	0.00001	0.00001	0.000003	0.00001			
Chloromethane (methyl chloride) - HAP/VOC	0.00021	0.00005	0.00023	0.00021	0.00005	0.00023			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.00011	0.00003	0.00012	0.00011	0.00003	0.00012			
* Dichlorodifluoromethane - CFC-12							0.0067	0.0017	0.0073
Dichlorofluoromethane - VOC/HCFC-21	0.0009	0.0002	0.0010				0.0009	0.0002	0.0010
* Dichloromethane (methylene chloride) - HAP				0.0041	0.0010	0.0045			
Dimethyl sulfide (methyl sulfide) - VOC	0.0017	0.0004	0.0018						
* Ethane							0.0923	0.0232	0.1016
Ethanol - VOC	0.0043	0.0011	0.0047						
Ethyl mercaptan (ethanethiol) - VOC	0.00049	0.00012	0.00054						
Ethylbenzene - HAP/VOC	0.0017	0.0004	0.0019	0.0017	0.0004	0.0019			
Ethylene dibromide - HAP/VOC	0.000001	0.000000	0.000001	0.000001	0.0000002	0.000001			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.00036	0.00009	0.00040
Hexane - HAP/VOC	0.0020	0.0005	0.0022	0.0020	0.0005	0.0022			
Hydrogen sulfide							0.5068	0.1273	0.5575
Mercury (total) - HAP				2.01E-07	5.04E-08	2.21E-07			
Methyl ethyl ketone - HAP/VOC	0.0018	0.0004	0.0019	0.0018	0.0004	0.0019			
Methyl isobutyl ketone - HAP/VOC	0.0007	0.0002	0.0007	0.0007	0.0002	0.0007			
Methyl mercaptan - VOC	0.00041	0.00010	0.00046						
Pentane - VOC	0.0008	0.0002	0.0009						
* Perchloroethylene (tetrachloroethylene) - HAP				0.0021	0.0005	0.0023			
Propane - VOC	0.0017	0.0004	0.0018						
* t-1,2-Dichloroethene							0.0009	0.0002	0.0010
Toluene - No or Unknown Co-disposal - HAP/VOC	0.0124	0.0031	0.0136	0.0124	0.0031	0.0136			
Trichloroethylene (trichloroethene) - HAP/VOC	0.0013	0.0003	0.0014	0.0013	0.0003	0.0014			
Vinyl chloride - HAP/VOC	0.0016	0.0004	0.0017	0.0016	0.0004	0.0017			
Xylenes - HAP/VOC	0.0044	0.0011	0.0048	0.0044	0.0011	0.0048			
TOTALS	0.05	0.01	0.06	0.04	0.01	0.04	114.05	28.64	125.45

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.

[2] Emission Rate in lbs/hr is based on 8,760 hours per year

ODC = Classified ozone depleting chemical (SUM = 0.0086 Mg/yr, 0.0022 lbs/hr, 0.0094 TPY)

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Existing Jones-Carroll Landfill

Controlled Emissions

for 2015

~~1711~~ 2620 Grand Island Blvd. – Grand Island, NY – 14072
Ph: (716) 773-6872 – Fax: (716) 773-6873

SUBJECT Landfill Methane Oxidation Factors for Existing Jones-Carroll Landfill

FIND: Determine the appropriate oxidation factor for use in calculation of controlled emissions from the existing Jones-Carroll Landfill under current conditions.

Solution: Use Table HH-4 in 40 CFR 98.348

→ $MF = \frac{K \times G_{CH4}}{SA}$ where: MF = methane flux, g/m²/d
K = unit conversion factor
= $10^6/365$ g/ton/yr
G_{CH4} = modeled CH_4 generation rate, metric ton
SA = surface area, m^2

→ In year 2015, model CH_4 generation rate,
G_{CH4} = (42.63 TPY (PTE))(0.91 metric ton/US short ton)
= 38.79 metric ton ✓

→ SA of the closed landfill = 3 acres × $\frac{4047 m^2}{acre}$
SA = 12,141 m^2 ✓

→ $MF = \frac{\left(\frac{10^6}{365}\right)(38.79)}{12,141} = 8.75\ g/m^2/d < 10\ g/m^2/d$ ✓

→ The Jones-Carroll Landfill is current under final cover including > 24" of soil cover.

→ ∴ C5 from Table HH-4 applies, and the appropriate oxidation factor,

OX = 35% ✓

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill | **Existing Controlled Emissions Summary**

Reference Number: 001 | LandGEM 3.02 Results * (1 - 35% oxidation factor)

Carroll Landfill Expansion Application | Inventory for Year 2015

Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							25.19	6.33	27.71
Carbon dioxide							103.68	26.04	114.04
Non-Methane Organic Compounds (NMOC)							0.20302	0.05099	0.22332
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.00025	0.00006	0.00028	0.00025	0.00006	0.00028
1,1,2,2-Tetrachloroethane - HAP/VOC	0.00072	0.00018	0.00080	0.00072	0.00018	0.00080			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.00093	0.00023	0.00103	0.00093	0.00023	0.00103			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.00008	0.00002	0.00008	0.00008	0.00002	0.00008			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.00016	0.00004	0.00018	0.00016	0.00004	0.00018			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.00008	0.00002	0.00009	0.00008	0.00002	0.00009			
2-Propanol (isopropyl alcohol) - VOC	0.01180	0.00296	0.01298						
* Acetone							0.00160	0.00040	0.00176
Acrylonitrile - HAP/VOC	0.00131	0.00033	0.00144	0.00131	0.00033	0.00144			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.00058	0.00015	0.00064	0.00058	0.00015	0.00064			
Bromodichloromethane - VOC	0.00199	0.00050	0.00219						
Butane - VOC	0.00114	0.00029	0.00126						
Carbon disulfide - HAP/VOC	0.00017	0.00004	0.00019	0.00017	0.00004	0.00019			
Carbon monoxide							0.01540	0.00387	0.01694
Carbon tetrachloride - HAP/VOC/ODC	0.000002	0.000001	0.000003	0.000002	0.000001	0.000003	0.000002	0.000001	0.000003
Carbonyl sulfide - HAP/VOC	0.00012	0.00003	0.00013	0.00012	0.00003	0.00013			
Chlorobenzene - HAP/VOC	0.00011	0.00003	0.00012	0.00011	0.00003	0.00012			
* Chlorodifluoromethane - HCFC-22							0.00044	0.00011	0.00049
Chloroethane (ethyl chloride) - HAP/VOC	0.00033	0.00008	0.00036	0.00033	0.00008	0.00036			
Chloroform - HAP/VOC	0.00001	0.00000	0.00002	0.00001	0.00000	0.00002			
Chloromethane (methyl chloride) - HAP/VOC	0.00024	0.00006	0.00026	0.00024	0.00006	0.00026			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.00012	0.00003	0.00013	0.00012	0.00003	0.00013			
* Dichlorodifluoromethane - CFC-12							0.00760	0.00191	0.00836
Dichlorofluoromethane - VOC/HCFC-21	0.00105	0.00026	0.00116				0.00105	0.00026	0.00116
* Dichloromethane (methylene chloride) - HAP				0.00467	0.00117	0.00514			
Dimethyl sulfide (methyl sulfide) - VOC	0.00190	0.00048	0.00209						
* Ethane	0.00000	0.00000	0.00000				0.10507	0.02639	0.11558
Ethanol - VOC	0.00488	0.00123	0.00537						
Ethyl mercaptan (ethanethiol) - VOC	0.00056	0.00014	0.00062						
Ethylbenzene - HAP/VOC	0.00192	0.00048	0.00211	0.00192	0.00048	0.00211			
Ethylene dibromide - HAP/VOC	0.000001	0.000000	0.000001	0.000001	0.000000	0.000001			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.00041	0.00010	0.00045
Hexane - HAP/VOC	0.00223	0.00056	0.00246	0.00223	0.00056	0.00246			
Hydrogen sulfide[3]							0.22	0.06	0.24
Mercury (total) - HAP				0.0000002	0.0000001	0.0000003			
Methyl ethyl ketone - HAP/VOC	0.00201	0.00050	0.00221	0.00201	0.00050	0.00221			
Methyl isobutyl ketone - HAP/VOC	0.00075	0.00019	0.00082	0.00075	0.00019	0.00082			
Methyl mercaptan - VOC	0.00047	0.00012	0.00052						
Pentane - VOC	0.00093	0.00023	0.00103						
* Perchloroethylene (tetrachloroethylene) - HAP				0.00241	0.00061	0.00265			
Propane - VOC	0.00190	0.00048	0.00209						
* t-1,2-Dichloroethene							0.00107	0.00027	0.00117
Toluene - No or Unknown Co-disposal - HAP/VOC	0.01411	0.00354	0.01552	0.01411	0.00354	0.01552			
Trichloroethylene (trichloroethene) - HAP/VOC	0.00144	0.00036	0.00159	0.00144	0.00036	0.00159			
Vinyl chloride - HAP/VOC	0.00179	0.00045	0.00197	0.00179	0.00045	0.00197			
Xylenes - HAP/VOC	0.00500	0.00126	0.00550	0.00500	0.00126	0.00550			
TOTALS	0.06	0.02	0.07	0.04	0.01	0.05	129.42	32.50	142.37

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.

[2] Emission Rate in lbs/hr is based on 8,760 hours per year

ODC = Classified ozone depleting chemical (SUM = 0.0098 Mg/yr, 0.0024 lbs/hr, 0.0107 TPY)

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

[3]Calculation of controlled H_2S = Uncontrolled emissions*(1-75% Diffusive reduction factor)

Proposed Carroll Landfill

Uncontrolled Emissions

for 2029

DAIGLER ENGINEERING P.C.
...... engineering · science · design ....
1711 Grand Island Blvd. – Grand Island, NY – 14072
Ph: (716) 773-6872 – Fax: (716) 773-6873

SUBJECT Airspace vs. Waste Volume

Given: • Volume between the top of the primary drainage layer and the top of waste = 5,735,484.73 cy

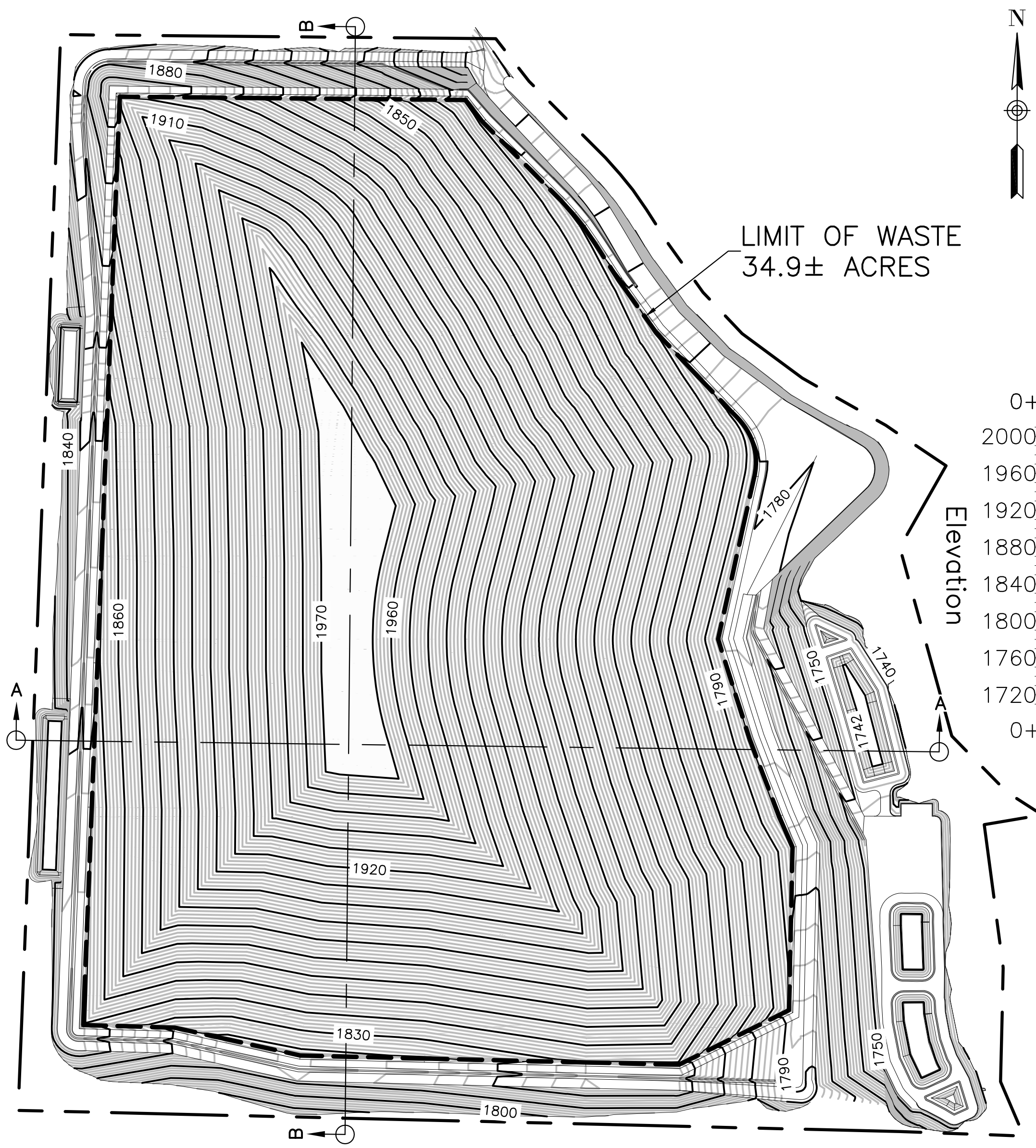
• This volume includes both waste & operations soils.

Assumption: Operations soils account for approximately 5% of the total airspace.

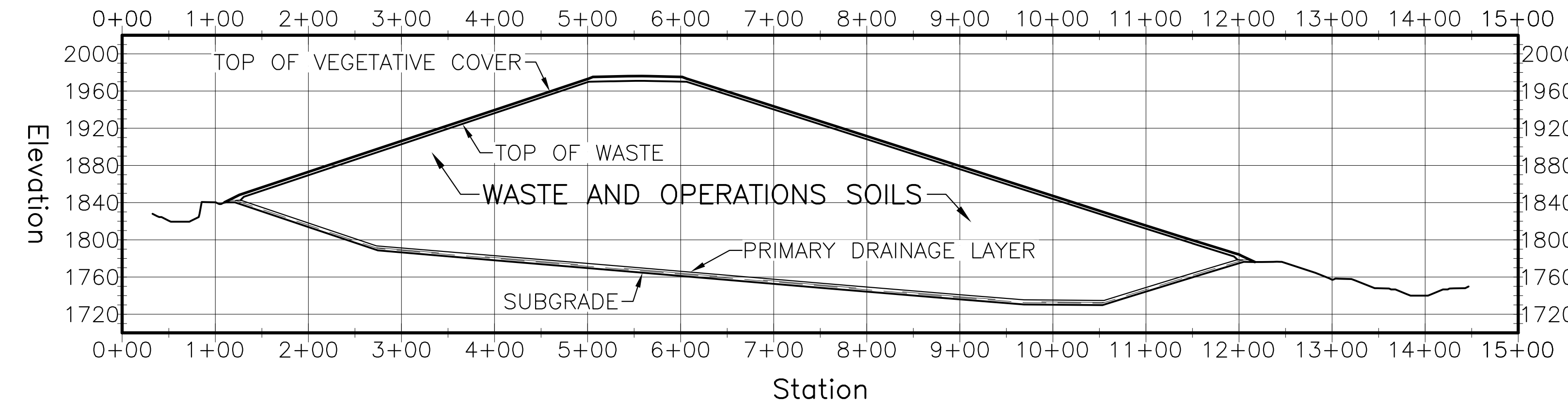
Compute: Waste Volume = (1-0.05) Airspace Volume

= 0.95 (5,735,484.73 cy)

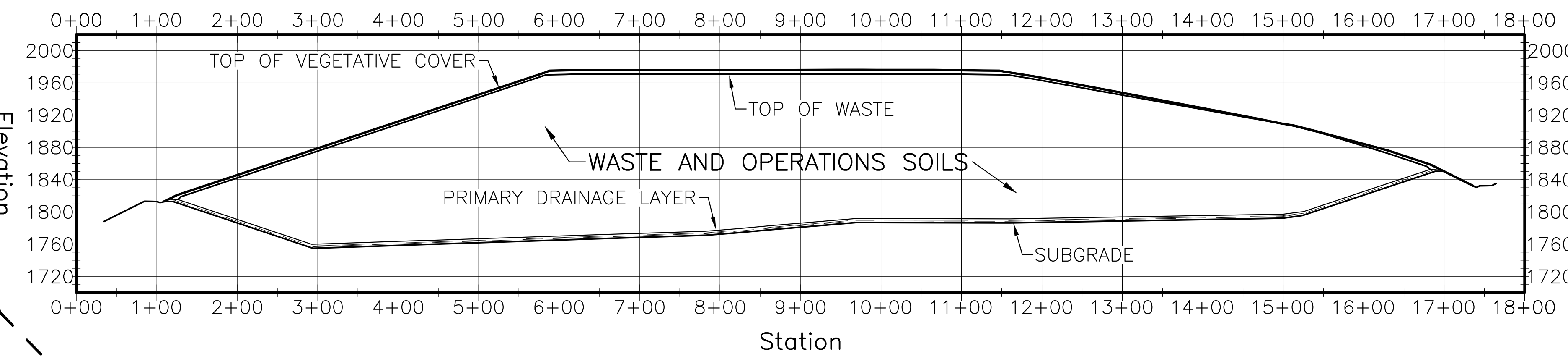
= 5,448,710.5 cy



PLAN
SCALE: 1"=300'



Profile View of A–A
SCALE: 1"=200' HORIZONTAL
1"=200' VERTICAL



Profile View of B–B
SCALE: 1"=200' HORIZONTAL
1"=200' VERTICAL

LANDFILL AIRSPACE

Base Surface	Comparison Surface	Cut	Fill	Net
PRIMARY DRAINAGE LAYER	TOP OF WASTE	0.00 Cu. Yd.	5,735,484.73 Cu. Yd.	5,735,484.73 Cu. Yd.<Fill>

Q:\Sealand\02-0104 Carroll Landfill\WORKING DRAWINGS-REDESIGN\ACAD\WASTE VOLUME.dwg 3/18/2013 11:35 AM

NO.	REVISION	BY	DATE

DAIGLER ENGINEERING P.C.
engineering · science · design
1711 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: March 2013

SCALE: AS NOTED

PREPARED FOR: SEALAND WASTE, LLC			LANDFILL AIRSPACE CARROLL LANDFILL EXPANSION APPLICATION	FIGURE 1
DES. BY:	DRW. BY:	CHK. BY:		
DWG: WASTE VOLUME.dwg			TOWN OF CARROLL / CAHAUTAUQUA COUNTY / NEW YORK	

Calculation of Uncontrolled Emissions from the Proposed Carroll Landfill

Annual Waste Acceptance Rate:

- Proposed Design Capacity = 1,000 ton/d
- Operational Days per Year: (365d/yr ÷ 7 d/wk) × (7 d/wk – Sundays) – 6 Holidays/yr

  = (52 × 6) – 6

  = 307 days per year
- Annual acceptance rate = 1,000 ton/d × 307 d/y = **307,000 TPY**

Total Estimated New Waste Mass

- Total estimated waste capacity of the proposed landfill = 5,448,710 cy
- Total waste capacity for new waste

  = 5,448,710 cy - Volume of existing waste in Jones-Carroll Landfill

  = 5,448,710 cy – 74,165 cy[1]

  = 5,374,545 cy
- Assumed density of C&D waste = 0.75 ton/cy (from NYSDEC, 2010, see main report Section 6 for full reference)
- Total estimated weight of new waste = 5,374,545 cy × 0.75 ton/cy = **4,030,909 ton**

[1] This volume was calculated using a model of the Jones-Carroll Landfill built from "as-built" landfill drawings and the existing ground topography. Although this volume is approximately half of that reported in the Jones-Carroll annual reports used to construct the LandGEM model for the existing landfill, it is within reason to expect the volume of the waste within the landfill will be less than that accepted due to initial compaction during waste placement as well as a breakdown of the waste itself as its biodegradable fraction degrades over time. Use of this lower number will not only be more conservative because it will allow a greater airspace for the acceptance of new waste, it should also more realistically reflect the actual waste space required to relocate the existing landfill.

Summary Report

Landfill Name or Identifier: Proposed Carroll Landfill Expansion

Date: Thursday, January 22, 2015

Description/Comments:

Using parameters for Lo and k derived from the Greenhouse Gas Reporting Rule Subpart H-H and not discounting for non-biodegradable waste mass.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*$year^{-1}$*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2016**	
Landfill Closure Year (with 80-year limit)	**2029**	
Actual Closure Year (without limit)	***2029***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**4,030,909**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*year^{-1}*
Potential Methane Generation Capacity, L_o	**32**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**40**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Hydrogen sulfide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2016	279,091	307,000	0	0
2017	279,091	307,000	279,091	307,000
2018	279,091	307,000	558,182	614,000
2019	279,091	307,000	837,273	921,000
2020	279,091	307,000	1,116,364	1,228,000
2021	279,091	307,000	1,395,455	1,535,000
2022	279,091	307,000	1,674,545	1,842,000
2023	279,091	307,000	1,953,636	2,149,000
2024	279,091	307,000	2,232,727	2,456,000
2025	279,091	307,000	2,511,818	2,763,000
2026	279,091	307,000	2,790,909	3,070,000
2027	279,091	307,000	3,070,000	3,377,000
2028	279,091	307,000	3,349,091	3,684,000
2029	36,281	39,909	3,628,182	3,991,000
2030	0	0	3,664,463	4,030,909
2031	0	0	3,664,463	4,030,909
2032	0	0	3,664,463	4,030,909
2033	0	0	3,664,463	4,030,909
2034	0	0	3,664,463	4,030,909
2035	0	0	3,664,463	4,030,909
2036	0	0	3,664,463	4,030,909
2037	0	0	3,664,463	4,030,909
2038	0	0	3,664,463	4,030,909
2039	0	0	3,664,463	4,030,909
2040	0	0	3,664,463	4,030,909
2041	0	0	3,664,463	4,030,909
2042	0	0	3,664,463	4,030,909
2043	0	0	3,664,463	4,030,909
2044	0	0	3,664,463	4,030,909
2045	0	0	3,664,463	4,030,909
2046	0	0	3,664,463	4,030,909
2047	0	0	3,664,463	4,030,909
2048	0	0	3,664,463	4,030,909
2049	0	0	3,664,463	4,030,909
2050	0	0	3,664,463	4,030,909
2051	0	0	3,664,463	4,030,909
2052	0	0	3,664,463	4,030,909
2053	0	0	3,664,463	4,030,909
2054	0	0	3,664,463	4,030,909
2055	0	0	3,664,463	4,030,909

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2056	0	0	3,664,463	4,030,909
2057	0	0	3,664,463	4,030,909
2058	0	0	3,664,463	4,030,909
2059	0	0	3,664,463	4,030,909
2060	0	0	3,664,463	4,030,909
2061	0	0	3,664,463	4,030,909
2062	0	0	3,664,463	4,030,909
2063	0	0	3,664,463	4,030,909
2064	0	0	3,664,463	4,030,909
2065	0	0	3,664,463	4,030,909
2066	0	0	3,664,463	4,030,909
2067	0	0	3,664,463	4,030,909
2068	0	0	3,664,463	4,030,909
2069	0	0	3,664,463	4,030,909
2070	0	0	3,664,463	4,030,909
2071	0	0	3,664,463	4,030,909
2072	0	0	3,664,463	4,030,909
2073	0	0	3,664,463	4,030,909
2074	0	0	3,664,463	4,030,909
2075	0	0	3,664,463	4,030,909
2076	0	0	3,664,463	4,030,909
2077	0	0	3,664,463	4,030,909
2078	0	0	3,664,463	4,030,909
2079	0	0	3,664,463	4,030,909
2080	0	0	3,664,463	4,030,909
2081	0	0	3,664,463	4,030,909
2082	0	0	3,664,463	4,030,909
2083	0	0	3,664,463	4,030,909
2084	0	0	3,664,463	4,030,909
2085	0	0	3,664,463	4,030,909
2086	0	0	3,664,463	4,030,909
2087	0	0	3,664,463	4,030,909
2088	0	0	3,664,463	4,030,909
2089	0	0	3,664,463	4,030,909
2090	0	0	3,664,463	4,030,909
2091	0	0	3,664,463	4,030,909
2092	0	0	3,664,463	4,030,909
2093	0	0	3,664,463	4,030,909
2094	0	0	3,664,463	4,030,909
2095	0	0	3,664,463	4,030,909

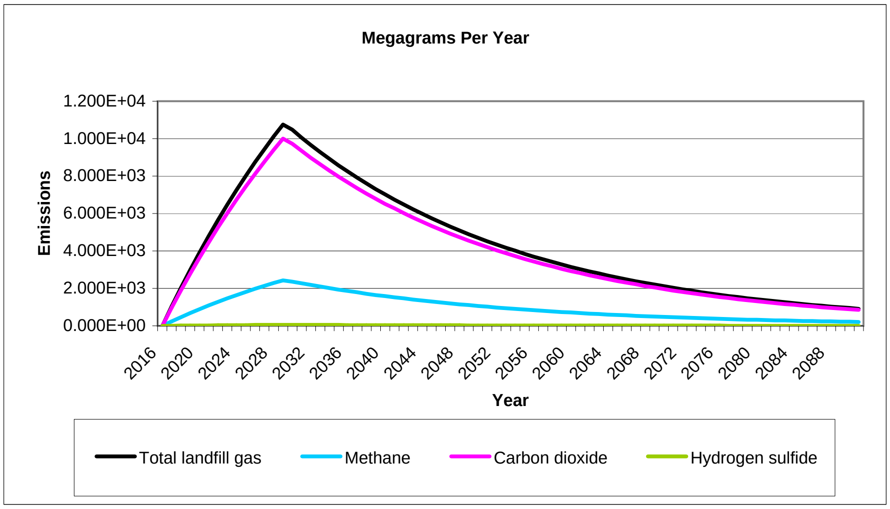
Pollutant Parameters

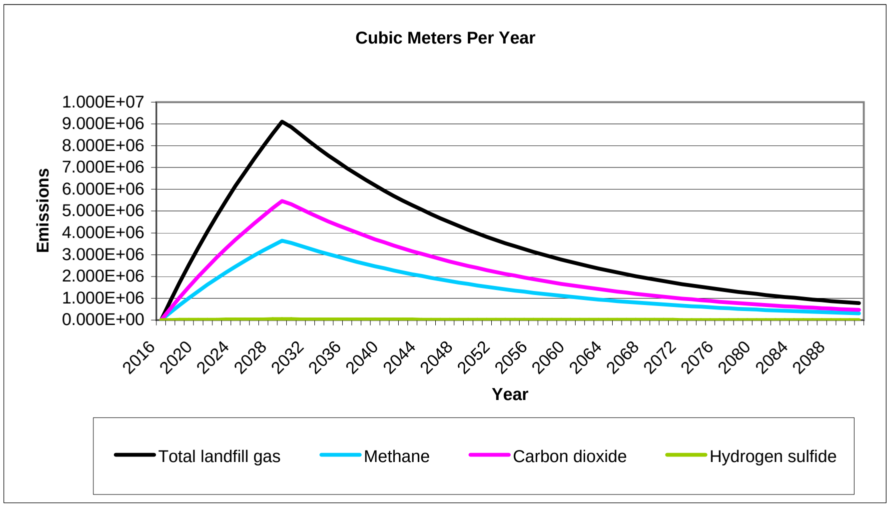
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

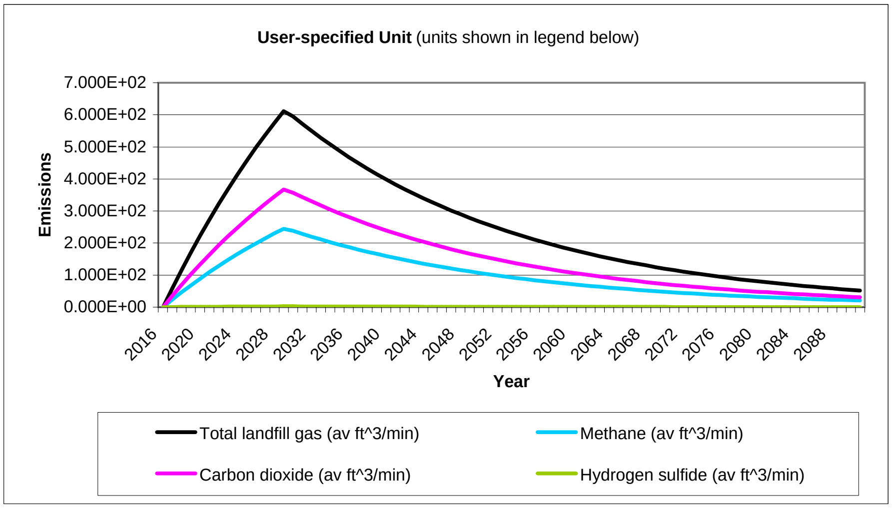
Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08	4310.00	
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
1.200E+04
1.000E+04
8.000E+03
6.000E+03
4.000E+03
2.000E+03
0.000E+00
Emissions
2016 2020 2024 2028 2032 2036 2040 2044 2048 2052 2056 2060 2064 2068 2072 2076 2080 2084 2088
Year
Total landfill gas
Methane
Carbon dioxide
Hydrogen sulfide


Cubic Meters Per Year
1.000E+07
9.000E+06
8.000E+06
7.000E+06
6.000E+06
5.000E+06
4.000E+06
3.000E+06
2.000E+06
1.000E+06
0.000E+00
Emissions
2016 2020 2024 2028 2032 2036 2040 2044 2048 2052 2056 2060 2064 2068 2072 2076 2080 2084 2088
Year
Total landfill gas
Methane
Carbon dioxide
Hydrogen sulfide


User-specified Unit (units shown in legend below)
7.000E+02
6.000E+02
5.000E+02
4.000E+02
3.000E+02
2.000E+02
1.000E+02
0.000E+00
Emissions
2016 2020 2024 2028 2032 2036 2040 2044 2048 2052 2056 2060 2064 2068 2072 2076 2080 2084 2088
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
Hydrogen sulfide (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2016	0	0	0	0	0	0
2017	1.040E+03	8.800E+05	5.912E+01	2.348E+02	3.520E+05	2.365E+01
2018	2.040E+03	1.725E+06	1.159E+02	4.604E+02	6.902E+05	4.637E+01
2019	3.000E+03	2.538E+06	1.705E+02	6.772E+02	1.015E+06	6.820E+01
2020	3.922E+03	3.318E+06	2.229E+02	8.855E+02	1.327E+06	8.918E+01
2021	4.809E+03	4.068E+06	2.733E+02	1.086E+03	1.627E+06	1.093E+02
2022	5.660E+03	4.788E+06	3.217E+02	1.278E+03	1.915E+06	1.287E+02
2023	6.479E+03	5.481E+06	3.682E+02	1.463E+03	2.192E+06	1.473E+02
2024	7.265E+03	6.146E+06	4.129E+02	1.640E+03	2.458E+06	1.652E+02
2025	8.020E+03	6.785E+06	4.559E+02	1.811E+03	2.714E+06	1.823E+02
2026	8.746E+03	7.399E+06	4.971E+02	1.974E+03	2.959E+06	1.988E+02
2027	9.443E+03	7.988E+06	5.367E+02	2.132E+03	3.195E+06	2.147E+02
2028	1.011E+04	8.555E+06	5.748E+02	2.283E+03	3.422E+06	2.299E+02
2029	1.076E+04	9.100E+06	6.114E+02	2.428E+03	3.640E+06	2.446E+02
2030	1.047E+04	8.857E+06	5.951E+02	2.364E+03	3.543E+06	2.380E+02
2031	1.006E+04	8.510E+06	5.718E+02	2.271E+03	3.404E+06	2.287E+02
2032	9.665E+03	8.176E+06	5.494E+02	2.182E+03	3.271E+06	2.197E+02
2033	9.286E+03	7.856E+06	5.278E+02	2.096E+03	3.142E+06	2.111E+02
2034	8.922E+03	7.548E+06	5.071E+02	2.014E+03	3.019E+06	2.029E+02
2035	8.572E+03	7.252E+06	4.872E+02	1.935E+03	2.901E+06	1.949E+02
2036	8.236E+03	6.967E+06	4.681E+02	1.859E+03	2.787E+06	1.873E+02
2037	7.913E+03	6.694E+06	4.498E+02	1.786E+03	2.678E+06	1.799E+02
2038	7.603E+03	6.432E+06	4.321E+02	1.716E+03	2.573E+06	1.729E+02
2039	7.305E+03	6.180E+06	4.152E+02	1.649E+03	2.472E+06	1.661E+02
2040	7.018E+03	5.937E+06	3.989E+02	1.584E+03	2.375E+06	1.596E+02
2041	6.743E+03	5.704E+06	3.833E+02	1.522E+03	2.282E+06	1.533E+02
2042	6.479E+03	5.481E+06	3.683E+02	1.463E+03	2.192E+06	1.473E+02
2043	6.225E+03	5.266E+06	3.538E+02	1.405E+03	2.106E+06	1.415E+02
2044	5.981E+03	5.059E+06	3.399E+02	1.350E+03	2.024E+06	1.360E+02
2045	5.746E+03	4.861E+06	3.266E+02	1.297E+03	1.944E+06	1.306E+02
2046	5.521E+03	4.670E+06	3.138E+02	1.246E+03	1.868E+06	1.255E+02
2047	5.304E+03	4.487E+06	3.015E+02	1.197E+03	1.795E+06	1.206E+02
2048	5.096E+03	4.311E+06	2.897E+02	1.151E+03	1.725E+06	1.159E+02
2049	4.897E+03	4.142E+06	2.783E+02	1.105E+03	1.657E+06	1.113E+02
2050	4.705E+03	3.980E+06	2.674E+02	1.062E+03	1.592E+06	1.070E+02
2051	4.520E+03	3.824E+06	2.569E+02	1.020E+03	1.530E+06	1.028E+02
2052	4.343E+03	3.674E+06	2.468E+02	9.804E+02	1.470E+06	9.874E+01
2053	4.173E+03	3.530E+06	2.372E+02	9.420E+02	1.412E+06	9.487E+01
2054	4.009E+03	3.391E+06	2.279E+02	9.050E+02	1.357E+06	9.115E+01
2055	3.852E+03	3.258E+06	2.189E+02	8.695E+02	1.303E+06	8.757E+01
2056	3.701E+03	3.131E+06	2.103E+02	8.354E+02	1.252E+06	8.414E+01
2057	3.556E+03	3.008E+06	2.021E+02	8.027E+02	1.203E+06	8.084E+01
2058	3.416E+03	2.890E+06	1.942E+02	7.712E+02	1.156E+06	7.767E+01
2059	3.282E+03	2.777E+06	1.866E+02	7.410E+02	1.111E+06	7.462E+01
2060	3.154E+03	2.668E+06	1.792E+02	7.119E+02	1.067E+06	7.170E+01
2061	3.030E+03	2.563E+06	1.722E+02	6.840E+02	1.025E+06	6.889E+01
2062	2.911E+03	2.463E+06	1.655E+02	6.572E+02	9.851E+05	6.619E+01
2063	2.797E+03	2.366E+06	1.590E+02	6.314E+02	9.464E+05	6.359E+01
2064	2.687E+03	2.273E+06	1.527E+02	6.067E+02	9.093E+05	6.110E+01
2065	2.582E+03	2.184E+06	1.468E+02	5.829E+02	8.737E+05	5.870E+01

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2066	2.481E+03	2.099E+06	1.410E+02	5.600E+02	8.394E+05	5.640E+01
2067	2.383E+03	2.016E+06	1.355E+02	5.381E+02	8.065E+05	5.419E+01
2068	2.290E+03	1.937E+06	1.302E+02	5.170E+02	7.749E+05	5.206E+01
2069	2.200E+03	1.861E+06	1.251E+02	4.967E+02	7.445E+05	5.002E+01
2070	2.114E+03	1.788E+06	1.202E+02	4.772E+02	7.153E+05	4.806E+01
2071	2.031E+03	1.718E+06	1.154E+02	4.585E+02	6.873E+05	4.618E+01
2072	1.951E+03	1.651E+06	1.109E+02	4.405E+02	6.603E+05	4.437E+01
2073	1.875E+03	1.586E+06	1.066E+02	4.233E+02	6.344E+05	4.263E+01
2074	1.801E+03	1.524E+06	1.024E+02	4.067E+02	6.095E+05	4.096E+01
2075	1.731E+03	1.464E+06	9.837E+01	3.907E+02	5.856E+05	3.935E+01
2076	1.663E+03	1.407E+06	9.452E+01	3.754E+02	5.627E+05	3.781E+01
2077	1.598E+03	1.352E+06	9.081E+01	3.607E+02	5.406E+05	3.632E+01
2078	1.535E+03	1.299E+06	8.725E+01	3.465E+02	5.194E+05	3.490E+01
2079	1.475E+03	1.248E+06	8.383E+01	3.329E+02	4.991E+05	3.353E+01
2080	1.417E+03	1.199E+06	8.054E+01	3.199E+02	4.795E+05	3.222E+01
2081	1.361E+03	1.152E+06	7.738E+01	3.073E+02	4.607E+05	3.095E+01
2082	1.308E+03	1.107E+06	7.435E+01	2.953E+02	4.426E+05	2.974E+01
2083	1.257E+03	1.063E+06	7.143E+01	2.837E+02	4.253E+05	2.857E+01
2084	1.207E+03	1.021E+06	6.863E+01	2.726E+02	4.086E+05	2.745E+01
2085	1.160E+03	9.814E+05	6.594E+01	2.619E+02	3.926E+05	2.638E+01
2086	1.115E+03	9.429E+05	6.336E+01	2.516E+02	3.772E+05	2.534E+01
2087	1.071E+03	9.060E+05	6.087E+01	2.418E+02	3.624E+05	2.435E+01
2088	1.029E+03	8.704E+05	5.848E+01	2.323E+02	3.482E+05	2.339E+01
2089	9.886E+02	8.363E+05	5.619E+01	2.232E+02	3.345E+05	2.248E+01
2090	9.498E+02	8.035E+05	5.399E+01	2.144E+02	3.214E+05	2.160E+01
2091	9.126E+02	7.720E+05	5.187E+01	2.060E+02	3.088E+05	2.075E+01
2092	8.768E+02	7.417E+05	4.984E+01	1.979E+02	2.967E+05	1.993E+01
2093	8.424E+02	7.127E+05	4.788E+01	1.902E+02	2.851E+05	1.915E+01
2094	8.094E+02	6.847E+05	4.601E+01	1.827E+02	2.739E+05	1.840E+01
2095	7.777E+02	6.579E+05	4.420E+01	1.756E+02	2.631E+05	1.768E+01
2096	7.472E+02	6.321E+05	4.247E+01	1.687E+02	2.528E+05	1.699E+01
2097	7.179E+02	6.073E+05	4.080E+01	1.621E+02	2.429E+05	1.632E+01
2098	6.897E+02	5.835E+05	3.920E+01	1.557E+02	2.334E+05	1.568E+01
2099	6.627E+02	5.606E+05	3.767E+01	1.496E+02	2.242E+05	1.507E+01
2100	6.367E+02	5.386E+05	3.619E+01	1.437E+02	2.154E+05	1.448E+01
2101	6.117E+02	5.175E+05	3.477E+01	1.381E+02	2.070E+05	1.391E+01
2102	5.877E+02	4.972E+05	3.341E+01	1.327E+02	1.989E+05	1.336E+01
2103	5.647E+02	4.777E+05	3.210E+01	1.275E+02	1.911E+05	1.284E+01
2104	5.426E+02	4.590E+05	3.084E+01	1.225E+02	1.836E+05	1.234E+01
2105	5.213E+02	4.410E+05	2.963E+01	1.177E+02	1.764E+05	1.185E+01
2106	5.008E+02	4.237E+05	2.847E+01	1.131E+02	1.695E+05	1.139E+01
2107	4.812E+02	4.071E+05	2.735E+01	1.086E+02	1.628E+05	1.094E+01
2108	4.623E+02	3.911E+05	2.628E+01	1.044E+02	1.564E+05	1.051E+01
2109	4.442E+02	3.758E+05	2.525E+01	1.003E+02	1.503E+05	1.010E+01
2110	4.268E+02	3.610E+05	2.426E+01	9.635E+01	1.444E+05	9.703E+00
2111	4.101E+02	3.469E+05	2.331E+01	9.257E+01	1.388E+05	9.323E+00
2112	3.940E+02	3.333E+05	2.239E+01	8.894E+01	1.333E+05	8.957E+00
2113	3.785E+02	3.202E+05	2.152E+01	8.545E+01	1.281E+05	8.606E+00
2114	3.637E+02	3.077E+05	2.067E+01	8.210E+01	1.231E+05	8.269E+00
2115	3.494E+02	2.956E+05	1.986E+01	7.888E+01	1.182E+05	7.944E+00
2116	3.357E+02	2.840E+05	1.908E+01	7.579E+01	1.136E+05	7.633E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2117	3.226E+02	2.729E+05	1.833E+01	7.282E+01	1.091E+05	7.334E+00
2118	3.099E+02	2.622E+05	1.762E+01	6.996E+01	1.049E+05	7.046E+00
2119	2.978E+02	2.519E+05	1.692E+01	6.722E+01	1.008E+05	6.770E+00
2120	2.861E+02	2.420E+05	1.626E+01	6.458E+01	9.681E+04	6.504E+00
2121	2.749E+02	2.325E+05	1.562E+01	6.205E+01	9.301E+04	6.249E+00
2122	2.641E+02	2.234E+05	1.501E+01	5.962E+01	8.936E+04	6.004E+00
2123	2.537E+02	2.146E+05	1.442E+01	5.728E+01	8.586E+04	5.769E+00
2124	2.438E+02	2.062E+05	1.386E+01	5.503E+01	8.249E+04	5.543E+00
2125	2.342E+02	1.981E+05	1.331E+01	5.288E+01	7.926E+04	5.325E+00
2126	2.250E+02	1.904E+05	1.279E+01	5.080E+01	7.615E+04	5.117E+00
2127	2.162E+02	1.829E+05	1.229E+01	4.881E+01	7.316E+04	4.916E+00
2128	2.077E+02	1.757E+05	1.181E+01	4.690E+01	7.030E+04	4.723E+00
2129	1.996E+02	1.688E+05	1.134E+01	4.506E+01	6.754E+04	4.538E+00
2130	1.918E+02	1.622E+05	1.090E+01	4.329E+01	6.489E+04	4.360E+00
2131	1.843E+02	1.559E+05	1.047E+01	4.159E+01	6.235E+04	4.189E+00
2132	1.770E+02	1.498E+05	1.006E+01	3.996E+01	5.990E+04	4.025E+00
2133	1.701E+02	1.439E+05	9.667E+00	3.840E+01	5.755E+04	3.867E+00
2134	1.634E+02	1.382E+05	9.288E+00	3.689E+01	5.530E+04	3.715E+00
2135	1.570E+02	1.328E+05	8.924E+00	3.544E+01	5.313E+04	3.570E+00
2136	1.509E+02	1.276E+05	8.574E+00	3.405E+01	5.104E+04	3.430E+00
2137	1.449E+02	1.226E+05	8.238E+00	3.272E+01	4.904E+04	3.295E+00
2138	1.393E+02	1.178E+05	7.915E+00	3.144E+01	4.712E+04	3.166E+00
2139	1.338E+02	1.132E+05	7.605E+00	3.020E+01	4.527E+04	3.042E+00
2140	1.285E+02	1.087E+05	7.307E+00	2.902E+01	4.350E+04	2.923E+00
2141	1.235E+02	1.045E+05	7.020E+00	2.788E+01	4.179E+04	2.808E+00
2142	1.187E+02	1.004E+05	6.745E+00	2.679E+01	4.015E+04	2.698E+00
2143	1.140E+02	9.645E+04	6.480E+00	2.574E+01	3.858E+04	2.592E+00
2144	1.095E+02	9.267E+04	6.226E+00	2.473E+01	3.707E+04	2.490E+00
2145	1.052E+02	8.903E+04	5.982E+00	2.376E+01	3.561E+04	2.393E+00
2146	1.011E+02	8.554E+04	5.748E+00	2.283E+01	3.422E+04	2.299E+00
2147	9.715E+01	8.219E+04	5.522E+00	2.193E+01	3.287E+04	2.209E+00
2148	9.334E+01	7.896E+04	5.306E+00	2.107E+01	3.159E+04	2.122E+00
2149	8.968E+01	7.587E+04	5.098E+00	2.025E+01	3.035E+04	2.039E+00
2150	8.617E+01	7.289E+04	4.898E+00	1.945E+01	2.916E+04	1.959E+00
2151	8.279E+01	7.004E+04	4.706E+00	1.869E+01	2.801E+04	1.882E+00
2152	7.954E+01	6.729E+04	4.521E+00	1.796E+01	2.692E+04	1.808E+00
2153	7.642E+01	6.465E+04	4.344E+00	1.725E+01	2.586E+04	1.738E+00
2154	7.343E+01	6.212E+04	4.174E+00	1.658E+01	2.485E+04	1.669E+00
2155	7.055E+01	5.968E+04	4.010E+00	1.593E+01	2.387E+04	1.604E+00
2156	6.778E+01	5.734E+04	3.853E+00	1.530E+01	2.294E+04	1.541E+00

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2016	0	0	0	0	0	0
2017	9.665E+02	5.280E+05	3.547E+01	5.376E+00	3.793E+03	2.548E-01
2018	1.895E+03	1.035E+06	6.956E+01	1.054E+01	7.437E+03	4.997E-01
2019	2.787E+03	1.523E+06	1.023E+02	1.550E+01	1.094E+04	7.349E-01
2020	3.644E+03	1.991E+06	1.338E+02	2.027E+01	1.430E+04	9.609E-01
2021	4.468E+03	2.441E+06	1.640E+02	2.485E+01	1.753E+04	1.178E+00
2022	5.259E+03	2.873E+06	1.930E+02	2.925E+01	2.064E+04	1.387E+00
2023	6.019E+03	3.288E+06	2.209E+02	3.348E+01	2.362E+04	1.587E+00
2024	6.750E+03	3.687E+06	2.478E+02	3.755E+01	2.649E+04	1.780E+00
2025	7.452E+03	4.071E+06	2.735E+02	4.145E+01	2.924E+04	1.965E+00
2026	8.126E+03	4.439E+06	2.983E+02	4.520E+01	3.189E+04	2.143E+00
2027	8.774E+03	4.793E+06	3.220E+02	4.880E+01	3.443E+04	2.313E+00
2028	9.396E+03	5.133E+06	3.449E+02	5.227E+01	3.687E+04	2.477E+00
2029	9.994E+03	5.460E+06	3.668E+02	5.559E+01	3.922E+04	2.635E+00
2030	9.728E+03	5.314E+06	3.571E+02	5.411E+01	3.817E+04	2.565E+00
2031	9.347E+03	5.106E+06	3.431E+02	5.199E+01	3.668E+04	2.464E+00
2032	8.980E+03	4.906E+06	3.296E+02	4.995E+01	3.524E+04	2.368E+00
2033	8.628E+03	4.713E+06	3.167E+02	4.799E+01	3.386E+04	2.275E+00
2034	8.290E+03	4.529E+06	3.043E+02	4.611E+01	3.253E+04	2.186E+00
2035	7.965E+03	4.351E+06	2.923E+02	4.430E+01	3.126E+04	2.100E+00
2036	7.652E+03	4.180E+06	2.809E+02	4.257E+01	3.003E+04	2.018E+00
2037	7.352E+03	4.017E+06	2.699E+02	4.090E+01	2.885E+04	1.939E+00
2038	7.064E+03	3.859E+06	2.593E+02	3.929E+01	2.772E+04	1.863E+00
2039	6.787E+03	3.708E+06	2.491E+02	3.775E+01	2.663E+04	1.790E+00
2040	6.521E+03	3.562E+06	2.394E+02	3.627E+01	2.559E+04	1.719E+00
2041	6.265E+03	3.423E+06	2.300E+02	3.485E+01	2.459E+04	1.652E+00
2042	6.020E+03	3.288E+06	2.210E+02	3.348E+01	2.362E+04	1.587E+00
2043	5.783E+03	3.160E+06	2.123E+02	3.217E+01	2.270E+04	1.525E+00
2044	5.557E+03	3.036E+06	2.040E+02	3.091E+01	2.181E+04	1.465E+00
2045	5.339E+03	2.917E+06	1.960E+02	2.970E+01	2.095E+04	1.408E+00
2046	5.129E+03	2.802E+06	1.883E+02	2.853E+01	2.013E+04	1.352E+00
2047	4.928E+03	2.692E+06	1.809E+02	2.741E+01	1.934E+04	1.299E+00
2048	4.735E+03	2.587E+06	1.738E+02	2.634E+01	1.858E+04	1.249E+00
2049	4.549E+03	2.485E+06	1.670E+02	2.531E+01	1.785E+04	1.200E+00
2050	4.371E+03	2.388E+06	1.604E+02	2.431E+01	1.715E+04	1.153E+00
2051	4.200E+03	2.294E+06	1.542E+02	2.336E+01	1.648E+04	1.107E+00
2052	4.035E+03	2.204E+06	1.481E+02	2.244E+01	1.583E+04	1.064E+00
2053	3.877E+03	2.118E+06	1.423E+02	2.156E+01	1.521E+04	1.022E+00
2054	3.725E+03	2.035E+06	1.367E+02	2.072E+01	1.462E+04	9.821E-01
2055	3.579E+03	1.955E+06	1.314E+02	1.991E+01	1.404E+04	9.436E-01
2056	3.438E+03	1.878E+06	1.262E+02	1.913E+01	1.349E+04	9.066E-01
2057	3.304E+03	1.805E+06	1.213E+02	1.838E+01	1.296E+04	8.711E-01
2058	3.174E+03	1.734E+06	1.165E+02	1.766E+01	1.246E+04	8.369E-01
2059	3.050E+03	1.666E+06	1.119E+02	1.696E+01	1.197E+04	8.041E-01
2060	2.930E+03	1.601E+06	1.075E+02	1.630E+01	1.150E+04	7.726E-01
2061	2.815E+03	1.538E+06	1.033E+02	1.566E+01	1.105E+04	7.423E-01
2062	2.705E+03	1.478E+06	9.928E+01	1.505E+01	1.061E+04	7.132E-01
2063	2.599E+03	1.420E+06	9.539E+01	1.446E+01	1.020E+04	6.852E-01
2064	2.497E+03	1.364E+06	9.165E+01	1.389E+01	9.798E+03	6.583E-01
2065	2.399E+03	1.311E+06	8.805E+01	1.334E+01	9.414E+03	6.325E-01

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2066	2.305E+03	1.259E+06	8.460E+01	1.282E+01	9.045E+03	6.077E-01
2067	2.214E+03	1.210E+06	8.128E+01	1.232E+01	8.690E+03	5.839E-01
2068	2.128E+03	1.162E+06	7.810E+01	1.184E+01	8.349E+03	5.610E-01
2069	2.044E+03	1.117E+06	7.503E+01	1.137E+01	8.022E+03	5.390E-01
2070	1.964E+03	1.073E+06	7.209E+01	1.093E+01	7.707E+03	5.179E-01
2071	1.887E+03	1.031E+06	6.926E+01	1.050E+01	7.405E+03	4.976E-01
2072	1.813E+03	9.905E+05	6.655E+01	1.009E+01	7.115E+03	4.780E-01
2073	1.742E+03	9.516E+05	6.394E+01	9.690E+00	6.836E+03	4.593E-01
2074	1.674E+03	9.143E+05	6.143E+01	9.310E+00	6.568E+03	4.413E-01
2075	1.608E+03	8.785E+05	5.902E+01	8.945E+00	6.310E+03	4.240E-01
2076	1.545E+03	8.440E+05	5.671E+01	8.594E+00	6.063E+03	4.074E-01
2077	1.484E+03	8.109E+05	5.449E+01	8.257E+00	5.825E+03	3.914E-01
2078	1.426E+03	7.791E+05	5.235E+01	7.933E+00	5.597E+03	3.760E-01
2079	1.370E+03	7.486E+05	5.030E+01	7.622E+00	5.377E+03	3.613E-01
2080	1.317E+03	7.192E+05	4.832E+01	7.323E+00	5.166E+03	3.471E-01
2081	1.265E+03	6.910E+05	4.643E+01	7.036E+00	4.964E+03	3.335E-01
2082	1.215E+03	6.639E+05	4.461E+01	6.760E+00	4.769E+03	3.204E-01
2083	1.168E+03	6.379E+05	4.286E+01	6.495E+00	4.582E+03	3.079E-01
2084	1.122E+03	6.129E+05	4.118E+01	6.241E+00	4.403E+03	2.958E-01
2085	1.078E+03	5.889E+05	3.956E+01	5.996E+00	4.230E+03	2.842E-01
2086	1.036E+03	5.658E+05	3.801E+01	5.761E+00	4.064E+03	2.731E-01
2087	9.950E+02	5.436E+05	3.652E+01	5.535E+00	3.905E+03	2.624E-01
2088	9.560E+02	5.223E+05	3.509E+01	5.318E+00	3.752E+03	2.521E-01
2089	9.185E+02	5.018E+05	3.371E+01	5.109E+00	3.604E+03	2.422E-01
2090	8.825E+02	4.821E+05	3.239E+01	4.909E+00	3.463E+03	2.327E-01
2091	8.479E+02	4.632E+05	3.112E+01	4.716E+00	3.327E+03	2.236E-01
2092	8.147E+02	4.450E+05	2.990E+01	4.532E+00	3.197E+03	2.148E-01
2093	7.827E+02	4.276E+05	2.873E+01	4.354E+00	3.072E+03	2.064E-01
2094	7.520E+02	4.108E+05	2.760E+01	4.183E+00	2.951E+03	1.983E-01
2095	7.225E+02	3.947E+05	2.652E+01	4.019E+00	2.835E+03	1.905E-01
2096	6.942E+02	3.792E+05	2.548E+01	3.862E+00	2.724E+03	1.830E-01
2097	6.670E+02	3.644E+05	2.448E+01	3.710E+00	2.617E+03	1.759E-01
2098	6.408E+02	3.501E+05	2.352E+01	3.565E+00	2.515E+03	1.690E-01
2099	6.157E+02	3.364E+05	2.260E+01	3.425E+00	2.416E+03	1.623E-01
2100	5.916E+02	3.232E+05	2.171E+01	3.291E+00	2.321E+03	1.560E-01
2101	5.684E+02	3.105E+05	2.086E+01	3.162E+00	2.230E+03	1.499E-01
2102	5.461E+02	2.983E+05	2.004E+01	3.038E+00	2.143E+03	1.440E-01
2103	5.247E+02	2.866E+05	1.926E+01	2.918E+00	2.059E+03	1.383E-01
2104	5.041E+02	2.754E+05	1.850E+01	2.804E+00	1.978E+03	1.329E-01
2105	4.843E+02	2.646E+05	1.778E+01	2.694E+00	1.901E+03	1.277E-01
2106	4.653E+02	2.542E+05	1.708E+01	2.588E+00	1.826E+03	1.227E-01
2107	4.471E+02	2.442E+05	1.641E+01	2.487E+00	1.754E+03	1.179E-01
2108	4.296E+02	2.347E+05	1.577E+01	2.389E+00	1.686E+03	1.133E-01
2109	4.127E+02	2.255E+05	1.515E+01	2.296E+00	1.620E+03	1.088E-01
2110	3.965E+02	2.166E+05	1.456E+01	2.206E+00	1.556E+03	1.046E-01
2111	3.810E+02	2.081E+05	1.398E+01	2.119E+00	1.495E+03	1.005E-01
2112	3.660E+02	2.000E+05	1.344E+01	2.036E+00	1.436E+03	9.652E-02
2113	3.517E+02	1.921E+05	1.291E+01	1.956E+00	1.380E+03	9.273E-02
2114	3.379E+02	1.846E+05	1.240E+01	1.880E+00	1.326E+03	8.909E-02
2115	3.247E+02	1.774E+05	1.192E+01	1.806E+00	1.274E+03	8.560E-02
2116	3.119E+02	1.704E+05	1.145E+01	1.735E+00	1.224E+03	8.225E-02

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2117	2.997E+02	1.637E+05	1.100E+01	1.667E+00	1.176E+03	7.902E-02
2118	2.879E+02	1.573E+05	1.057E+01	1.602E+00	1.130E+03	7.592E-02
2119	2.767E+02	1.511E+05	1.015E+01	1.539E+00	1.086E+03	7.294E-02
2120	2.658E+02	1.452E+05	9.757E+00	1.479E+00	1.043E+03	7.008E-02
2121	2.554E+02	1.395E+05	9.374E+00	1.421E+00	1.002E+03	6.734E-02
2122	2.454E+02	1.340E+05	9.006E+00	1.365E+00	9.629E+02	6.470E-02
2123	2.357E+02	1.288E+05	8.653E+00	1.311E+00	9.251E+02	6.216E-02
2124	2.265E+02	1.237E+05	8.314E+00	1.260E+00	8.889E+02	5.972E-02
2125	2.176E+02	1.189E+05	7.988E+00	1.211E+00	8.540E+02	5.738E-02
2126	2.091E+02	1.142E+05	7.675E+00	1.163E+00	8.205E+02	5.513E-02
2127	2.009E+02	1.097E+05	7.374E+00	1.117E+00	7.883E+02	5.297E-02
2128	1.930E+02	1.054E+05	7.085E+00	1.074E+00	7.574E+02	5.089E-02
2129	1.854E+02	1.013E+05	6.807E+00	1.032E+00	7.277E+02	4.890E-02
2130	1.782E+02	9.734E+04	6.540E+00	9.911E-01	6.992E+02	4.698E-02
2131	1.712E+02	9.352E+04	6.284E+00	9.522E-01	6.718E+02	4.514E-02
2132	1.645E+02	8.985E+04	6.037E+00	9.149E-01	6.454E+02	4.337E-02
2133	1.580E+02	8.633E+04	5.800E+00	8.790E-01	6.201E+02	4.167E-02
2134	1.518E+02	8.294E+04	5.573E+00	8.446E-01	5.958E+02	4.003E-02
2135	1.459E+02	7.969E+04	5.355E+00	8.114E-01	5.725E+02	3.846E-02
2136	1.402E+02	7.657E+04	5.145E+00	7.796E-01	5.500E+02	3.696E-02
2137	1.347E+02	7.357E+04	4.943E+00	7.491E-01	5.284E+02	3.551E-02
2138	1.294E+02	7.068E+04	4.749E+00	7.197E-01	5.077E+02	3.411E-02
2139	1.243E+02	6.791E+04	4.563E+00	6.915E-01	4.878E+02	3.278E-02
2140	1.194E+02	6.525E+04	4.384E+00	6.644E-01	4.687E+02	3.149E-02
2141	1.148E+02	6.269E+04	4.212E+00	6.383E-01	4.503E+02	3.026E-02
2142	1.103E+02	6.023E+04	4.047E+00	6.133E-01	4.327E+02	2.907E-02
2143	1.059E+02	5.787E+04	3.888E+00	5.892E-01	4.157E+02	2.793E-02
2144	1.018E+02	5.560E+04	3.736E+00	5.661E-01	3.994E+02	2.683E-02
2145	9.778E+01	5.342E+04	3.589E+00	5.439E-01	3.837E+02	2.578E-02
2146	9.395E+01	5.132E+04	3.449E+00	5.226E-01	3.687E+02	2.477E-02
2147	9.027E+01	4.931E+04	3.313E+00	5.021E-01	3.542E+02	2.380E-02
2148	8.673E+01	4.738E+04	3.183E+00	4.824E-01	3.403E+02	2.287E-02
2149	8.333E+01	4.552E+04	3.059E+00	4.635E-01	3.270E+02	2.197E-02
2150	8.006E+01	4.374E+04	2.939E+00	4.453E-01	3.142E+02	2.111E-02
2151	7.692E+01	4.202E+04	2.823E+00	4.279E-01	3.019E+02	2.028E-02
2152	7.390E+01	4.037E+04	2.713E+00	4.111E-01	2.900E+02	1.949E-02
2153	7.101E+01	3.879E+04	2.606E+00	3.950E-01	2.786E+02	1.872E-02
2154	6.822E+01	3.727E+04	2.504E+00	3.795E-01	2.677E+02	1.799E-02
2155	6.555E+01	3.581E+04	2.406E+00	3.646E-01	2.572E+02	1.728E-02
2156	6.298E+01	3.440E+04	2.312E+00	3.503E-01	2.471E+02	1.660E-02

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill
Reference Number: 002
Carroll Landfill

Proposed Uncontrolled Emissions Summary
LandGEM 3.02 Results
Inventory for Year 2029

Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							2428.34	609.86	2671.18
Carbon dioxide							9994.21	2509.96	10993.63
Non-Methane Organic Compounds (NMOC)							19.57	4.91	21.53
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0242	0.0061	0.0267	0.0242	0.0061	0.0267
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0699	0.0176	0.0769	0.0699	0.0176	0.0769			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0899	0.0226	0.0989	0.0899	0.0226	0.0989			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.0073	0.0018	0.0081	0.0073	0.0018	0.0081			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.0154	0.0039	0.0169	0.0154	0.0039	0.0169			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.0077	0.0019	0.0085	0.0077	0.0019	0.0085			
2-Propanol (isopropyl alcohol) - VOC	1.1375	0.2857	1.2513						
* Acetone							0.1539	0.0386	0.1693
Acrylonitrile - HAP/VOC	0.1265	0.0318	0.1392	0.1265	0.0318	0.1392			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0562	0.0141	0.0618	0.0562	0.0141	0.0618			
Bromodichloromethane - VOC	0.1922	0.0483	0.2114						
Butane - VOC	0.1100	0.0276	0.1210						
Carbon disulfide - HAP/VOC	0.0167	0.0042	0.0184	0.0167	0.0042	0.0184			
Carbon monoxide							1.4842	0.3727	1.6326
Carbon tetrachloride - HAP/VOC/ODC	0.0002	0.0001	0.0003	0.0002	0.0001	0.0003	0.0002	0.0001	0.0003
Carbonyl sulfide - HAP/VOC	0.01114	0.0028	0.0123	0.0111	0.0028	0.0123			
Chlorobenzene - HAP/VOC	0.01065	0.0027	0.0117	0.0107	0.0027	0.0117			
* Chlorodifluoromethane - HCFC-22							0.0425	0.0107	0.0468
Chloroethane (ethyl chloride) - HAP/VOC	0.0317	0.0080	0.0349	0.0317	0.0080	0.0349			
Chloroform - HAP/VOC	0.0014	0.0003	0.0015	0.0014	0.0003	0.0015			
Chloromethane (methyl chloride) - HAP/VOC	0.0229	0.0058	0.0252	0.0229	0.0058	0.0252			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.0117	0.0029	0.0129	0.0117	0.0029	0.0129			
* Dichlorodifluoromethane - CFC-12							0.7322	0.1839	0.8054
Dichlorofluoromethane - VOC/HCFC-21	0.1013	0.0254	0.1114				0.1013	0.0254	0.1114
* Dichloromethane (methylene chloride) - HAP				0.4501	0.1130	0.4951			
Dimethyl sulfide (methyl sulfide) - VOC	0.1834	0.0461	0.2018						
* Ethane							10.13	2.54	11.14
Ethanol - VOC	0.4709	0.1183	0.5180						
Ethyl mercaptan (ethanethiol) - VOC	0.0541	0.0136	0.0595						
Ethylbenzene - HAP/VOC	0.1848	0.0464	0.2033	0.1848	0.0464	0.2033			
Ethylene dibromide - HAP/VOC	0.00007	0.00002	0.00008	0.00007	0.00002	0.00008			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.0395	0.0099	0.0435
Hexane - HAP/VOC	0.2153	0.0541	0.2368	0.2153	0.0541	0.2368			
Hydrogen sulfide							55.5933	13.9618	61.1527
Mercury (total) - HAP				2.20E-05	5.53E-06	2.42E-05			
Methyl ethyl ketone - HAP/VOC	0.1938	0.0487	0.2132	0.1938	0.0487	0.2132			
Methyl isobutyl ketone - HAP/VOC	0.0720	0.0181	0.0792	0.0720	0.0181	0.0792			
Methyl mercaptan - VOC	0.0455	0.0114	0.0501						
Pentane - VOC	0.0901	0.0226	0.0991						
* Perchloroethylene (tetrachloroethylene) - HAP				0.2322	0.0583	0.2554			
Propane - VOC	0.1836	0.0461	0.2019						
* t-1,2-Dichloroethene							0.1027	0.0258	0.1130
Toluene - No or Unknown Co-disposal - HAP/VOC	1.3599	0.3415	1.4959	1.3599	0.3415	1.4959			
Trichloroethylene (trichloroethene) - HAP/VOC	0.1393	0.0350	0.1532	0.1393	0.0350	0.1532			
Vinyl chloride - HAP/VOC	0.1727	0.0434	0.1900	0.1727	0.0434	0.1900			
Xylenes - HAP/VOC	0.4822	0.1211	0.5304	0.4822	0.1211	0.5304			
TOTALS	5.87	1.47	6.45	4.01	1.01	4.41	12510.53	3141.91	13761.58

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.
[2] Emission Rate in lbs/hr is based on 8,760 hours per year
ODC = Classified ozone depleting chemical (SUM = 0.9400 Mg/yr, 0.2361 lbs/hr, 1.0340 TPY)
* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Existing Jones-Carroll Landfill
and Proposed Carroll Landfill
Controlled Emissions
for 2029

SUBJECT Calculate Controlled H_2S Emissions in year 2029

DAILY COVER

Knowns (from AutoCAD):

- 2D Total Area = 72,316.70 ft² = 1.66 acres
- 2D Flat Top Area @ approx. 2.2% Slope = 28,238.54 ft²

Calculated:

- 2D Sideslope Area @ approx. 33.3% slope
  = Total Area − Flat Top Area
  = 72,316.70 − 28,238.54
  = 44,078.16 ft²
- 3D Daily Cover Area = Flat Top Slope (2D Flat Top Area) + Sideslope Slope (2D Sideslope Area)
  = 1.022 (28,238.54) + 1.333 (44,078.16)
  = 87,615.975 ft²

INTERMEDIATE COVER

Knowns (from AutoCAD):

- 2D Area of intermediate + daily cover = 622,744.45 ft²
- 2D Road Area @ approx 10% slope = 73,571.61 ft²
- 2D Area of Flat Top @ approx. 2.2% Slope = 24,871.05 ft²

Calculated:

- 2D Total Area = 2D Area of intermediate + daily cover − 2D Total Area of daily cover
  = 622,744.45 − 72,316.70
  = 550,427.75 ft² = 12.64 acres
- 2D Sideslope Area @ approx. 33.3% Slope
  = Total Area − Road Area − Flat Top Area
  = 550,427.75 − 73,571.61 − 24,871.05 = 451,985.09 ft²

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SUBJECT Calculate Controlled H_2S Emissions in Year 2029, CONT.

- 3D Intermediate Cover Area =
  Sideslope Slope (2D Sideslope Area)
  + Road Slope (2D Road Area)
  + Flat Top Slope (Flat Top Area)
  = 1.333(451,985.09) + 1.10 (73,571.61)
  + 1.022 (24,871.05)
  = 708,843.11 ft²

FINAL COVER

Knowns (from AutoCAD):

- 2D Area of Limit of Waste (LOW) = 1,520,804.18 ft²

Calculated

- 2D Total Final Cover Area = Area of LOW
  − Area of Intermediate Cover
  − Area of Daily cover
  = 1,520,804.18 − 550,427.75 − 72,316.70
  = 898,059.73 ft² = 20.62 acres

- 3D Final Cover Area (all @ approx 33.3% slope)
  = 1.333 (898,059.73)
  = 1,197,113.62 ft²

TOTAL 3D Landfill Area = 3D Daily Cover Area + 3D Intermediate Cover Area + 3D Final Cover Area
= 87,615.975 + 708,843.11 + 1,197,113.62
= 1,993,572.71 ft² = 45.77 acres

LFG Collection Efficiency by Cover Type

From Table HH-3 in 40 CFR 98.348 Mandatory GHG Reporting Rule for Municipal Solid Waste Landfills (October 30, 2009)

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SUBJECT Calculate Controlled H_2S Emissions in Year 2029, CONT.

Cover Type	LFG Collection Efficiency
Daily Cover (A3)	60%
Intermediate Cover (A4)	75%
Final Cover	95%

→ Average LFG Collection Efficiency:

$$\frac{[(\text{Daily Cover Area})(\text{Daily cover efficiency}) + (\text{Intermediate cover Area})(\text{Intermediate Cover Efficiency}) + (\text{Final Cover Area})(\text{Final Cover Efficiency})]}{\text{TOTAL AREA}}$$

$$= \frac{(87{,}615.975)(0.6) + (708{,}843.11)(0.75) + (1{,}197{,}113.62)(0.95)}{1{,}993{,}572.71}$$

= 86.35% ✓

→ Uncontrolled H_2S Emissions from 2029 = 61.71 TPY ✓
(year of maximum emissions)

→ Maximum Fugitive H_2S Emissions:

• Diffusive Reduction through the cover system = 75%

∴ = (Uncontrolled H_2S Emissions)(1 - Average LFG collection Efficiency)(1 - diffusive reduction)

= (61.71)(1 - 0.8635)(1 - 0.75)

= 2.11 TPY ✓

→ Maximum Point Source H_2S Emissions:

= (Uncontrolled Emissions)(Average LFG Collection Efficiency)(1 - SulfaTreat Removal Efficiency)

= (61.71)(0.8635)(1 - 0.99925)

= 0.04 TPY ✓

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SUBJECT Landfill Methane Oxidation Factors for Proposed Controlled Emissions

FIND: Determine the appropriate oxidation factor for use in fugitive Landfill emissions calculations in 2029

Solution: Use Table HH-4 in 40 CFR 98.348

→ $MF = \frac{K \times G_{CH_4}}{SA}$

where: MF = methane flux rate from the given reporting year, $g/m^2/d$

K = unit conversion factor = $10^6/365$ g/ton/yr

G_{CH_4} = Modeled generation rate in the given year, metric ton

SA = Surface area of landfill in the given year, m^2

→ In the year of maximum emissions, 2029

G_{CH_4} = Proposed PTE CH_4 + Existing PTE CH_4

$= (3,329 \text{ TPY} + 30.3 \text{ TPY})\left(\frac{0.91 \text{ metric ton}}{\text{US short ton}}\right)$

= 3,057 metric ton ✓

→ In the year of maximum emissions, 2029

$SA = 45.77 \text{ acres (3D area)} \times \frac{4047 \ m^2}{\text{acre}}$

$= 185,231 \ m^2$ ✓

→ $MF = \frac{\left(\frac{10^6}{365}\right)(3,057)}{185,231} = 45.2 \ g/m^2/d > 10 \ g/m^2/d$ but $< 70 \ g/m^2/d$ ✓

→ In 2029, the majority of the landfilled area (61%) will be under final cover. Final cover includes soil layers > 24" in thickness.

∴ → Per Table HH-4 oxidation factor = 25% (C6) ✓

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill — **Existing Controlled Emissions Summary**

Reference Number: 001 — LandGEM 3.02 Results * [(86.35% collection efficiency) + (1-86.35%)*(1-25% oxidation factor)]

Carroll Landfill Expansion Application — Inventory for Year 2029

Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							21.38	5.37	23.52
Carbon dioxide							88.00	22.10	96.80
Non-Methane Organic Compounds (NMOC)							0.17232	0.04328	0.18955
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.00021	0.00005	0.00023	0.00021	0.00005	0.00023
1,1,2,2-Tetrachloroethane - HAP/VOC	0.00062	0.00015	0.00068	0.00062	0.00015	0.00068			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.00079	0.00020	0.00087	0.00079	0.00020	0.00087			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.00006	0.00002	0.00007	0.00006	0.00002	0.00007			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.00014	0.00003	0.00015	0.00014	0.00003	0.00015			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.00007	0.00002	0.00007	0.00007	0.00002	0.00007			
2-Propanol (isopropyl alcohol) - VOC	0.01002	0.00252	0.01102						
* Acetone							0.00135	0.00034	0.00149
Acrylonitrile - HAP/VOC	0.00111	0.00028	0.00123	0.00111	0.00028	0.00123			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.00049	0.00012	0.00054	0.00049	0.00012	0.00054			
Bromodichloromethane - VOC	0.00169	0.00043	0.00186						
Butane - VOC	0.00097	0.00024	0.00107						
Carbon disulfide - HAP/VOC	0.00015	0.00004	0.00016	0.00015	0.00004	0.00016			
Carbon monoxide							0.01307	0.00328	0.01438
Carbon tetrachloride - HAP/VOC/ODC	0.000002	0.000001	0.000002	0.000002	0.000001	0.000002	0.000002	0.000001	0.000002
Carbonyl sulfide - HAP/VOC	0.00010	0.00002	0.00011	0.00010	0.00002	0.00011			
Chlorobenzene - HAP/VOC	0.00009	0.00002	0.00010	0.00009	0.00002	0.00010			
* Chlorodifluoromethane - HCFC-22							0.00037	0.00009	0.00041
Chloroethane (ethyl chloride) - HAP/VOC	0.00028	0.00007	0.00031	0.00028	0.00007	0.00031			
Chloroform - HAP/VOC	0.00001	0.00000	0.00001	0.00001	0.00000	0.00001			
Chloromethane (methyl chloride) - HAP/VOC	0.00020	0.00005	0.00022	0.00020	0.00005	0.00022			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.00010	0.00003	0.00011	0.00010	0.00003	0.00011			
* Dichlorodifluoromethane - CFC-12							0.00645	0.00162	0.00709
Dichlorofluoromethane - VOC/HCFC-21	0.00089	0.00022	0.00098				0.00089	0.00022	0.00098
* Dichloromethane (methylene chloride) - HAP				0.00396	0.00100	0.00436			
Dimethyl sulfide (methyl sulfide) - VOC	0.00162	0.00041	0.00178						
* Ethane	0.00000	0.00000	0.00000				0.08919	0.02240	0.09811
Ethanol - VOC	0.00415	0.00104	0.00456						
Ethyl mercaptan (ethanethiol) - VOC	0.00048	0.00012	0.00052						
Ethylbenzene - HAP/VOC	0.00163	0.00041	0.00179	0.00163	0.00041	0.00179			
Ethylene dibromide - HAP/VOC	0.000001	0.000000	0.000001	0.000001	0.000000	0.000001			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.00035	0.00009	0.00038
Hexane - HAP/VOC	0.00190	0.00048	0.00209	0.00190	0.00048	0.00209			
Hydrogen sulfide[3]							0.01762	0.00443	0.01938
Mercury (total) - HAP				0.0000002	0.0000000	0.0000002			
Methyl ethyl ketone - HAP/VOC	0.00171	0.00043	0.00188	0.00171	0.00043	0.00188			
Methyl isobutyl ketone - HAP/VOC	0.00063	0.00016	0.00070	0.00063	0.00016	0.00070			
Methyl mercaptan - VOC	0.00040	0.00010	0.00044						
Pentane - VOC	0.00079	0.00020	0.00087						
* Perchloroethylene (tetrachloroethylene) - HAP				0.00204	0.00051	0.00225			
Propane - VOC	0.00162	0.00041	0.00178						
* t-1,2-Dichloroethene							0.00090	0.00023	0.00100
Toluene - No or Unknown Co-disposal - HAP/VOC	0.01197	0.00301	0.01317	0.01197	0.00301	0.01317			
Trichloroethylene (trichloroethene) - HAP/VOC	0.00123	0.00031	0.00135	0.00123	0.00031	0.00135			
Vinyl chloride - HAP/VOC	0.00152	0.00038	0.00167	0.00152	0.00038	0.00167			
Xylenes - HAP/VOC	0.00425	0.00107	0.00467	0.00425	0.00107	0.00467			
TOTALS	0.05	0.01	0.06	0.04	0.01	0.04	109.68	27.55	120.65

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.

[2] Emission Rate in lbs/hr is based on 8,760 hours per year

ODC = Classified ozone depleting chemical (SUM = 0.0083 Mg/yr, 0.0021 lbs/hr, 0.0091 TPY)

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

[3]Calculation of controlled H2S = Uncontrolled emissions*[(86.35% collection efficiency*(1-0.99925% SulfaTreat removal efficiency))+(1-86.35%)*(1-75% Diffusive reduction factor)]

Appendix A
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill | **Proposed Controlled Emissions Summary**
Reference Number: 002 | LandGEM 3.02 Results * [(86.35% collection efficiency) + (1-86.35%)*(1-25% oxidation factor)]
Carroll Landfill | Inventory for Year 2029

Pollutant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
* Methane							2345.48	589.05	2580.03
Carbon dioxide							9653.16	2424.31	10618.48
Non-Methane Organic Compounds (NMOC)							18.90	4.75	20.79
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0234	0.0059	0.0258	0.0234	0.0059	0.0258
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0675	0.0170	0.0742	0.0675	0.0170	0.0742			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0868	0.0218	0.0955	0.0868	0.0218	0.0955			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.0071	0.0018	0.0078	0.0071	0.0018	0.0078			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.0148	0.0037	0.0163	0.0148	0.0037	0.0163			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.0074	0.0019	0.0082	0.0074	0.0019	0.0082			
2-Propanol (isopropyl alcohol) - VOC	1.0987	0.2759	1.2086						
* Acetone							0.1486	0.0373	0.1635
Acrylonitrile - HAP/VOC	0.1222	0.0307	0.1344	0.1222	0.0307	0.1344			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0543	0.0136	0.0597	0.0543	0.0136	0.0597			
Bromodichloromethane - VOC	0.1857	0.0466	0.2042						
Butane - VOC	0.1062	0.0267	0.1169						
Carbon disulfide - HAP/VOC	0.0161	0.0041	0.0178	0.0161	0.0041	0.0178			
Carbon monoxide							1.4335	0.3600	1.5769
Carbon tetrachloride - HAP/VOC/ODC	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002
Carbonyl sulfide - HAP/VOC	0.0108	0.0027	0.0118	0.0108	0.0027	0.0118			
Chlorobenzene - HAP/VOC	0.0103	0.0026	0.0113	0.0103	0.0026	0.0113			
* Chlorodifluoromethane - HCFC-22							0.0411	0.0103	0.0452
Chloroethane (ethyl chloride) - HAP/VOC	0.0307	0.0077	0.0337	0.0307	0.0077	0.0337			
Chloroform - HAP/VOC	0.0013	0.0003	0.0014	0.0013	0.0003	0.0014			
Chloromethane (methyl chloride) - HAP/VOC	0.0221	0.0056	0.0244	0.0221	0.0056	0.0244			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.0113	0.0028	0.0124	0.0113	0.0028	0.0124			
* Dichlorodifluoromethane - CFC-12							0.7072	0.1776	0.7779
Dichlorofluoromethane - VOC/HCFC-21	0.0978	0.0246	0.1076				0.0978	0.0246	0.1076
* Dichloromethane (methylene chloride) - HAP				0.4347	0.1092	0.4782			
Dimethyl sulfide (methyl sulfide) - VOC	0.1772	0.0445	0.1949						
* Ethane							9.7834	2.4570	10.7618
Ethanol - VOC	0.4548	0.1142	0.5003						
Ethyl mercaptan (ethanethiol) - VOC	0.0522	0.0131	0.0575						
Ethylbenzene - HAP/VOC	0.1785	0.0448	0.1964	0.1785	0.0448	0.1964			
Ethylene dibromide - HAP/VOC	0.0001	0.0000	0.0001	0.0001	0.0000	0.0001			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.0382	0.0096	0.0420
Hexane - HAP/VOC	0.2079	0.0522	0.2287	0.2079	0.0522	0.2287			
Hydrogen sulfide[3]							1.93313	0.48549	2.12644
Mercury (total) - HAP				2.13E-05	5.34E-06	2.34E-05			
Methyl ethyl ketone - HAP/VOC	0.1872	0.0470	0.2059	0.1872	0.0470	0.2059			
Methyl isobutyl ketone - HAP/VOC	0.0696	0.0175	0.0765	0.0696	0.0175	0.0765			
Methyl mercaptan - VOC	0.0440	0.0110	0.0484						
Pentane - VOC	0.0870	0.0219	0.0957						
* Perchloroethylene (tetrachloroethylene) - HAP				0.2243	0.0563	0.2467			
Propane - VOC	0.1773	0.0445	0.1950						
* t-1,2-Dichloroethene							0.0992	0.0249	0.1091
Toluene - No or Unknown Co-disposal - HAP/VOC	1.3135	0.3299	1.4449	1.3135	0.3299	1.4449			
Trichloroethylene (trichloroethene) - HAP/VOC	0.1345	0.0338	0.1479	0.1345	0.0338	0.1479			
Vinyl chloride - HAP/VOC	0.1668	0.0419	0.1835	0.1668	0.0419	0.1835			
Xylenes - HAP/VOC	0.4657	0.1170	0.5123	0.4657	0.1170	0.5123			
TOTALS	5.67	1.42	6.23	3.87	0.97	4.26	12083.61	3034.70	13291.97

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 defaults (Inventory conventional - No or Unknown Co-disposal) with the exception of hydrogen sulfide concentration as detailed in the supporting text.

[2] Emission Rate in lbs/hr is based on 8,760 hours per year

ODC = Classified ozone depleting chemical (SUM = 0.9079 Mg/yr, 0.2280 lbs/hr, 0.9987 TPY)

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

[3]Calculation of controlled H2S = Uncontrolled landfill emissions*[(86.35% collection efficiency*(1-0.99925% SulfaTreat removal efficiency))+(1-86.35%)*(1-75% Diffusive reduction factor

Insert SulfaTreat Brochure here. File protection will not allow me to insert the pdf into this file. Brochure can be found at Q:\Sealand\02-0104 Carroll Landfill\Engineering Report\LFG Collection & Control System\SulfaTreat Vendor Performance sheets\sulfatreat_10881.pdf

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A Schlumberger Company

SulfaTreat - A Business Unit of M-I L.L.C. - 17998 Chesterfield Airport Road - Suite 215 - Chesterfield - Missouri - 63005 - USA
Tel: 636-532-2189 - Toll Free: 800-726-7687 - Fax: 636-532-2764 - info@sulfatreat.com

DATE: Nov 08, 2013

SULFATREAT ESTIMATED PERFORMANCE SHEET ('EPS')

CUSTOMER INFORMATION

Company:	Daigler Eng		
Lease Name:	Carroll Landfill		
Contact:	Bethany Acquisto	**Lease City:**	na
Phone:	716-773-6872 X 201	**Lease State:**	NY
Fax:		**Lease Country:**	United States

OPERATING CONDITIONS

Gas Flow Rate (cfm):	250	**Gas Pressure ("wc):**	0.0
Inlet H2S (ppm):	4,000.0	**Gas Temperature (F):**	100.0
Max. Outlet H2S (ppm):	3.0	**Water Saturation:**	100%
CO2 (Mole %):	40.0	**O2 (Mole %):**	0.00

REACTOR INFORMATION AND CONFIGURATION

Total Number Of Vessels:	2	**Dimensions (ft x ft):**	8.00 x 40.00
System Design*:	LeadLag	**Bed Height (ft):**	6.0
Estimated Pressure Drop ("wc):	2.69	**Min. S/S Height (ft):**	10.0
		Vessel Loading (lbs):	120,000.3

*Vessels are in trains of two

PREDICTED RESULTS		PRICE ESTIMATES	
Days to Max. Outlet H2S:	213**	**Product Selection:**	EST-2242
Sulfur Removed (lbs):	27,465	**Product Price (USD/ lb):**	1.35
Sulfur Removed (lbs/day):	129.1	**Product Cost/Vessel (USD):**	162,000
Gas Volume Produced (MMScf):	76.59	**Cost/Mcf(USD):**	2.1153
Gas Velocity (ft/min):	0.82	**Cost/lb Sulfur Removed (USD):**	5.90

NOTES & SPECIAL CONDITIONS

Application County:	na	**Contact Email:**	

**Change one of the two vessels and reverse vessel sequence

ASK ABOUT OUR PRODUCT WARRANTY

Any Questions? Call Mike Civili at 800-726-7687 or 636-532-2189

SulfaTreat - A Business Unit of M-I L.L.C. - 17998 Chesterfield Airport Road - Suite 215 - Chesterfield - Missouri - 63005 - USA
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DATE: Nov 08, 2013

SULFATREAT ESTIMATED PERFORMANCE SHEET ('EPS')

CUSTOMER INFORMATION

Company:	Daigler Eng		
Lease Name:	Carroll Landfill		
Contact:	Bethany Acquisto	**Lease City:**	na
Phone:	716-773-6872 X 201	**Lease State:**	NY
Fax:		**Lease Country:**	United States

OPERATING CONDITIONS

Gas Flow Rate (cfm):	800	**Gas Pressure ("wc):**	0.0
Inlet H2S (ppm):	4,000.0	**Gas Temperature (F):**	100.0
Max. Outlet H2S (ppm):	3.0	**Water Saturation:**	100%
CO2 (Mole %):	40.0	**O2 (Mole %):**	0.00

REACTOR INFORMATION AND CONFIGURATION

Total Number Of Vessels:	4	**Dimensions (ft x ft):**	8.00 x 40.00
System Design*:	LeadLag	**Bed Height (ft):**	6.0
Estimated Pressure Drop ("wc):	4.30	**Min. S/S Height (ft):**	10.0
		Vessel Loading (lbs):	120,000.3

*Vessels are in trains of two

PREDICTED RESULTS		PRICE ESTIMATES	
Days to Max. Outlet H2S:	133**	**Product Selection:**	EST-2242
Sulfur Removed (lbs):	54,930	**Product Price (USD/ lb):**	1.35
Sulfur Removed (lbs/day):	413.1	**Product Cost/Vessel (USD):**	162,000
Gas Volume Produced (MMScf):	153.17	**Cost/Mcf(USD):**	2.1153
Gas Velocity (ft/min):	1.31	**Cost/lb Sulfur Removed (USD):**	5.90

NOTES & SPECIAL CONDITIONS

Application County:	na	**Contact Email:**	

**Change one of the two vessels and reverse vessel sequence

ASK ABOUT OUR PRODUCT WARRANTY

Any Questions? Call Mike Civili at 800-726-7687 or 636-532-2189

SULFATREAT 410XHP (EST-2242)

SULFATREAT 410XHP is low pressure drop, high capacity, iron oxide adsorbent, providing predictable and reliable results for the removal of Hydrogen Sulfide from water saturated gas, with or without oxygen.

SULFATREAT 410XHP is a non-hazardous granular material engineered for the removal of hydrogen sulfide (H_2S) from gas streams. During the adsorption process, water saturated gas or vapor flows down through the SULFATREAT 410XHP in the vessel's bed. Hydrogen sulfide chemically reacts to form a stable and safe byproduct. Product consumption is dependent only on the amount of hydrogen sulfide that actually passes through the bed. This economically matches the need for H_2S removal with variations in system flow conditions and outlet specifications, regardless of the total volume or other common components of the gas. Upstream of the SULFATREAT 410XHP vessel(s), the installation requires an inlet separator to remove free liquids from the gas. Equipment may also include a water injection system to saturate the inlet gas.

Typical Physical Properties

Appearance....................Black, odorless

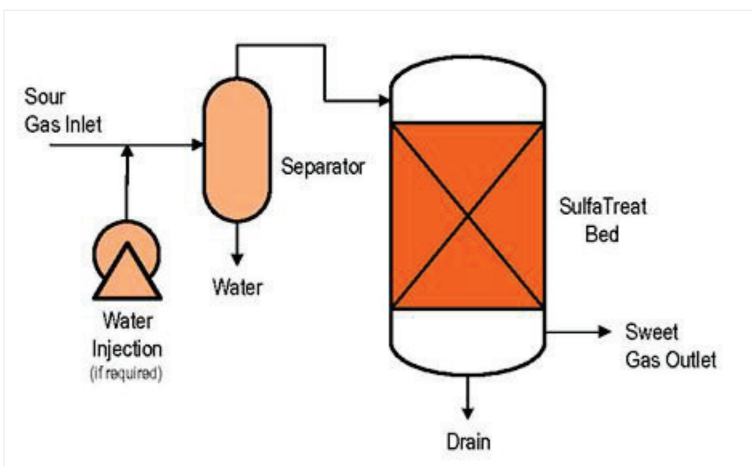
Form....................Graunular (4 to 10 mesh)

Composition....................Proprietary

Packing density, kg/l (lb/ft^3)....................0.94 - 1.04 (58.7 – 64.9)

Features

- Reliable, predictable performance
- Operating flexibility
- Cost-effective hydrogen sulfide removal
- Predictable, consistent pressure drop
- Simple vessel change outs
- Straight-forward disposal of spent media



Packaging

SULFATREAT 410XHP is available 2,000-lb (907-kg) bulk bags. Full truckload orders of 40,000 lb (18,144 kg) and 20-ft (6.0-m) overseas containers are shipped from the main warehouse near St. Louis, Missouri.

Less-than-truckload orders may be shipped from conveniently located warehouses throughout the United States and Canada.

Handling and Disposal

SULFATREAT 410XHP is an iron oxide absorbent. Such materials can be handled safely provided that proper safety procedures, such as permit-to-work systems, and risk assessments, such as a Job Safety Analysis, chemical-handling assessments, lifting studies and applicable disposal regulations, are followed. It is recommended that an experienced contractor be engaged for product loading and discharge.

SULFATREAT 410XHP is environmentally safe and environmentally non-hazardous in its unreacted and reacted forms. Follow all federal, state and local regulations for disposal and handling.

Please refer to the relevant Material Safety Data Sheet for further information.

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A Schlumberger Company

U.S.A.
17998 Chesterfield Airport Road
Suite 215, Chesterfield, MO 63005
Toll-Free: 1 800 726 7687

Europe
Aberdeen, UK
Tel: +44 1224 285500

Asia Pacific
Kuala Lumpur, Malaysia
Tel: + 603 2161 7655

www.miswaco.slb.com
Email: questions@miswaco.slb.com

APPENDIX B

Calculation of Fugitive Particulate Emissions from Facility Operations

(Emission Point 03)

Calculation of Fugitive Particulate Emissions from Landfill Operations (Emission Point 03)

Landfill operations including activities such as use of heavy equipment on unpaved roads, waste deposition, and movement/handling of soil, generate fugitive particulate emissions. The hourly and annual loading of fugitive particulate emissions from landfill operations are estimated below for a "worst-case" year during which the majority of the site is being utilized. Figure B-1 illustrates the activity onsite.

Fugitive particulate matter sources are separated into line sources and area sources. Line sources are detailed in Section A. Fugitive Particulates for Unpaved Roads. Area sources include four main activities. Section B details fugitive emissions from general landfill operations occurring in the active landfilling area. Sections C and D detail fugitive emissions from liner construction and borrow/fill areas, respectively. Finally, Section E details fugitive emissions from C&D Processing Operations.

Annual Operating Hours

- Proposed Hours of Operation: 7:00am – 5:00pm, Mon. – Fri.
  7:00am – 2:00pm, Sat.
  Year Round (-) 6 holidays

- Annual Operating Days = 365 days/year – 52 Sundays/year – 6 holidays/year
  = **307 days/year**

- Annual Operating Hours

$$=\left(\frac{10hrs}{day}\right)\times\left[\left(\frac{5days}{week}\right)\left(\frac{52.14weeks}{year}\right)-\left(\frac{6holidays}{year}\right)\right]+\left(\frac{7hrs}{day}\right)\left(\frac{1day}{week}\right)\left(\frac{52.14weeks}{year}\right)$$

$$=\left(\frac{10hrs}{day}\right)\times\left(\frac{254.7\ full\ \ working\ \ days}{year}\right)+\left(\frac{7hrs}{day}\right)\times\left(\frac{52.14Saturdays}{year}\right)$$

= **2,912 hours/year**

A FUGITIVE PARTICULATES FROM UNPAVED ROADS

Emission Factor

Particulate emissions from unpaved roads are estimated using the emission factor for industrial sites (equation 1a) multiplied by the control factor for natural mitigation due to precipitation and watering (equation 2) of AP-42, Section 13.2.2, Unpaved Roads, November 2006.

LEGEND:

- BORROW/FILL AREA
- LINER CONSTRUCTION
- ACTIVE LANDFILLING
- DRAINAGE CHANNEL FLOW DIRECTION
- CULVERT
- ACCESS ROAD
- LINE SOURCE

PARTICULATE EMISSION SOURCES:

LINE SOURCES	LENGTH (FEET)
L1 – INNER ACCESS ROAD	1,963 FT
a Entrance to L4	553 FT
b L4 to L3	372 FT
c L3 to L5	724 FT
d L5 to L2	314 FT
L2 – ACTIVE LANDFILL LOOP	888 FT
L3 – RECYCLING FACILITY LOOP	1,241 FT
L4 – LEACHATE LOADOUT FACILITY	595 FT
L5 – STAGING AREA LOOP	535 FT
L6 – OUTER PERIMETER ACCESS ROAD	5,878 FT

AREA SOURCES	AREA (ACRES)
A1 – ACTIVE LANDFILLING AREA	7.89 ACRES
A2 – LINER CONSTRUCTION AREA	5.11 ACRES
A3 – BORROWING/FILL AREA	4.99 ACRES
A4 – RECYCLING FACILITY AREA	4.89 ACRES

POINT SOURCES	STACK RELEASE HEIGHT (FEET)
P1a&b – WASTE OIL HEATER EXHAUST VENTS (8 INCH ID)	28 FEET

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NO.	REVISION	BY	DATE

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: February 2015

SCALE: 1"=300'

PREPARED FOR: SEALAND WASTE, LLC
DES. BY: DRW. BY: CHK. BY:
DWG: Worst Case PM Detail.dwg

WORST-CASE SCENARIO PARTICULATE EMISSIONS
CARROLL LANDFILL EXPANSION APPLICATION
TOWN OF CARROLL CHAUTAUQUA COUNTY NEW YORK

FIGURE B-1

$$E_{ext} = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b} \times \left[\frac{(365-P)}{365}\right]$$

where; *k*, *a*, and *b*, are empirical constants given in the table below, and

E_{ext} = emission factor extrapolated for natural and controlled mitigation (lbs/Vehicle Miles Traveled (VMT))

s = surface material silt content (%)
= 7.45% (Table 13.2.2-1., C&D Debris Landfill estimated by averaging silt content means for construction sites and municipal solid waste landfills)

W = mean vehicle weight (tons)

P = number of days per year with at least 0.254 mm (0.01 in.) of precipitation
= $P_N + P_C$

P_N = natural mitigation; 160 days (conservatively approximated using Figure 13.2.2-1.)

P_C = controlled mitigation by watering; estimated at 164 days (assumed to be 80% of the days per year without rain) [Note: $P_C = 0$ for potential-to-emit calculations]

From: Table 13.2.2-2. Constant	Industrial Roads		
	PM-2.5	**PM-10**	**PM-30***
***k* (lbs/VMT)**	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

* Assumed equivalent to total particulate matter (PM)

A.1 Waste Delivery Trucks

A.1.a Known Variables

- Proposed Annual Waste Acceptance Rate = 307,000 ton/year
- Proposed Daily Waste Acceptance Rate = 1,000 tons/day

A.1.b Assumed Variables

- Waste delivery truck composition is assumed to be 75% transfer trailers and 25% tandem triaxle dump trucks

- Waste density is assumed to be 0.75 ton/cy in-place, but only half that, 0.375 ton/cy, when loose in a truck
- No R-permits will be allowed

	Transfer Trailer	Dump Truck
Empty weight:	20 ton	13 ton
Trailer capacity:	100 cy	25 cy
Avg. load volume at 70% capacity:	100*0.7 =70 cy	25*0.7 =18 cy
Avg. load weight at 70% capacity:	70*0.375 = 26.25 ton	18*0.375 = 6.75 ton
Max weight w/o R-permit:	40	40
Load maxed by permissible weight:	40 – 20 = 20 ton	NA
Full weight:	20 + 20 = 40 ton	13 + 6.75 = 19.75 ton
Number of trucks:	45	15

- $$W = \frac{\text{(Operating weight of truck (ingress) + Empty weight of truck (egress))}}{2}$$
  $$= \frac{[(45 \text{ transfer trailers} \times (40 \text{ ton} + 20 \text{ ton})/2) + (15 \text{ dump trucks} \times (19.75 \text{ ton} + 13 \text{ ton})/2)]}{60 \text{ trucks}}$$
  = 26.6 tons

- Estimated VMT per load = Round trip distance from the proposed facility entrance to the active landfill area (shown on Figure B-1 as L1, the inner access road, plus the active landfill loop (L2)).
  $$= \frac{[(1{,}963\ feet)(2) + (888\ feet)]}{5{,}280\ feet/mile}$$
  = 0.91 miles/load

A.1.c PM-X Emission Equations for Waste Delivery Trucks on Unpaved Roads

(See attached spreadsheet)

- Ton of waste per load, weighted $= \frac{(20 \text{ ton/trailer} \times 45 \text{ trailer}) + (6.75 \text{ ton/dump} \times 15 \text{ dumps})}{(45 + 15) \text{ trucks}}$
  = 16.7 ton/load
- Proposed Annual Acceptance Rate $= \left(\frac{307{,}000 tons}{year}\right)\left(\frac{1 load}{16.7 tons}\right)$
  = 18,383 loads/year

- Proposed Hourly Weekday Acceptance Rate $= \left(\frac{60 load}{day}\right)\left(\frac{1 day}{10 hours}\right)$
  = 6 loads/hour

- Proposed Maximum Hourly Acceptance Rate would occur when the proposed daily waste acceptance rate of 1,000 ton/day is accepted on a Saturday when the number of working hours per day is reduced.

- Proposed Maximum Hourly Acceptance Rate $= \left(\frac{60load}{day}\right)\left(\frac{1day}{7hours}\right)$
  = 8.6 loads/hour

- Proposed Average Hourly Acceptance Rate $= \frac{\left(\frac{6.0load}{hour}\right)(5days)+\left(\frac{8.6load}{hour}\right)(1day)}{6days}$
  = 6.4 loads/hour

<u>Proposed Average Emissions</u>:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Average Hourly Acceptance Rate (loads/hr)

where; PM-X = particulate matter of size X
$E_{ext;X}$ = extrapolated emission factor calculated using size X constants

Annually:
PM-X (ton/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Annual Acceptance Rate (loads/year) ÷ 2,000 lbs/ton

<u>Potential-to-Emit Emissions</u>:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Maximum Hourly Acceptance Rate (loads/hr)

where; P_C = 0

Annually:
PM-X (ton/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Annual Acceptance Rate (loads/year) ÷ 2,000 lbs/ton

where; P_C = 0

A. FUGITIVE PARTICULATE EMISSIONS FROM UNPAVED ROADS

A.1 Waste Delivery Trucks:

Proposed Annual Acceptance Rate (loads/year) =	18,383		
Proposed Daily Acceptance Rate (loads/day) =	60		
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	6.0		
Proposed Maximum (Saturday) Hourly Acceptance Rate (loads/hour) =	8.6		
Proposed Average Hourly Acceptance Rate (loads/hour) =	6.4		
Estimated Vehicle Miles Traveled per Load (VMT/load) =	0.91		
Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45
s (%) =	7.45		
W (tons) =	26.6		
P (days) =	324		
P (natural) =	160		
P (controlled) =	164		

Emissions:	**Proposed**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**6.16**	**8.80**	**41.05**	**44.02**
PM-10 =	**1.71**	**2.45**	**11.42**	**12.25**
PM-2.5 =	**0.17**	**0.25**	**1.14**	**1.23**

A.2 RECYCLING FACILITY TRUCKS

A.2.a Known Variables

Composting Operation

- Yard waste acceptance for the composting operation = 400 ton/year

C&D Processing Operation (CDPO)

- Maximum Daily C&D processing Acceptance Rate = 320 ton/day
- Proposed Typical C&D processing Acceptance Rate = 160 ton/day

---

A.2.b Assumed Variables

Composting Operation

- Yard waste acceptance is limited to 9 months, March through November (25 operating days per month for a total of 225 days)
- Yard waste brought to the facility primarily via pickup trucks and pull behind trailers at a rate of approximately 1,000 lbs per load
- Pickup truck empty weight = 2.5 ton
- Processed yard waste product sold/used offsite = 262 cy/year (131 cy in clean wood chips and 131 cy in compost)
- Processed yard waste leaves the site in dump trucks (empty weight = 13 ton) at a rate of 15 cy/load
- Estimated density of new wood chips = 550 lbs/cy (15 cy × 550 lbs/cy ÷ 2000 lbs/ton = 4.1 ton of material/load)
- Estimated density of compost = 1,200 lbs/cy (15 cy × 1,200 lbs/cy ÷ 2000 lbs/ton = 9.0 ton of material/load)

C&D Processing Operation (CDPO)

- C&D recyclables will be received in the same type and approximate distribution of trucks as the C&D waste (i.e., weighted average of 16.7 ton/load = approx.10 trucks at typical rate (7 transfer trailers and 3 tandem/triaxle dump trucks) or approximately 20 trucks at the maximum rate (14 transfer trailers and 6 tandem/triaxle dump trucks))
- Approximately 15% of what is received at the CDPO (24 ton/day at typical rate and 48 ton/day at the maximum rate @ 0.75 ton/cy) will leave the facility as saleable goods
- Processed C&D debris leaves the site in dump trucks (empty weight = 13 ton) at a rate of 16 cy/load (16 cy × 0.75 ton/cy = 12 ton of material/load)

- Estimated VMT per load = Round trip distance from the proposed facility entrance to the Recycling Facility and around the recycling facility loop. On Figure B-1 this route is represented by L1a and L1b, sections of the inner access road, and L3, the recycling facility loop.

  $= \frac{[(553\,feet + 372\,feet)(2) + (1{,}241\,feet)]}{5{,}280\,feet/mile}$

  = 0.59 miles/load

- W (yard waste, in) = (Operating weight of truck (ingress) + Empty weight of truck (egress)) / 2

  = (3 ton + 2.5 ton)/2

  = 2.75 tons

- W (yard waste, out) = (13 ton + (13 ton + ((9.0 ton/load +4.1 ton/load)/2))) / 2

  = 16.3 tons

- W (CDPO,in) = 26.6 ton; same as waste trucks

- W (CDPO, out) = (13 + (13 + 12)) / 2

  = 19 tons

A.2.c PM-X Emission Equations for Recyclables Delivery Trucks on Unpaved Roads

(See attached spreadsheet)

Sum of each of the four operations calculated individually as below.

Proposed Average Emissions:

Hourly:

PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Average Hourly Acceptance/Shipping Rate (loads/hr)

where; PM-X = particulate matter of size X

$E_{ext;X}$ = extrapolated emission factor calculated using size X constants

Annually:

PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Annual Acceptance/Shipping Rate (loads/year) ÷ 2,000 lbs/ton

<u>Potential-to-Emit Emissions</u>:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Proposed Maximum Hourly Acceptance/Shipping Rate (loads/hr)

where; P_C = 0

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Maximum Annual Acceptance/Shipping Rate (loads/year) ÷ 2,000 lbs/ton

where; P_C = 0

A.2 Recycling Facility Trucks:

Composting Operation (in)	
Proposed Annual Acceptance Rate (loads/year) =	800
Proposed Daily Acceptance Rate (loads/day) =	4
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	0.36
Proposed Maximum Hourly Acceptance Rate (loads/hour) =	0.51
Proposed Average Hourly Acceptance Rate (loads/hour) =	0.38
W (tons) =	2.75

Composting Operation (out)	
Proposed Annual Shipping Rate (loads/year) =	18
Proposed Daily Shipping Rate (loads/day) =	0.06
Proposed Hourly Shipping Rate (loads/hour) =	0.01
W,avg. (tons) =	16.3

CDPO (in)	
Proposed Typical Annual Acceptance Rate (loads/year) =	3,070
Proposed Typical Daily Acceptance Rate (loads/day) =	10
Maximum Annual Acceptance Rate (loads/year) =	6,140
Maximum Daily Acceptance Rate (loads/day) =	20
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	1.00
Proposed Maximum (Saturday) Acceptance Rate (loads/hour) =	1.43
Proposed Average Hourly Acceptance Rate (loads/hour) =	1.07
W (tons) =	26.6

CDPO (out)	
Proposed Annual Shipping Rate (loads/year) =	614
Proposed Daily Shipping Rate (loads/day) =	2.00
Maximum Annual Shipping Rate (loads/year) =	1,228
Maximum Daily Shipping Rate (loads/day) =	4.00
Proposed Hourly Weekday Shipping Rate (loads/hour) =	0.20
Proposed Maximum (Saturday) Shipping Rate (loads/hour) =	0.29
Proposed Average Hourly Shipping Rate (loads/hour) =	0.21
W (tons) =	19

Estimated Vehicle Miles Traveled per load (VMT/load) = 0.59

Emperical Constants:	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45

s (%) = 7.45

P (days) = 324
P (natural) = 160
P (controlled) = 164

Emissions:	**Proposed**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.86**	**1.21**	**5.77**	**11.62**
PM-10 =	**0.24**	**0.34**	**1.60**	**3.23**
PM-2.5 =	**0.02**	**0.03**	**0.16**	**0.32**

A.3 Leachate Hauling Vehicles

A.3.a Assumed Variables

- According to the leachate generation scenarios calculated for the Engineering Report, Rev 1. (See Appendix D), approximately 867,450 gallons over a 90-day period or thirteen 5,500-gallon loads of leachate are expected to be hauled from the site each week during the period that most closely approximates the scenario shown in Figure B-1 (Scenario Three).

- Unlike the operations in A.1 and A.2, leachate hauling operations are assumed to occur only Monday through Friday (5 days per week) within normal facility operating hours. Therefore, one or two leachate trucks will be required per day.

- Annual Number of Leachate Loads = 13 loads/week * 52.14 weeks/year
  = 678 loads/year

- Average Hourly Leachate Loads = 13 loads/week ÷ 5 days/week ÷ 10 working hours/day
  = 0.26 loads/hour

- Maximum Hourly Leachate Loads = 2 trucks/hour, based on use of one leachate truck and the round trip travel time to the WWTP.

- A 6,300 gallon leachate tanker truck operating at a maximum capacity of 5,500 gallons of leachate is assumed to have an empty weight of 17 ton and an operating weight of 40 ton

  W = mean vehicle weight (tons)

  $$= \frac{\text{(Empty weight (ingress) + Operating weight (egress))}}{2}$$

  = (17 ton + 40 ton)/2

  = 28.5 tons

- Leachate trucks will enter the facility entrance, and veer right to pull onto the leachate load-out pad, then loop around to cross the scale upon exiting the facility. This route is represented on Figure B-1 as L4 and L1a.

- Estimated VMT per load $= \frac{(595 + 553\,feet)}{5{,}280\,feet/mile}$

  = 0.22 miles/load

A.3.b PM-X Emission Equations for Leachate Trucks on Unpaved Roads

(See attached spreadsheet)

Proposed Average Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Average Hourly Leachate Loads (loads/hr)

where; PM-X = particulate matter of size X
$E_{ext;X}$ = extrapolated emission factor calculated using size X constants

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Annual Number of Leachate Loads (loads/year) ÷ 2,000 lbs/ton

Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Maximum Hourly Leachate Loads (loads/hr)

where; P_C = 0

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Annual Number of Leachate Loads (loads/year) ÷ 2,000 lbs/ton

where; P_C = 0

A.3 Leachate Hauling Vehicles:

Annual Leachate Hauling Rate (loads/year) =	678
Average Hourly Leachate Hauling Rate (loads/hour) =	0.26
Maximum Hourly Leachate Hauling Rate (loads/hour) =	2.0
Estimated Vehicle Miles Traveled per Load (VMT/load) =	0.22

Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45

s (%) =	7.45
W (tons) =	28.5
P (days) =	324
P (natural) =	160
P (controlled) =	164

Emissions:	**Proposed**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.06**	**0.08**	**2.39**	**0.40**
PM-10 =	**0.02**	**0.02**	**0.66**	**0.11**
PM-2.5 =	**0.00**	**0.00**	**0.07**	**0.01**

A.4 LANDFILL LINER CONSTRUCTION MATERIALS DELIVERY TRUCKS

A.4.a Known Variables

- In the scenario shown in Figure B-1, Cell 2 is under liner construction. Cell 2 is approximately 222,660 square feet or 5.11 acres in size (plan area).

- Landfill soil balance calculations show that no delivery of soil material will be necessary for liner or embankment construction onsite (see Engineering Report, Rev. 1).

- Material deliveries will be required for all other components of the liner system, including:
  - ¾ inch nominal rounded stone;
  - 60-mil geomembrane (2 layers);
  - Geotextile (3 layers);
  - Geocomposite (2 layers); and,
  - Geosynthetic Clay Liner (1 layer).

A.4.b Assumed Variables

- Area of liner materials required = 222,660 ft^2 × 1.05 (to account for slope and waste) ~ 233,800 ft^2
- Slope & Waste factor = 1.05 (Used to account for the liner surface applied to a 3D sloped surface over a 2D Area)
- Thickness of Stone Drainage Layer = 2 ft (from standard double composite liner detail)
- Total thickness of liner stone components = 2.1 ft = thickness of stone drainage layer × 1.05 to account for the stone bedding for the secondary and porewater pipe drains and in the porewater trench drain and waste.
- Density of ¾ inch rounded stone = 1.5 ton/cy
- Cell 2 is assumed to be excavated and liner construction completed within one 12 month period and all deliveries of materials required for liner construction will occur within that same 12 month period with the exception of the drainage layer stone.
- All stone for liner construction will be delivered over a 12 month period beginning 6 months prior to the modeled year as all stone must be onsite within the first 6 months of the year to leave time to complete liner construction.
- All non-stone deliveries will occur within a one month (four week) period with a maximum number of four delivery trucks per day.
- All deliveries assumed to occur only Monday through Friday (5 days per week) within normal facility hours.
- The following information regarding construction materials and delivery variables have been assumed based on experience with a similar project.

	Geomembrane	Geotextile	Geocomposite	Geosynthetic Clay Liner
Typical area per roll:	9,080 ft^2	4,500 ft^2	2,770 ft^2	2,065 ft^2
Typical # of rolls per truck:	12	40	27	16
Approximate material weight:	3,900 lb/roll	330 lb/roll	1,990 lbs/roll	2,600 lb/roll

- Construction material delivery vehicles will make a round trip from the proposed facility entrance to a staging area within the Borrow/Fill Area (shown on Figure B-1 as L1a, L1b, and L1c, sections of the inner access road, plus L5, the staging area loop).

- Estimated VMT per load $= \dfrac{(553\ feet + 372\ feet + 724\ feet)(2) + 535\ feet}{5{,}280\ feet / mile}$

  = 0.73 miles/load

A.4.c PM-X Emission Equations for Liner Construction Delivery Trucks on Unpaved Roads

(See attached spreadsheet)

Proposed Average Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Assumed Number of Hourly Construction Related Loads (loads/hr)

where; PM-X = particulate matter of size X

$E_{ext;X}$ = extrapolated emissions factor calculated using size X constants

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Annual Number of Construction Related Delivery Loads (loads/year) ÷ 2,000 lbs/ton

Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Assumed Number of Hourly Construction Related Loads (loads/hr)

where; P_C = 0

Annually:

PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT/load × Annual Number of Construction Related Delivery Loads (loads/year) ÷ 2,000 lbs/ton

where; P_C = 0

A.4 Landfill Liner Construction Material Delivery Trucks:

Stone Deliveries:

Cell 2 Area =	222,660	sq.ft.
Slope and Waste Factor =	1.05	
Total Stone Liner Thickness =	2.1	ft
Volume of stone handled =	490,965	cf
Assumed density of stone =	1.5	ton/cy
Ton of material Handled =	27,276	ton
Assumed Weight per load =	20	ton/load
Number of loads of stone required =	1,364	loads
Number of loads per day over 12 mos =	5	loads/day
Hourly stone delivery rate =	0.529	loads/hour
Empty Weight of Stone delivery truck =	18	ton

Two-Axle Truck Deliveries:

	Geomembrane	Geotextile	Geocomposite	Geosynthetic Clay Liner	
Number of layers =	2	3	2	1	
Total area Required =	467,586	701,379	467,586	233,793	
Typical area per roll (sq. ft.) =	9,080	4,500	2,770	2,065	
Typical # of rolls per truck =	12	40	27	16	
Total number of rolls =	52	156	169	114	
Total number of trucks =	5	4	7	8	Total = 24
Approximate weight of material (lbs/roll) =	3,900	330	1,990	2,600	
Empty weight of delivery truck (ton) =	16	16	16	16	
Operating weight of delivery truck (ton) =	39.4	22.6	42.865	36.8	

Total number of construction related deliveries =	706	loads/year	Assumes half the stone will be delivered prior to the modeled year
	1.2	loads/day	Proposed average number of non-stone deliveries per day over a one month period.
	0.6	loads/hour	Typical total hourly deliveries of construction materials
	4.0	loads/day	Maximum non-stone deliveries
	0.9	loads/hour	Assumed maximum total hourly deliveries of construction materials

Estimated Vehicle Miles Traveled per load (VMT/load) = 0.73

Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45

s (%) = 7.45

W (tons, weighted) = 56.9

P (days) = 324
P (natural) = 160
P (controlled) = 164

Emissions:	**Proposed**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.70**	**0.38**	**5.02**	**1.91**
PM-10 =	**0.20**	**0.11**	**1.40**	**0.53**
PM-2.5 =	**0.02**	**0.01**	**0.14**	**0.05**

A.5 ONSITE VEHICLE FLEET

A.5.a Assumed Variables

- Only a select group of vehicles from the Equipment List in Table 3-8 are assumed to spend a significant amount of their operating hours traveling the site's unpaved roads
- Mean Operating Weight (tons) = (Empty weight + Gross vehicle weight)/2
- Each piece of equipment is assumed to be actually driving on unpaved road for 25% of the time it is in use. Under normal use conditions, equipment will be driven to an area then stopped to load, allow for communications or observation, or fix or fuel other equipment, before moving on. The exception to this is the water truck. This truck is idle only while refilling the water tank. Therefore under normal use conditions it is assumed to be actually driving on unpaved road 80% of the time.
- Potential-to-Emit (PTE) Equipment Usage = Proposed Usage × 1.5; or 50% greater usage than assumed to be typical
- $VMT_{proposed}$ (miles/year) = estimated vehicle usage × assumed vehicle speed
  = 33,218 miles/year for the onsite fleet
- $W_{proposed}$ = 8.57 ton, average vehicle weight weighted by $VMT_{proposed}$
- VMT_{PTE} = PTE equipment usage × assumed vehicle speed
  = 39,561 miles/year
- W_{PTE} = 8.46 ton, average vehicle weight weighted by VMT_{PTE}
- Emissions from Onsite Vehicle Use of Unpaved Roads are assumed to be evenly distributed among all line sources L1 through L6

A.5.b PM-X Emission Equations for Onsite Vehicle Use of Unpaved Roads

(See attached spreadsheet)

Proposed Average Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × $VMT_{proposed}$/year ÷ Summed Fleet Usage (hrs/yr)

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × $VMT_{proposed}$/year ÷ 2,000 lbs/ton

Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{ext;X}$ (lbs/VMT) × VMT_{PTE}/year ÷ Summed Fleet Usage (PTE hrs/yr)

where; P_C = 0

Annually:
PM-X (tons/year) = $E_{ext;X}$ (lbs/VMT) × VMT_{PTE}/year ÷ 2,000 lbs/ton

where; P_C = 0

A.5 Onsite Vehicle Fleet:

Equipment	Mean Operating Weight (tons)	Proposed Average Equipment Use (% per day)	(days/year)	(hours/year)	PTE Usage (hours/year)	Assumed Average Speed (mph)	Average VMT (miles/year)	PTE VMT (miles/year)	Weight Avg VMT	Weight PTE VMT	
D25 Off-Road Dump	30.5	0.55	307	1,602	2,402	5	2,002	3,003	61,061	91,592	
D25 Off-Road Dump	30.5	0.55	307	1,602	2,402	5	2,002	3,003	61,061	91,592	
2,000 Gallon Water Truck*	9	0.55	164	856	0	10	6,845	0	61,602	0	
Equipment Maintenance Truck	13.5	0.18	260	444	666	10	1,110	1,665	14,982	22,473	
Tool Truck	11	0.18	260	444	666	10	1,110	1,665	12,208	18,311	
Fuel/Lube Truck	13	0.3	307	874	1,310	10	2,184	3,276	28,392	42,588	
Tractor	4	0.18	130	222	333	5	277	416	1,110	1,665	
Pickup Truck	2.5	0.91	307	2,650	3,975	20	13,250	19,874	33,124	49,686	
Pickup Truck	2.5	0.36	260	888	1,332	20	4,439	6,659	11,098	16,647	
Average =	**12.9**					**TOTAL =**	**33,218**	**39,561**	**284,637**	**334,553**	**= Sum**
			Sum =	**9,580**	**13,086**				**8.57**	**8.46**	**= Weighted Average Weight**

Emissions:	**Proposed Hourly (lbs/hr)**	**Proposed Annually (tons/yr)**	**Potential-to-Emit Hourly (lbs/hr)**	**Potential-to-Emit Annually (tons/yr)**
PM =	**2.19**	**10.50**	**9.50**	**62.16**
PM-10 =	**0.61**	**2.92**	**2.64**	**17.30**
PM-2.5 =	**0.06**	**0.29**	**0.26**	**1.73**

*For PTE emissions no watering is performed, therefore the water truck is not used.

A.1 + A.2 + A.3 + A.4 + A.5

TOTAL FOR UNPAVED ROADS:

Emissions:	**Proposed Hourly (lbs/hr)**	**Proposed Annually (tons/yr)**	**Potential-to-Emit Hourly (lbs/hr)**	**Potential-to-Emit Annually (tons/yr)**
PM =	**9.98**	**20.98**	**63.73**	**120.12**
PM-10 =	**2.78**	**5.84**	**17.74**	**33.43**
PM-2.5 =	**0.28**	**0.58**	**1.77**	**3.34**

B FUGITIVE EMISSIONS FROM ACTIVE LANDFILLING AREA

Area source A1, shown on Figure B-1 is the active landfilling area. Particulate emissions from landfill operations in the active landfilling area are related to the following activities:

- Waste deposition or waste truck unloading;
- Waste movement or placement with bulldozers;
- Waste compaction; and,
- Handling of soil/cover material, including truck dumping and bulldozing.

Particulates generated from these activities are estimated using the emission factors suggested in Table 13.2.3-1. under II. Site Preparation (earth moving) from AP-42, Section 13.2.3, January 1995. Based on the equipment that will be kept and maintained onsite listed in Table 3-8, the following emission factors will be estimated.

Operation	Emission Factor Source (from Table 13.2.3-1.)
Truck Unloading of Debris	Section 13.2.4[1]
Bulldozing	Bulldozing of Overburden from AP-42, Table 11.9-1.
Compacting	Bulldozing of Overburden from AP-42, Table 11.9-1.
Truck Dumping of Cover Soils	Section 13.2.4[1]

[1]Table 13.2.3-1. specifies material handling factor in Section 13.2.2. This factor was not found. Section 13.2.4 was substituted.

B.1 WASTE DEPOSITION OR WASTE TRUCK UNLOADING AND TRUCK DUMPING OF COVER SOIL

Particulate emissions for unloading of C&D debris from waste delivery trucks and truck dumping of cover soils is estimated using emission factors described in AP-42, Section 13.2.4., Aggregate Handling and Storage Piles, November 2006.

$$E_{PM-X} = k_{PM-X}(0.0032)\times\left[\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right]$$

where; $E_{PM\text{-}X}$ = size-specific emission factor (lbs/ton material handled)

$k_{PM\text{-}X}$ = size-specific multiplier (dimensionless)
k_{PM} = 0.74 (<30μm is assumed to be equal to total PM)
$k_{PM\text{-}10}$ = 0.35
$k_{PM\text{-}2.5}$ = 0.053

U = mean wind velocity (miles per hour)

M = moisture content of C&D debris and cover materials (%)

B.1.a Known Variables

- Average Daily Waste Acceptance Rate = 1,000 tons/day

B.1.b Assumed Variables

- Volume of cover material = 3% by volume of the waste (Source: See waste volume calculation in Appendix A)
- Assumed C&D debris density = 0.375 ton/cy (One half the waste-in-place density assumed by NYSDEC C&D Processing Facility 2010 Annual Report Form)
- Approximate density of cover material = 130.67 lbs/ft^3 (Source: Site Investigation Report, by P.J. Carey & Associates dated September 2013)
- *U* = 7.85 mph (Source: Weather Underground (http://www.wunderground.com), arithmetic mean of daily average wind speed rates for measurements taken at the Chautauqua County/Jamestown Airport in Jamestown, NY over the five year period including 2005 - 2009)
- *M* = 16.66% (Source: Site Investigation Report, by P.J. Carey & Associates dated September 2013, for onsite soils to be used as cover; considered reasonable approximation for highly variable waste)
- Proposed Waste Acceptance Rate by volume = rate × density

$$= \left(\frac{1{,}000 tons}{day}\right)\left(\frac{cy}{0.375 ton}\right)$$

= 2,667 cy/day

- Proposed volume of cover material = Acceptance rate by volume × 0.03
= 2,667 cy/day × 0.03
= 80 cy/day

- Proposed weight of cover material = volume × density

$$= \left(\frac{80 cy}{day}\right)\left(\frac{130.67 lbs}{ft^3}\right)\left(\frac{27\ ft^3}{cy}\right)\left(\frac{ton}{2{,}000 lbs}\right)$$

= 141 tons/day

- Total weight of materials handled daily = waste accepted + cover materials used
  = 1,000 tons/day + 141 tons/day
  = 1,141 tons/day

B.1.c PM-X Emission Equations for Waste Truck Unloading

(See attached spreadsheet)

Proposed Average Emissions:

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Average Hourly Materials Handling Rate (ton/hour)

where; PM-X = particulate matter of size X

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/ton material handled) × Annual Materials Handling Rate (ton/year)

Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Maximum Hourly Materials Handling Rate (ton/hour)

Annually:
PM-X (tons/year) = same as average

B. FUGITIVE EMISSIONS FROM ACTIVE LANDFILLING AREA

B.1 Waste Deposition or Waste Truck Unloading and Truck Dumping of Cover Soil

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013

Emissions:

E-PM =	**0.00021885**	**lbs/ton**
E-PM-10 =	**0.00010351**	**lbs/ton**
E-PM-2.5 =	**1.5674E-05**	**lbs/ton**

Proposed Waste Acceptance Rate =	1,000	tons/day	
Average waste in-place density =	0.375	ton/cy	
Proposed Waste Acceptance Rate by volume =	2,667	cy/day	
Volume of cover material is assumed to be 3% of the waste.			Source: See waste volume calculation Appendix A
Proposed volume of cover materials =	80	cy/day	
Average Density of cover material =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Proposed weight of cover materials =	141.1236	tons/day	
Total weight of materials handled =	1,141	tons/day	= waste + cover
Annual Materials Handling Rate =	350,325	tons/year	
Average Hourly Materials Handling Rate =	122	tons/hour	
Maximum Hourly Materials Handling Rate =	163	tons/hour	

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Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.03**	**0.04**	**0.04**	**0.04**
PM-10 =	**0.01**	**0.02**	**0.02**	**0.02**
PM-2.5 =	**0.00**	**0.00**	**0.00**	**0.00**

B.2 WASTE & COVER BULLDOZING & COMPACTING EMISSIONS

Particulate emissions from bulldozing and compacting activities are estimated using the total PM emission factor equations and the associated PM-10 and PM-2.5 scaling factor given in Table 11.9-1. for bulldozing of overburden from AP-42, Section 11.9., Mineral Products Industry, July 1998.

$$E_{PM} = \frac{5.7(s)^{1.2}}{(M)^{1.3}}, \qquad E_{PM\text{-}10} = \frac{0.75(s)^{1.5}}{(M)^{1.4}}, \qquad E_{PM\text{-}2.5} = E_{PM} \times 0.105$$

where; E_{PM} = emission factor for total particulate matter ≤ 30 µm (lbs/hr)
$E_{PM\text{-}10}$ = emission factor for PM-10 (lbs/hr)
$E_{PM\text{-}2.5}$ = emission factor for PM-2.5 (lbs/hr)
s = silt content of C&D debris and cover material (%)
M = moisture content of C&D debris and cover material (%)

B.2.a Known Variables

- According to the equipment list in Table 3-8, the site will have 2 bulldozers and 1 landfill compactor onsite
- Proposed number of Operating Days = 307 days/year
- Proposed number of facility Operating Hours = 2,912 hours/year

B.2.b Assumed Variables

- *s,cover soils* = 39.97% (Source: Site Investigation Report, by P.J. Carey & Associates dated September 2013, geometric mean of % passing #200 Sieve (AP-42 definition of % silt) for onsite soils)
- *s,waste* = 5.22% (based on % silt (% passing #200 Sieve) from crushed concrete block recycled from C&D waste as reported in Umoh, A. (2012) *Recycling demolition waste sandcrete blocks as aggregate in concrete*. ARPN Journal of Engineering and Applied Sciences, 7(9), 1111-1118; it is assumed that the majority of constituents of C&D waste will be characterized by minimal silt content even upon the crushing they will experience during bulldozing and compacting operations. Concrete and mixed rubble is likely to contribute the most silt and is estimated to make up to 50% of the C&D waste load, therefore use of this number is expected to be conservative)
- *s, weighted average* = s,cover soils × 3% + s,waste × (100% - 3%)
  = 39.97 × 0.03 + 5.22 × 0.97
  = 6.26 %

- *M* = 16.66% (Source: Site Investigation Report, by P.J. Carey & Associates dated September 2013, for onsite soils to be used as cover; considered reasonable approximation for highly variable waste)
- Potential-to-Emit (PTE) Equipment Usage = Proposed Usage × 1.5, or 50% greater usage than assumed to be typical, up to maximum of the total number of operating hours (2,912 hour/year)

B.2.c PM Emission Equations from Bulldozing and Compacting Operations in the Active Landfilling Area

(See attached spreadsheet)

Proposed Average Emissions:

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/hr) × Proposed Annual Equipment Operating Hours (hour/year) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = PM-X (tons/year) ÷ Proposed Number of Facility Operating hours per year (hours/year) × 2,000 lbs/ton

Potential-to-Emit Emissions:

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/hr) × Maximum Annual Equipment Operating Hours (hour/year) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = PM-X (tons/year) ÷ Maximum Number of Facility Operating hours per year (hours/year) × 2,000 lbs/ton

B.2 Waste & Cover Material Bulldozing and Compacting Emissions

Proposed # of Facility Operating Hours/yr = 2,912

Equipment	Proposed Equipment Use			PTE Equipment Use
	(% per day)	(days/year)	(hours/year)	(hours/year)
Cat 826 Landfill Compactor	0.73	307	2,126	2,912
D6 Bulldozer	0.73	307	2,126	2,912
D6 Bulldozer	0.36	307	1,048	1,572
Proposed Annual Equipment Operating Hours =			5,300	7,396 = Maximum Annual Equipment Operating Hours

Emission Factors:

PM (lbs/hr) = 5.7*s^1.2/M^1.3
PM-10 (lbs/hr) = 0.75*s^1.5/M^1.4
PM-2.5 scaling factor = 0.105

s, cover soils (%) = 39.97 Source: Site Investigation Report, PJ Carey & Associates, September 2013
s, waste (%) = 5.22 Source: based on crushed concrete block from recycled from C&D waste
s, weighted average (%) = 6.2625

M (%) = 16.66 Source: Site Investigation Report, PJ Carey & Associates, September 2013

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**2.42**	**3.52**	**3.38**	**4.92**
PM-10 =	**0.42**	**0.61**	**0.58**	**0.85**
PM-2.5 =	**0.25**	**0.37**	**0.35**	**0.52**

B.1 + B.2

TOTAL FOR AREA SOURCE A1 (Active Landfilling Area				
Emissions:	**Proposed**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**2.45**	**3.56**	**3.41**	**4.96**
PM-10 =	**0.43**	**0.62**	**0.60**	**0.87**
PM-2.5 =	**0.26**	**0.37**	**0.36**	**0.52**

C FUGITIVE EMISSIONS FROM LINER CONSTRUCTION AREA

Area source A2, shown on Figure B-1 is the Liner Construction Area. In the scenario shown, Cell 2 is under liner construction. Cell 2 is approximately 222,660 square feet or 5.11 acres in size (plan area). Using AutoCAD, a volume surface was constructed between the existing topography and the design top of subgrade surface with the limits of Cell 2 as a boundary condition. The resulting volume, 85,615 cy, is the estimated soil to be excavated for Cell 2. Particulate emissions from landfill liner construction are related to the following activities:

- Excavating to subgrade;
- Loading and removal of overburden;
- Truck dumping of liner soil and stone layers;
- Bulldozing of liner soil and stone layers; and,
- Compacting of soil liner.

Particulates generated from these activities are estimated using the emission factor suggested in Table 13.2.3-1. under II. Site Preparation (earth moving) from AP-42, Section 13.2.3, January 1995. Truck Unloading of Stone is the one exception. This activity is estimated using the emission factor in Table 11.19.2-2 in AP-42, Section 11.19.2., Crushed Stone Processing and Pulverized Mineral Processing, August 2004.

Operation	Emission Factor Source (from Table 13.2.3-1.)
Excavating	Section 13.2.4[1]
Loading of Excavated material into trucks	Section 13.2.4[1]
Truck Dumping of liner soil	Section 13.2.4[1]
Bulldozing of soil and stone layers	Bulldozing of Overburden from AP-42, Table 11.9-1.
Compacting of soil liner	Bulldozing of Overburden from AP-42, Table 11.9-1.

[1]Table 13.2.3-1. specifies material handling factor in Section 13.2.2. This factor was not found. Section 13.2.4 was substituted.

C.1 EXCAVATION AND TRUCK LOADING OF EXCAVATED MATERIALS

Particulate emissions for excavation and truck loading of excavated materials is estimated using emission factors described in AP-42, Section 13.2.4., Aggregate Handling and Storage Piles, November 2006.

$$E_{PM-X} = k_{PM-X}(0.0032)\times\left[\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right]$$

where; $E_{PM\text{-}X}$ = size-specific emission factor (lbs/ton material handled)
$k_{PM\text{-}X}$ = size-specific multiplier (dimensionless)
k_{PM} = 0.74 (<30μm is assumed to be equal to total PM)
$k_{PM\text{-}10}$ = 0.35
$k_{PM\text{-}2.5}$ = 0.053

U = mean wind velocity (miles per hour)

M = moisture content of in-situ soils (%)

C.1.a Known Variables

- *M* = 16.66%, average natural moisture content of in-situ materials based on 13 laboratory measurements on samples from across the site as reported in the Site Investigation Report, by P.J. Carey & Associates dated September 2013
- Wet weight density of in-situ materials = 130.67 lbs/ft^3, average based on three laboratory measurement on samples from three locations as reported in the Site Investigation Report, by P.J. Carey & Associates dated September 2013
- Tons of Materials Handled = Volume of soil between existing topography and subgrade within Cell 2 × Wet weight density of in-situ materials

$$= 85{,}615cy\left(\frac{130.67lbs}{ft^3}\right)\left(\frac{27\,ft^3}{cy}\right)\left(\frac{1ton}{2{,}000lbs}\right)$$

= 151,029 ton

C.1.b Assumed Variables

- *U* = 7.85 mph (Source: Weather Underground (http://www.wunderground.com), arithmetic mean of daily average wind speed rates for measurements taken at the Chautauqua County/Jamestown Airport in Jamestown, NY over the five year period including 2005 - 2009)
- Cell 2 is assumed to be excavated and liner construction completed within one 12 month period
- Assumed Average Hourly Production Rate = 300 ton/hour
- Assumed Maximum Hourly Production Rate = 500 ton/hour

C.1.c PM-X Emission Equations for Excavation and Truck Loading of Excavated Materials

(See attached spreadsheet)

<u>Proposed Average Emissions</u>

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/ton material handled) × Total Weight of Materials Handled (ton) × 2 (excavation & truck loading) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Average Hourly Production Rate (ton/hour) × 2 (excavation & truck loading)

<u>Potential-to-Emit Emissions</u>

Annually:
PM-X (tons/year) = same as proposed average emissions

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Maximum Hourly Production Rate (ton/hour) × 2 (excavation & truck loading)

C. FUGITIVE EMISSIONS FROM LINER CONSTRUCTION AREA

C.1 Excavation and Truck Loading of Excavated Materials

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013

<u>Emission Factors:</u>

E-PM =	0.00021885	lbs/ton	
E-PM-10 =	0.00010351	lbs/ton	
E-PM-2.5 =	1.5674E-05	lbs/ton	
Modeled volume to be excavated within Cell 2 =	85,615	cy	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Tons of Materials Handled =	151,029	ton	
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

.

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.13**	**0.03**	**0.22**	**0.03**
PM-10 =	**0.06**	**0.02**	**0.10**	**0.02**
PM-2.5 =	**0.01**	**0.00**	**0.02**	**0.00**

C.2 TRUCK DUMPING OF SOIL LINER COMPONENTS

The emission factor is the same as that used in C.1. It is assumed that the soils excavated from Cell 2 will be used for liner construction.

C.2.a Known Variables

- 2D Area of Cell 2 = 222,660 ft^2
- Total thickness of Soil Liner components = 3 ft (from standard double composite liner detail which includes a 24 in thick secondary soil liner and a 12 in thick structural fill layer)
- M = 16.66% (see note in C.1.a)
- Wet weight density of in-situ materials = 130.67 lbs/ft^3 (see note in C.1.a)

C.2.b Assumed Variables

- U = 7.85 mph (Source: Weather Underground (http://www.wunderground.com), arithmetic mean of daily average wind speed rates for measurements taken at the Chautauqua County/Jamestown Airport in Jamestown, NY over the five year period including 2005 - 2009)
- Slope factor = 1.05 (Used to account for the liner surface applied to a 3D sloped surface over a 2D Area)
- Cell 2 is assumed to be excavated and liner construction completed within one 12 month period.
- Assumed Average Hourly Production Rate = 300 ton/hour
- Assumed Maximum Hourly Production Rate = 500 ton/hour
- Volume of Materials handled = 2D Area of Cell 2 × Total Soil Liner Thickness × Slope Factor
  = 222,660 sf × 3.0 ft × 1.05
  = 701,379 cf

C.2.c PM-X Emission Equations for Truck Dumping of Soil Liner Components

(See attached spreadsheet)

Proposed Average Emissions

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/ton material handled) × Total Weight of Materials Handled (ton) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Average Hourly Production Rate (ton/hour)

Potential-to-Emit Emissions

Annually:
PM-X (tons/year) = same as proposed average emissions

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Maximum Hourly Production Rate (ton/hour)

C.2 Truck Dumping of Soil Liner Components

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
<u>Emission Factors:</u>			
E-PM =	0.00021885	lbs/ton	
E-PM-10 =	0.00010351	lbs/ton	
E-PM-2.5 =	1.5674E-05	lbs/ton	
2D Area of Cell 2 =	222,660	sf	
Total Soil Liner Thickness =	3	ft	
Slope Factor =	1.05		
Volume of materials handled =	701,379	cf	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Ton of Materials Handled =	45,825	ton	
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

.

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.07**	**0.01**	**0.11**	**0.01**
PM-10 =	**0.03**	**0.00**	**0.05**	**0.00**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**

C.3 Truck Dumping of Stone Liner Components

The emission factor in Table 11.19.2-2 in AP-42, Section 11.19.2., Crushed Stone Processing and Pulverized Mineral Processing, August 2004 for truck unloading of fragmented stone is assumed for this activity. The only factor listed in the table is for PM-10; $E_{PM\text{-}10} = 1.6 \times 10^{-5}$.

C.3.a Known Variables

- 2D Area of Cell 2 = 222,660 ft^2
- Thickness of Stone Drainage Layer = 2 ft (from standard double composite liner detail)

C.3.b Assumed Variables

- $E_{PM\text{-}2.5} = E_{PM\text{-}10}$ (a conservative upper limit)
- $E_{PM} = 3 \times E_{PM\text{-}10}$ (typical ratio for other factors listed in Table 11.19.2-2)
- Total thickness of liner stone components = 2.1 ft (thickness of stone drainage layer × 1.05 to account for the stone bedding for the secondary and porewater pipe drains and in the porewater trench drain and waste)
- Slope factor = 1.05 (used to account for the liner surface applied to a 3D sloped surface over a 2D Area)
- Density of ¾ inch rounded stone = 1.5 ton/cy
- Cell 2 is assumed to be excavated and liner construction completed within one 12 month period.
- Assumed Average Hourly Production Rate = 300 ton/hour
- Assumed Maximum Hourly Production Rate = 500 ton/hour
- Volume of Materials handled = 2D Area of Cell 2 × Total Thickness of Stone Liner Components × Slope Factor
  = 222,660 sf × 2.1 ft × 1.05
  = 490,965 cf

C.3.c PM-X Emission Equations Truck Dumping of Stone Liner Components

(See attached spreadsheet)

<u>Proposed Average Emissions</u>

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/ton material handled) × Total Weight of Materials Handled (ton) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Average Hourly Production Rate (ton/hour)

Potential-to-Emit Emissions

Annually:
PM-X (tons/year) = same as proposed average emissions

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Maximum Hourly Production Rate (ton/hour)

C.3 Truck Dumping of Stone Liner Components

Truck Unloading – Fragmented Stone

<u>Emission Factors:</u>		
E -PM =	0.0000483	lbs/ton of material throughput
E -PM-10 =	0.000016	lbs/ton of material throughput
E -PM-2.5 =	0.000016	lbs/ton of material throughput

2D Area of Cell 2	222,660	sf
Total Stone Liner Thickness =	2.1	ft
Slope & Waste Factor =	1.05	
Volume of materials handled =	490,965	cf
Assumed density of stone =	1.5	ton/cy
Ton of Materials Handled =	27,276	ton
Average Hourly Production Rate =	300	ton/hour
Maximum Hourly Production Rate =	500	ton/hour

.

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.01**	**0.00**	**0.02**	**0.00**
PM-10 =	**0.00**	**0.00**	**0.01**	**0.00**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**

C.4 Bulldozing & Compacting of Soil and Stone Liner Components

The emission factors are the same as that used in B.2. There are three layers within the liner system that will require bulldozing and compacting; secondary soil liner, structural fill, and stone drainage layer.

C.4.a Known Variables

- *s,soils* = 39.97% (see note in B.2.b)
- *M,soils* = 16.66% (see note in B.2.b)

C.4.b Assumed Variables

- *s,stone* = 3.9% (from AP-42 Table 13.2.4-1. as various limestone products under stone quarrying and processing)
- *M,stone* = 2.1% (from AP-42 Table 13.2.4-1. as various limestone products under stone quarrying and processing)
- Ton of soils handled = 45,825 ton (see Spreadsheet C.2)
- Ton of stone handled = 27,276 ton (see Spreadsheet C.3)
- Assumed Average Hourly Production Rate = 300 ton/ hour
- *s,weighted average* = $\dfrac{s,soils \times \text{ton of soils handled} + s,stone \times \text{ton of stone handled}}{\text{ton of soils handled + ton of stone handled}}$

  $= \dfrac{(39.97\%)(45{,}825\text{ ton}) + (3.9\%)(27{,}276\text{ ton})}{45{,}825\text{ ton} + 27{,}276\text{ ton}}$

  $= 26.5\%$

- *M,weighted average* = $\dfrac{M,soils \times \text{ton of soils handled} + M,stone \times \text{ton of stone handled}}{\text{ton of soils handled + ton of stone handled}}$

  $= \dfrac{(16.66\%)(45{,}825\text{ ton}) + (2.1\%)(27{,}276\text{ ton})}{45{,}825\text{ ton} + 27{,}276\text{ ton}}$

  $= 11.2\%$

C.4.c PM Emission Equations from Bulldozing and Compacting of Soil and Stone Liner Components

(See attached spreadsheet)

Proposed Average Emissions = Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/hr) × 2 (Pieces of Equipment in use at any given time)

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/hr) × Total Number of Hours of Handling at Average Production Rate (hour/year) × 2 (bulldozing & compacting activity) ÷ 2,000 lbs/ton

C.4 Bulldozing and Compacting of Soil and Stone Liner Components

Emission Factors:		
PM (lbs/hr)=	5.7*s^1.2/M^1.3	
PM-10 (lbs/hr) =	0.75*s^1.5/M^1.4	
PM-2.5 scaling factor =	0.105	
s , soils (%) =	39.97	
s , stone (%) =	3.9	
s , weighted average (%) =	26.5	
M (%) =	16.66	
M , stone (%) =	2.1	
M , weighted average (%) =	11.2	
Average hourly production rate =	300	ton/hour
Total Weight of Materials Handled =	73,100	ton
Hours of Handling at Average Production Rate =	244	hours
Maximum pieces of equipment in use at any given time =	2	

Emissions:	Proposed Average		Potential-to-Emit	
	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)
PM =	25.10	3.06	25.10	3.06
PM-10 =	6.93	0.84	6.93	0.84
PM-2.5 =	2.64	0.32	2.64	0.32

C.1 + C.2 + C.3 + C.4

TOTAL FOR AREA SOURCE A2 (Liner Construction Area)				
Emissions:	Proposed Average		Potential-to-Emit	
	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)
PM =	25.31	3.10	25.45	3.10
PM-10 =	7.03	0.86	7.10	0.86
PM-2.5 =	2.65	0.32	2.67	0.32

D FUGITIVE EMISSIONS FROM BORROW/FILL AREA

On Figure B-1, Area Source A3 is the Borrow/Fill Area. Activities that create fugitive emissions in the borrow/fill area include, site preparation, truck unloading of stone materials from offsite into the staging area and subsequent front loading of stone onto trucks for use in the liner construction in A2 as needed, and truck dumping of materials excavated out of Area Source A2. Excavated materials will either be unloaded into stockpiles for later use as soil liner material or landfill cover soils, or will be used for structural fill in an embankment/screening berm along the west side of A3. Bulldozing and shaping of the embankment/screening berm is another possible fugitive dust creating activity.

The Borrow/Fill Area shown in Figure B-1 is approximately 217,195 square feet or 4.99 acres in size (plan area). The staging area within the Borrow/Fill Area, as well as a portion of the embankment/screening berm, will be established during the initial construction of Cell 1 as shown on the most recent version of permit drawing PD-9, the Phasing Plan for the Carroll Landfill Expansion Application. Using AutoCAD, a volume surface was constructed between the existing topography and the design top of subgrade surface, which includes the western embankment/screening berm, limited to the western boundary of the Borrow/Fill Area. The resulting net fill volume, 67,347 cy, is the total estimated volume of structural fill required for the embankment in this area. It is assumed that this area of the embankment will be built using the balance of remaining soils excavated from A2 during this same year.

Particulates generated from these activities are estimated using the emission factor suggested in Table 13.2.3-1. under II. Site Preparation (earth moving) from AP-42, Section 13.2.3, January 1995. Truck Unloading and Loading of Stone are exceptions. This activity is estimated using the emission factor in Table 11.19.2-2 in AP-42, Section 11.19.2., Crushed Stone Processing and Pulverized Mineral Processing, August 2004.

Operation	Emission Factor Source (from Table 13.2.3-1.)
Site Preparation	Bulldozing of Overburden from AP-42, Table 11.9-1.
Truck dumping of excavated material	Section 13.2.4[1]
Loading of excavated materials into trucks	Section 13.2.4[1]
Truck unloading and loading of stone	Section 13.2.4[1]
Bulldozing/shaping of embankment	Bulldozing of Overburden from AP-42, Table 11.9-1.

[1]Table 13.2.3-1. specifies material handling factor in Section 13.2.2. This factor was not found. Section 13.2.4 was substituted.

D.1 SITE PREPARATION OF THE BORROW/FILL AREA (BULLDOZING OF OVERBURDEN)

The emission factors are the same as that used in B.2. The staging area and a portion of the embankment/screening berm will have already been established and, therefore, will not require site preparation. It is assumed that the remainder of the Borrow/Fill Area will be grubbed and leveled during the 12 month timeframe being modeled.

D.1.a Known Variables

- Operating hours per week = 57 hours
- *s* = 39.97% (see note in B.2.b)
- *M* = 16.66% (see note in B.2.b)
- Total Area of A3 = 217,195 sf
- Area of Staging Area + Embankment Area = 112,880 sf
- Area requiring site preparation = 217,195 sf – 112,880 sf = 104,315 sf

D.1.b Assumed Variables

- It is assumed that site preparation will be completed at a rate of approximately 0.5 acres per day at eight hours per day
- Only one piece of equipment will be used at any given time

D.1.c PM Emission Equations from Site Preparation of the Borrow/Fill Area

(See attached spreadsheet)

Proposed Average Emissions = Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/hr)

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/hr) × Total Hours Required to Complete the Task (hour/year) ÷ 2,000 lbs/ton

D. FUGITIVE EMISSIONS FROM BORROW/FILL AREA

D.1 Site Preparation of the Borrow/Fill Area (Bulldozing of Overburden)

Emission Factors:			
PM (lbs/hr)=	5.7*s^1.2/M^1.3		
PM-10 (lbs/hr) =	0.75*s^1.5/M^1.4		
PM-2.5 scaling factor =	0.105		
s (%) =	39.97		Source: Site Investigation Report, PJ Carey & Associates, September 2013
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
Total Borrow/Fill Area =	217,195	sf	
Staging Area and Embankment area already prepared =	112,880	sf	
Total area requiring site preparation =	104,315	sf	
Rate of site preparation =	0.5	acres/day	
	21,780	sf/day	
Total number of days required to complete the Task =	4.8	days	
Hours per day equipment is in use =	8	hours/day	
Total number of hours required to complete the Task =	38	hours	

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**12.30**	**0.24**	**12.30**	**0.24**
PM-10 =	**3.69**	**0.07**	**3.69**	**0.07**
PM-2.5 =	**1.29**	**0.02**	**1.29**	**0.02**

D.2 TRUCK DUMPING AND RELOADING OF EXCAVATED MATERIALS FROM A2

The emission factors are the same as that used in C.1. It is assumed that the soils excavated from Cell 2 will be stockpiled in the staging area. A portion of the stockpile will be reloaded for liner construction later in the year. Material from the stockpile will also be reloaded for use in Area Source A1 as discretionary cover.

D.2.a Known Variables

- Total volume of excavated materials from Cell 2 construction = 85,615 cy. This equals the volume of material that will be unloaded.
- Total Volume of Soil Liner Components = 25,977 cy
- Number of Operating Days per year = 307 days
- M = 16.66% (see note in C.1.a)
- Wet weight density of in-situ materials = 130.67 lbs/ft^3 (see note in C.1.a)

D.2.b Assumed Variables

- U = 7.85 mph (see note in C.1.b)
- Assumed daily rate of cover soil usage = 80 cy/day (see calculation for B.1)
- Assumed Average Hourly Production Rate = 300 ton/hour
- Assumed Maximum Hourly Production Rate = 500 ton/hour
- Volume of Materials Loaded = Volume of Materials Required for Soil Liner Components + Annual Volume of Cover Soil
- Total Volume of Materials Handled = Volume of Materials Unloaded + Volume of Materials Loaded

D.2.c PM-X Emission Equations for Truck Dumping of Soil Liner Components

(See attached spreadsheet)

<u>Proposed Average Emissions</u>

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/ton material handled) × Tons of Materials Handled (ton) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Average Hourly Production Rate (ton/hour)

Potential-to-Emit Emissions

Annually:
PM-X (tons/year) = same as proposed average emissions

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/ton material handled) × Maximum Hourly Production Rate (ton/hour)

D.2 Truck Dumping and Reloading of Excavated Materials From A2

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013

Emission Factors:

E-PM =	0.00021885	lbs/ton
E-PM-10 =	0.00010351	lbs/ton
E-PM-2.5 =	1.5674E-05	lbs/ton

Volume of Materials Excavated from Cell 2 =	85,615	cy	
Volume of Materials Required for Soil Liner Components =	25,977	cy	
Daily Rate of cover soil usage =	80	cy/day	
Number of operating days per year =	307	days/year	
Annual Volume of Cover Soil =	24,560	cy/year	
Total Volume of Materials Handled =	136,152	cy	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Ton of Materials Handled =	240,178	ton	
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

.

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.07**	**0.03**	**0.11**	**0.03**
PM-10 =	**0.03**	**0.01**	**0.05**	**0.01**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**

D.3 Truck Dumping and Reloading of Stone Materials from Offsite

The emission factors in Table 11.19.2-2 in AP-42, Section 11.19.2., Crushed Stone Processing and Pulverized Mineral Processing, August 2004 for truck unloading of fragmented stone and truck loading of crushed stone are assumed for these activities. Only factors for PM-10 are listed in the table; $E_{PM\text{-}10} = 1.6 \times 10^{-5}$ for truck unloading and $E_{PM\text{-}10} = 1.0 \times 10^{-4}$ for truck loading.

D.3.a Known Variables

- 2D Area of Cell 2 = 222,660 ft^3
- Thickness of Stone Drainage Layer = 2 ft (from standard double composite liner detail)

D.3.b Assumed Variables

- $E_{PM\text{-}2.5} = E_{PM\text{-}10}$ (a conservative upper limit)
- $E_{PM} = 3 \times E_{PM\text{-}10}$ (typical ratio for other factors listed in Table 11.19.2-2)
- Tonnage of stone loaded = Amount of stone required for Cell 2construction
  = 27,276 ton (see C.3 for related assumptions and calculation)
- Tonnage of stone unloaded = one half the amount of stone materials required for Cell 2 construction
  = 13,638 ton (see A.4 for related assumptions and calculation)
- As presented in Section A.4, average hourly stone delivery rate = 0.529 load/hour at 20 ton/load
- Assumed maximum hourly truck delivery rate (stone unloading) = 2 loads/hour at 20 ton/load
- Assumed average hourly production rate for truck loading = 80 ton/hour (one truck load every 15 minutes for four runs in one hour at 20 tons/load)
- Assumed maximum hourly production rate for truck loading = 140 ton/hour (one truck load approximately every 8 minutes for seven runs in one hour at 20 tons/load)

D.3.c PM-X Emission Equations Truck Dumping of Stone Liner Components

(See attached spreadsheet)

<u>Proposed Average Emissions</u>

Annually:

PM-X (tons/year) = ($E_{PM;X}$ for unloading (lbs/ton material handled) × Ton of Material Handled (ton)) + ($E_{PM;X}$ for loading (lbs/ton material handled) × Ton of Material Handled (ton)) ÷ 2,000 lbs/ton

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ for unloading (lbs/ton material handled) × Average stone unloading rate (ton/hour) + $E_{PM;X}$ for loading (lbs/ton material handled) × Average stone loading rate (ton/hour)

Potential-to-Emit Emissions

Annually:
PM-X (tons/year) = same as proposed average emissions

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ for unloading (lbs/ton material handled) × Maximum stone unloading rate + $E_{PM;X}$ for loading (lbs/ton material handled) × Maximum stone loading rate (ton/hour)

D.3 Truck Dumping & Reloading of Stone Materials from Offsite

Emission Factors: (lbs/ton of material throughput)

Source	*E*-PM	*E*-PM-10	*E*-PM-2.5
Truck Unloading – Fragmented Stone	0.000048	0.000016	0.000016
Truck Loading – Conveyor, Crushed Stone	0.0003	0.0001	0.0001

Ton of Materials Loaded =	27,276	ton
Ton of Materials Unloaded =	13,638	ton
Hourly stone delivery rate =	0.529	loads/hour
Weight of stone per load =	20	ton/load
Average Stone Unloading Rate =	10.57	ton/hour
Maximum Stone Delivery Rate =	40	ton/hour
Average hourly stone loading rate =	80	ton/hour
Maximum hourly stone loading rate =	140	ton/hour

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.02**	**0.00**	**0.04**	**0.00**
PM-10 =	**0.01**	**0.00**	**0.01**	**0.00**
PM-2.5 =	**0.01**	**0.00**	**0.01**	**0.00**

D.4 Bulldozing and Shaping of the Embankment/Screening Berm

The emission factors are the same as that used in B.2. The entire embankment/screening berm, along the western boundary of the Borrow/Fill Area is estimated to require 67,347 cy of soil. It is assumed that a portion of this area of the embankment will be built during the same year that the soil is excavated from Cell 2. The total volume of soils excavated from Cell 2 is estimated to be 85,615 cy. This soil will be used for soil liner in the construction of Cell 2 (estimated volume = 25,977 cy) and discretionary cover material in Cell 1 (24,560 cy/year at the estimated rate of 80 cy/day). The balance of remaining soils excavated (35,078 cy) is assumed to be used for the embankment/screening berm.

D.4.a Known Variables

- Operating hours per week = 57 hours
- *s* = 39.97% (see note in B.2.b)
- *M* = 16.66% (see note in C.1.a)
- Wet weight density of in-situ materials = 130.67 lbs/ft^3 (see note in C.1.a)

D.4.b Assumed Variables

- Average hourly production rate = 300 ton/hour
- Only one piece of equipment will be used at any given time

D.4.c PM Emission Equations for Bulldozing and Shaping of the Embankment/Screening Berm

(See attached spreadsheet)

Proposed Average Emissions = Potential-to-Emit Emissions:

Hourly:
PM-X (lbs/hr) = $E_{PM;X}$ (lbs/hr)

Annually:
PM-X (tons/year) = $E_{PM;X}$ (lbs/hr) × Total Hours Required to complete Task (hour/year) ÷ 2,000 lbs/ton

D.4 Bulldozing and Shaping of the Embankment/Screening Berm

Emission Factors:			
PM (lbs/hr)=	5.7*s^1.2/M^1.3		
PM-10 (lbs/hr) =	0.75*s^1.5/M^1.4		
PM-2.5 scaling factor =	0.105		
s (%) =	39.97		Source: Site Investigation Report, PJ Carey & Associates, September 2013
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
Average Hourly Production Rate =	300	ton/hour	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Volume of Materials Handled =	35,078	cy	
Total Weight of Materials Handled =	61,879	ton	
Total Hours Required to Complete Task =	206	hours (at average hourly production rate)	

Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**12.30**	**1.27**	**12.30**	**1.27**
PM-10 =	**3.69**	**0.76**	**3.69**	**0.76**
PM-2.5 =	**1.29**	**0.13**	**1.29**	**0.13**

D.1 + D.2 + D.3 + D.4

TOTAL FOR SOURCE AREA A3 (Borrow/Fill Area)				
Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**24.68**	**1.53**	**24.75**	**1.53**
PM-10 =	**7.42**	**0.85**	**7.45**	**0.85**
PM-2.5 =	**2.60**	**0.16**	**2.60**	**0.16**

E FUGITIVE EMISSIONS FROM C&D PROCESSING AREA

A4 on Figure B-1 is an area source of fugitive particulate emissions from C&D processing operations within the recycling facility. C&D processing operations proposed for the Carroll Landfill include crushing using an impact crusher, screening using a shaker screen, and movement of processed materials using a stacking conveyor and trucks. Concrete aggregate and wood waste are the two primary components of the C&D processing operation. Particulate emissions from C&D processing activities are estimated using AP-42, Section 11.19.2., Crushed Stone Processing and Pulverized Mineral Processing, August 2004. The emission factors detailed in this section are most appropriate for the processing of concrete aggregate, but can be considered a conservative maximum for wood waste processing as well. The proposed design of the C&D processing operation includes a dust suppression system; therefore, controlled emission factors are used in the calculations for proposed average emissions. Potential-to-emit emissions estimates use the uncontrolled emission factors. Emission factors for truck unloading of fragmented stone were used to represent the receipt of recyclable materials at the C&D processing operation, while emission factors for truck loading – conveyor, crushed stone were used to represent movement of processed materials offsite.

Source	**Emission Factors (lbs/ton of material throughput)**		
	E_{PM}	E_{PM-10}	$E_{PM-2.5}$
Crushing	0.0054	0.0024	0.0024[1]
Crushing (controlled)	0.0012[2]	0.00054[2]	0.00010[2]
Screening	0.025	0.0087	0.0087[1]
Screening (controlled)	0.0022	0.00074	0.000050
Conveyor Transfer Point	0.0030	0.0011	0.0011[1]
Conveyor Transfer Point (controlled)	0.00014	0.000046	0.000013
Truck Unloading – Fragmented Stone	0.000048[3]	0.000016	0.000016[1]
Truck Loading – Conveyor, Crushed Stone	0.0003[3]	0.0001	0.0001[1]

[1] E_{PM-10} used as an upper limit
[2] Tertiary crushing used as upper limit as suggested in Table 11.19.9-2.
[3] No Data listed in Table 11.19.9-2.; Assumed $E_{PM-10} \times 3$ which is typical of the other sources

E.1 KNOWN VARIABLES

- C&D Processing Operation Typical Throughput = 160 ton/day
- C&D Processing Operation Maximum Design Throughput = 320 ton/day
- Area Source A4 = 4.89 acres

E.2 PM-X Emission Equations from C&D Processing Operations

(See attached spreadsheet)

Proposed Average Emissions

Annually:

$$\text{PM-X}_{AVE}\text{ (tons/yr)} = [E_{\text{PM-X, crushing, controlled}} + E_{\text{PM-X, screening, controlled}} + E_{\text{PM-X, conveyor transfer point, controlled}} + E_{\text{PM-X, truck unloading}} + E_{\text{PM-X, truck loading}}]\text{ (lbs/ton material throughput)} \times \text{Typical throughput (tons/day)} \times 307\text{ operating days/year} \div 2{,}000\text{ lbs/ton}$$

Hourly:

$$\text{PM-X}_{AVE}\text{ (lbs/hour)} = \text{PM-X}_{AVE}\text{ (tons/yr)} \div 2{,}912\text{ Facility Operating hours/year} \times 2{,}000\text{ lbs/ton}$$

Potential-to-Emit Emissions

Annually:

$$\text{PM-X}_{PTE}\text{ (tons/yr)} = [E_{\text{PM-X, crushing}} + E_{\text{PM-X, screening}} + E_{\text{PM-X, conveyor transfer point}} + E_{\text{PM-X, truck unloading}} + E_{\text{PM-X, truck loading}}]\text{ (lbs/ton material throughput)} \times \text{Maximum throughput (tons/day)} \times 307\text{ operating days/year} \div 2{,}000\text{ lbs/ton}$$

Hourly:

$$\text{PM-X}_{PTE}\text{ (lbs/hour)} = [E_{\text{PM-X, crushing}} + E_{\text{PM-X, screening}} + E_{\text{PM-X, conveyor transfer point}} + E_{\text{PM-X, truck unloading}} + E_{\text{PM-X, truck loading}}]\text{ (lbs/ton material throughput)} \times \text{Maximum throughput (tons/day)} \div 7\text{ Minimum \# operating hours/day (on Saturdays)}$$

E. FUGITIVE EMISSIONS FROM C&D PROCESSING AREA

C&D Processing Facility Typical Throughput =	160	ton/day
C&D Processing Facility Maximum Throughput =	320	ton/day
Operating Days/year =	307	
Operating Hours/year =	2,912	
Minimum # of Operating Hours/day =	7	

Emission Factors: (lbs/ton of material throughput)

Source	*E* -PM	*E* -PM-10	*E* -PM-2.5
Crushing	0.0054	0.0024	0.0024
Crushing (controlled)	0.0012	0.00054	0.0001
Screening	0.025	0.0087	0.0087
Screening (controlled)	0.0022	0.00074	0.00005
Conveyor Transfer Point	0.003	0.0011	0.00111
Conveyor Transfer Point (controlled)	0.00014	0.000046	0.000013
Truck Unloading – Fragmented Stone	0.000048	0.000016	0.000016
Truck Loading – Converyor, Crushed Stone	0.0003	0.0001	0.0001

TOTAL FOR SOURCE AREA A4 (CDPO)				
Emissions:	**Proposed Average**		**Potential-to-Emit**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.07**	**0.10**	**1.54**	**1.66**
PM-10 =	**0.02**	**0.04**	**0.56**	**0.60**
PM-2.5 =	**0.00**	**0.01**	**0.56**	**0.61**

APPENDIX C

Calculation of Emission Estimates from the Stationary Compression Ignition Internal Combustion Engines

(Emission Point 04)

Calculation of Emissions Estimates from Stationary Compression Ignition Internal Combustion Engines (Emission Point 04)

The Carroll Landfill's proposed Recycling Facility includes four pieces of equipment that employ compression ignition internal combustion engines; tub grinder, impact crusher, shaker screen, and staking conveyor. Emissions from these engines were estimated using the Tier 4 final emissions standards, as these are the standards that will be in effect at the time the proposed facility commences (assumed to be 2017). All equipment is assumed to be purchased new.

The only pollutants not covered by the new NSPS emissions standards are sulfur dioxide (SO_2) and total hazardous air pollutants (HAPs). To calculate emissions for SO_2, an emission factor was taken from Chapter 3.4 of AP-42 (*Large Stationary Diesel and all Stationary Dual-fuel Engines*, October 1996) which is dependant on the level of sulfur in the fuel; 0.00809 × % sulfur. Starting in October of 2010, §80.510(b) capped the sulfur content of diesel fuel used in nonroad engines at 15 ppm down considerably from 500 ppm. Given its dependence on the sulfur content of the fuel, the emission factor from Chapter 3.4 was believed to be a more accurate account of actual emissions today than the emission factor from AP-42 Chapter 3.3 (*Gasoline and Diesel Industrial Engines*, October 1996) which is not dependant on the sulfur content of the fuel. Therefore, the emission factor from Chapter 3.4 was applied to all four engines regardless of size.

To calculate an emission estimate for HAPs, emission factors were take from a Memorandum, *Emissions Reduction Associated with NSPS for Stationary CI ICE*, written by Alpha-Gamma Technologies, Inc. to the US EPA dated June 3, 2005 and available on the US EPA's website[1]. This memorandum briefly describes how the US EPA used emission factors published in AP-42 for HAPs as Tier 1 level emissions and derived new emission factors for each successively stricter tier. The resulting Tier 4 final emission factors were provided in Table A-5 of this memorandum.

A. EQUIPMENT ENGINE INFORMATION

Equipment	Engine Rating, HP (kW)	Proposed Usage, hours/year	Maximum Usage, hours/year
Tub Grinder	1050 (782)	247	371
Impact Crusher	300 (224)	1,281	1,922
Shaker Screen	84 (62)	2,126	2,912
Staking Conveyor	48 (35)	1,602	2,403

The proposed usage is based on the anticipated waste acceptance for the recycling facility and the estimated production rates of the equipment based on manufacturer's information. The maximum usage is assumed to be 50% greater than proposed up to the maximum number of facility operating hours (2,912 hours per year).

[1] http://www.epa.gov/airtoxics/icengines/docs/emission_reduction_ci_nsps.pdf; Accessed on November 14, 2013.

B. CALCULATION OF HOURLY EMISSION RATE

(See Attached Spreadsheet.)
NOTE: The proposed average and potential-to-emit hourly emission rates are the same.

All Pollutants except for SO_2 and HAPs:

$$E_{P_{hr}} = \sum (ES_P \times kW \div CF)$$

where, E_{Phr} = hourly emissions rate for pollutant P (lbs/hr)
ES_P = emission standard for pollutant P (g/kW-hr)
kW = engine rating (kW)
CF = conversion factor (453.59 g/lb)

SO_2:

$$E_{SO2_{hr}} = \sum (EF_{SO2} \times \%S \times HP)$$

where, E_{SO2hr} = hourly emissions rate for SO_2 (lbs/hr)
EF_{SO2} = emission factor for SO_2 (0.00809 lb/HP-hr)
$\%S$ = percent sulfur in diesel fuel (15ppm = 0.0015%)
HP = engine rating (HP)

HAPs:

$$E_{HAP_{hr}} = \sum (EF_{HAP} \times HP \div CF)$$

where, E_{HAPhr} = hourly emissions rate for HAPs (lbs/hr)
EF_{HAP} = emission factor for HAPs (g/HP-hr)
HP = engine rating (HP)
CF = conversion factor (453.59 g/lb)

C. CALCULATION OF ANNUAL EMISSION RATES

(See Attached Spreadsheet.)

- **Proposed Average Annual Emissions Rate:**

$$E_{P_{yr}} = E_{P_{hr}} \times \text{Estimated \# of Annual Operating Hours} \div 2{,}000 \text{ lb/ton}$$

where, E_{Pyr} = annual emissions rate for pollutant P (tons/year)

- **<u>Potential-to-Emit Annual Emissions Rate</u>:**

$$E_{P_{yr}} = E_{P_{hr}} \times \text{ Maximum \# of Operating Hours} \div 2{,}000 \text{ lb/ton}$$

where, E_{Pyr} = annual emissions rate for pollutant P (tons/year)

Appendix C
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Stationary Internal Combustion Engine Emissions Estimates

Equipment	Engine Power Rating		Equipment Usage	
			Proposed Average	Maximum
	HP	kW	hours/yr	hours/yr
Tub Grinder	1050	782	247	371
Impact Crusher	300	224	1,281	1,922
Shaker Screen	84	62	2,126	2,912
Stacking Conveyor	48	35	1,602	2,403

Regulated Air Pollutants

CO

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate	
			Proposed Average	Potential-to-Emit
	g/kW-hr	lbs/hr	tons/yr	tons/yr
Tub Grinder	3.5	6.03	0.75	1.12
Impact Crusher	3.5	1.73	1.11	1.66
Shaker Screen	5	0.68	0.73	1.00
Stacking Conveyor	5.5	0.42	0.34	0.51
TOTAL		**8.87**	**2.92**	**4.28**

NOx

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate	
			Proposed Average	Potential-to-Emit
	g/kW-hr	lbs/hr	tons/yr	tons/yr
Tub Grinder	3.5	6.03	0.75	1.12
Impact Crusher	0.4	0.20	0.13	0.19
Shaker Screen	0.4	0.05	0.06	0.08
Stacking Conveyor*	3.572	0.28	0.22	0.33
TOTAL		**6.56**	**1.15**	**1.72**

*The applicable Tier 4 final Emission Standard for this engine is the sum of NOx and NMHCs = 4.7 g/kW-hr. A ratio of NOx to NMHC of 76:24% was assumed based on the linear relationship of NOX to NMHC from Table 1 of Subpart IIII, Table 1 from 40 CFR 89.112, to Tables 4, 5, and 6 from 40 CFR 1039.102.

PM-10 (PM-2.5)*

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate	
			Proposed Average	Potential-to-Emit
	g/kW-hr	lbs/hr	tons/yr	tons/yr
Tub Grinder	0.04	0.069 (0.067)	0.009 (0.008)	0.013 (0.012)
Impact Crusher	0.02	0.010 (0.010)	0.006 (0.006)	0.009 (0.009)
Shaker Screen	0.02	0.003 (0.003)	0.003 (0.003)	0.004 (0.004)
Stacking Conveyor	0.03	0.002 (0.002)	0.002 (0.002)	0.003 (0.003)
TOTAL		**0.08 (0.08)**	**0.02 (0.02)**	**0.03 (0.03)**

*All PM assumed to be < 10um and PM-2.5 is assumed to be 97% of PM-10
per Alpha-Gamma Technologies, Inc. Memorandum, June 3, 2005.

Appendix C
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

NMHC (Total VOCs)

Equipment	Tier 4 final Emission Standard g/kW-hr	Hourly Emission Rate lbs/hr	Annual Emission Rate Proposed Average tons/yr	Potential-to-Emit tons/yr
Tub Grinder	0.19	0.33	0.04	0.06
Impact Crusher	0.19	0.09	0.06	0.09
Shaker Screen	0.19	0.03	0.03	0.04
Stacking Conveyor*	1.128	0.09	0.07	0.10
TOTAL		**0.53**	**0.20**	**0.29**

*The applicable Tier 4 final Emission Standard for this engine is the sum of NOx and NMHCs = 4.7 g/kW-hr. A ratio of NOx to NMHC of 76:24% was assumed based on the linear relationship of NOX to NMHC from Table 1 of Subpart IIII, Table 1 from 40 CFR 89.112, to Tables 4, 5, and 6 from 40 CFR 1039.102.

SO_2

Equipment	AP-42, Ch. 3.4 Emission Factor lb/HP-hr	Hourly Emission Rate lbs/hr	Annual Emission Rate Proposed Average tons/yr	Potential-to-Emit tons/yr
Tub Grinder	1.21E-05	0.013	0.002	0.002
Impact Crusher	1.21E-05	0.004	0.002	0.003
Shaker Screen	1.21E-05	0.001	0.001	0.001
Stacking Conveyor	1.21E-05	0.001	0.0005	0.001
TOTAL		**0.02**	**0.01**	**0.01**

Total HAPs

Equipment	2005 Memo* Emission Factor g/HP-hr	Hourly Emission Rate lbs/hr	Annual Emission Rate Proposed Average tons/yr	Potential-to-Emit tons/yr
Tub Grinder	1.79E-02	0.041	0.005	0.008
Impact Crusher	2.53E-02	0.017	0.011	0.016
Shaker Screen	9.84E-03	0.002	0.002	0.003
Stacking Conveyor**	9.84E-03	0.001	0.001	0.001
TOTAL		**0.06**	**0.02**	**0.03**

*Memorandum, *Emission Reduction Associated with NSPS for Stationary CI ICE*, from Tanya Parise of Alpha-Gamma Technologies, Inc. to Sims Roy, EPA OQAPS ESD Combustion Group, dated June 3, 2005
**Stacking Conveyor power rating rounded up to 50 HP.

APPENDIX D

Calculation of Emission Estimates from the Waste Oil Space Heaters

(Emission Point 05)

Calculation of Emission Estimates from the Waste Oil Space Heater (Emission Point 05)

The Carroll Landfill is expected to install two waste oil space heaters to heat the maintenance building. Emissions from waste oil combustion units can be estimated using the emissions factors presented in AP-42, Section 1.11, October 1996. The burner type that was chosen and sized for the Carroll Landfill is an atomizing burner and the emission factors used below reflect this burner type.

A. COMPOSITION OF WASTE OIL

The following contaminant percentages for ash and sulfur of waste oil were taken from Table 2-1. of "Emission Factor Documentation for AP-42 Section 1.11 – Waste Oil Combustion" prepared by Edward Aul & Associates, Inc. and E.H. Pechan & Associates, Inc., April 1993. The information for lead was updated with data taken in 1994 and reported in "Toxicological Profile for Used Mineral-Based Crankcase Oil" prepared by U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, September 1997.

- % Ash (A) = 0.65%
- % Sulfur (S) = 0.50%
- % Lead (L) = 0.0048%

B. COMBUSTION UNIT INFORMATION

- Rated Fuel Usage (*F*) = 2.4 gallons/hour (per heater per the manufacturer)
- Estimated # of Operating Hours = 5,088 hours/year
  (Based on area temperatures from the Jamestown Airport acquired from NOAA, seven months per year (Oct. thru April) the temperature is < 55ºF. It was assumed that the heaters will be used 24 hours per day every day during these months.)
- Maximum # of Operating Hours = 8,760 hours/year (year round, 24/7)

C. CALCULATION OF HOURLY EMISSION RATE

NOTE: The proposed average and potential-to-emit hourly emission rates are the same.

$$E_{P_{hr}} = EF_P \times F/1000 \times 2 Heaters$$

where,

E_{Phr} = hourly emission rate for pollutant P (lbs/hr)
EF_P = emission factor (lbs/1,000 gallons of fuel burned)
F = rate fuel usage (gal/hr)

D. CALCULATION OF ANNUAL EMISSION RATE

Proposed Average Annual Emission Rate:

$$E_{P_{yr}} = E_{P_{hr}} \times \text{ Estimated \# of Operating Hours} \times 1 \text{ ton/2,000 lbs}$$

where, E_{Pyr} = annual emissions rate for pollutant P (tons/year)

Potential-to-Emit Annual Emission Rate:

$$E_{P_{yr}} = E_{P_{hr}} \times \text{ Maximum \# of Operating Hours} \times 1 \text{ ton/2,000 lbs}$$

where, E_{Pyr} = annual emissions rate for pollutant P (tons/year)

Waste Oil Space Heaters Emission Estimates

Rated Fuel Usage per Heater =	2.4	gal/hr
Est. Annual Operating Hours =	5,088	hr
Maximum Annual Operating Hours =	8,760	hr
Number of Heaters Required =	2	

Waste Oil Components:

% Ash (A)	0.65	%
% Sulfur (S)	0.50	%
% Lead (L)	0.0048	%

Pollutant	Emission Factor lbs/1,000gal burned	Hourly Emission Rate lbs/hr	Annual Emission Rate Proposed Average tons/yr	Annual Emission Rate Potential-to-Emit tons/yr
Regulated Air Pollutants				
CO	2.1	0.0101	0.0256	0.0442
NOx	16	0.0768	0.1954	0.3364
PM	66A = 42.9	0.2059	0.5239	0.9019
PM-10	57A = 37.05	0.1778	0.4524	0.7789
SOx	107S = 53.5	0.2568	0.6533	1.1248
TOC (Assumed = total VOCs)	1	0.0048	0.0122	0.0210
Hazardous Air Pollutants				
Antimony	4.5E-03	0.000022	0.000055	0.000095
Arsenic	6.0E-02	0.000288	0.000733	0.001261
Beryllium	1.8E-03	0.000009	0.000022	0.000038
Cadmium	1.2E-02	0.000058	0.000147	0.000252
Chromium	1.8E-01	0.000864	0.002198	0.003784
Cobalt	5.2E-03	0.000025	0.000063	0.000109
Dibutylphthalate	3.4E-05	1.63E-07	4.15E-07	7.15E-07
Lead	50L = 0.24	0.001152	0.00293	0.0050
Manganese	5.0E-02	0.000240	0.000611	0.001051
Naphthalene	9.2E-05	4.42E-07	1.12E-06	1.93E-06
Nickel	1.6E-01	0.000768	0.001954	0.003364
Phenol	2.8E-05	1.34E-07	3.42E-07	5.89E-07
Total HAPs		**0.00**	**0.01**	**0.02**
Greenhouse Gas Emissions				
CO_2	22,000	106	269	463

APPENDIX E

Calculation of Emission Estimates from the Electric Arc Welder

(Emission Point 06)

Calculation of Emission Estimates from the Electric Arc Welder (Emission Point 06)

The Carroll Landfill is expected to employ an electric arc welder in the maintenance building. Emissions from the electric arc welder can be estimated using the emission factors presented in AP-42, Section 12.19, January 1995. Emissions depend on the type of welding used and the types and quantities of electrodes consumed. The type of arc welding is assumed to be shielded metal arc welding (SMAW) as it is the most common, according to AP-42. A hypothetical electrode composition and consumption rate was assembled based on reported information from another facility with a landfill.

A. COMPOSITION OF ELECTRODE CONSUMPTION

The following electrode types and consumption rates were assumed.

Electrode Type	Consumption Rate (lb/yr)
E7018	50
E6013	25
E6010	10
E6011	10
ENi-Cu	1

B. CALCULATION OF ANNUAL EMISSION RATES

NOTE: The proposed average and potential-to-emit hourly emission rates are the same.

$$E_{P_{yr}} = EF_P \times {EC}/{1000} \div 2{,}000 lbs/ton$$

where, E_{Pyr} = annual emission rates for pollutant P (ton/yr)
EF_P = emission factor (lbs/1,000 lbs of electrode consumed)
EC = mass of electrode consumed (lbs/yr)

C. HOURLY EMISSION RATES

Hourly emission rates were not calculated for this source. Due to the extreme variability in welding operations, estimation of this number was considered impractical.

Welding Operations Emission Estimates

Electrode Type	Consumption Rate (lbs/yr)	Pollutant Emissions Factors (lbs/1,000lbs of electrode consumed)							Estimated Annual Emissions (tons/yr)						
		PM-10	Cr	Cr (VI)	Co	Mn	Ni	Pb	PM-10	Cr	Cr (VI)	Co	Mn	Ni	Pb
E7018	50	18.4	0.06	ND	<0.01	10.3	0.02	ND	4.60E-04	1.50E-06	ND	<5.00E-08	2.58E-04	5.00E-07	ND
E6013	25	19.7	0.04	ND	<0.01	9.45	0.02	ND	2.46E-04	5.00E-07	ND	<5.00E-08	1.18E-04	2.50E-07	ND
E6010	10	25.6	0.03	0.01	ND	9.91	0.04	ND	1.28E-04	1.50E-07	5.00E-08	ND	4.96E-05	2.00E-07	ND
E6011	10	38.4	0.05	ND	0.01	9.98	0.05	ND	1.92E-04	2.50E-07	ND	5.00E-08	4.99E-05	2.50E-07	ND
ENi-Cu	1	10.1	ND	ND	ND	2.12	4.23	ND	5.05E-06	ND	ND	ND	1.06E-06	2.12E-06	ND
TOTAL									**1.03E-03**	**2.40E-06**	**5.00E-08**	**5.00E-08**	**4.76E-04**	**3.32E-06**	**ND**
								lbs/yr =	2.06	< 0.01	< 0.01	< 0.01	0.95	0.01	

ND = No data.

APPENDIX F

Calculation of Emission Estimates from the Leachate Storage Tank

(Emission Point 07)

Calculation of Emission Estimates from the Leachate Storage Tank (Emission Point 07)

A. ASSUMPTIONS

- Leachate composition is mostly water. Water is assumed to makeup 98% with the remaining 2% partitioned among several volatile compounds. With one exception, the volatile compounds are classified as a volatile organic compound (VOC), a hazardous air pollutant (HAP), or both. Acetone is the one exception. Acetone is not a HAP and is not classified as a VOC per the definition in 6 NYCRR 200.1(cg)(29). Methylene chloride and Tetrachloroethylene also are specifically exempt from the definition of a VOC per 200.1(cg)(10) and (30), respectively.

- Several references[1] were combined to construct a hypothetical composition of volatile compounds in C&D leachate. The hypothetical composition is based conservatively on the maximum concentration value in the detected ranges reported. The designation of each compound as a VOC and/or HAP is denoted in the list below by a V and/or H flowing the compound name.

  The top 5 major volatile compounds in landfill gas according to the LandGEM model account for approximately 62% of the total gas emissions. The compounds estimated to be in landfill gas were redistributed, keeping their same ratios to derive the following leachate composition:

  Water………...................................98.0000%
  p-Cresol, V……..............................0.7966%
  Acetone 0.7127%
  Methyl Ethyl Ketone, V/H...............0.3494%
  Toluene, V/H....................................0.0335%
  Isopropanol, V…..............................0.0277%
  o-Cresol, V.......................................0.0182%
  Xylenes, V/H…..............................0.0116%
  Ethanol, V……... ....0.0116%
  Naphthalene, V/H 0.0088%
  Methylene Chloride, H.....................0.0084%
  Hexane, V/H……... ....0.0059%

[1] Where available, data specific to C&D debris landfill leachate was used. The two references from which the majority of data was taken include ICF (1995) and Townsend *et al*. (2000) (see report Section 6.0 for full references). Three additional parameters (isopropanol, ethanol, and hexane) are known components of municipal solid waste landfills that were not analyzed for in the C&D references. These parameters were added to the hypothetical composition from the reference EPA 530/SW-87/028F by scaling to toluene (a component listed in both this reference and ICF (1995). Xylene (mixed) another common compound, was used to validate the addition of compounds in this manner. The value of xylene (mixed) estimated by scaling from toluene was nearly the same as the ICF (1995) value (83.5 ppb versus 85.0 ppb).

Dichloroethane (1,2), V 0.0036%
Trichloroethane, V/H......................0.0028%
Ethylbenzene, V/H..........................0.0025%
Carbon disulfide, V/H.....................0.0021%
1,2,4-Trimethylbenzene, V 0.0014%
Dichloroethane (1,1), V/H 0.0009%
Tetrachloroethylene, H 0.0007%
Dichloroethylene (trans-1,2), V 0.0006%
Chloroform, V/H.............................0.0004%
Benzene, V/H..................................0.0004%
Dichloroethylene (cis-1,2), V 0.0002%
Styrene, V 0.0002%

- Average, Minimum, and Maximum Temperatures:

  The average (57.3°F), minimum (48.8°F), and maximum (65.8°F) daily liquid surface temperatures were estimated using the TANKS 4.0.9d program. Input parameters that influenced the estimation of these temperatures were selection of Erie, Pennsylvania as the closest major city listed and the tank color and condition. The actual tank color will be cobalt blue and since the tank will be either new or newly refurbished it is assumed to be in good condition. Since blue is not a listed option, a medium shade of gray was selected as a reasonable representation.

B. LEACHATE MOLECULAR WEIGHT

- Molecular weight of individual compounds: See Spreadsheet

- Leachate molecular weight, $MW_{\text{LEACH}} = \sum(MW_i \times \%_i) = 19.292$ g/mol

  where, MW_i = molecular weight of component i, g/mol
  $\%_i$ = percentage of component i

C. LIQUID MOLE FRACTION OF INDIVIDUAL COMPONENTS

- Liquid mole fraction, $\chi_i = \dfrac{MW_i \times \%_i}{MW_{LEACH}}$, See Spreadsheet

D. PARTIAL PRESSURES

- Vapor Pressures of individual components at temperatures of concern: See Spreadsheet

  The vapor pressure of water was taken from Perry's Chemical Engineer's Handbook, 6th edition, 1984). The vapor pressures of the volatile compounds were estimated using the computer program, TANKS 4.0.9d.

- Partial Pressures of individual components at temperatures of concern: See Spreadsheet

  Partial Pressure = $P_i \times \chi_i$

  where, P_i = vapor pressure of individual component i at average, minimum, and maximum expected temperatures

E. LEACHATE VAPOR PRESSURE

Vapor pressure of the leachate, psi = $\sum P_i \times \chi_i$ = 0.2985 psi @ 57.3°F
= 0.2160 psi @ 48.8°F
= 0.3828 psi @ 65.8°F

F. LEACHATE TANK INFORMATION

The leachate tank will be a glass-fused-to-steel, above ground tank (Aquastore or equivalent). It will be cobalt blue in color with a gray dome roof. The tank will have the following dimensions:

- Shell Diameter = 31 ft
- Tank Height = 29 ft
- Maximum Liquid Height = 28.4 ft (assumed as 98% of tank height)
- Average Liquid Height = 14.2 ft (assumed as half maximum liquid height)
- Working volume was calculated by the TANKS program
- Roof dome radius = tank diameter (default)
- Breather Vent Vacuum setting = - 0.03 psig (default)
- Breather Vent Pressure setting = 0.03 psig (default)

G. LEACHATE TANK THROUGHPUT ESTIMATE

Thirteen, 90-day scenarios were run based on the phasing plan. The maximum leachate generation rate was estimated to be 2,064,368 gallons. See the latest version of the Carroll Landfill Engineering Report for details on this calculation.

Leachate Tank Throughput = $\frac{2{,}064{,}368\,gal}{90\,day} \times \frac{365\,day}{year}$ =~8,372,000 gal/year

H. LEACHATE TANK EMISSION

- **Annual Emission Rate**

  The output of the computer program TANKS 4.0.9d is annual emissions in lbs/year. See attached TANKS 4.0.9d Emissions Report. Note that the "Unidentified Components" in the TANKS 4.0.9d Emissions Report are the 98% water and the associated losses from the "Unidentified Components" are water vapor, not volatile organics.

- **Hourly Emission Rate (lbs/hr)**

  = (Annual Emission Rate, lbs/year)$\left(\frac{1\,year}{8{,}760\,hours}\right)$

  See attached spreadsheet.

Assume leachate composition is 98% water & 2% trace compounds in the ratio indicated by the hypothetical mixture

Hypothetical mixture used

Trace Compounds	ug/L (ppb)	%
p-Cresol	5700	0.7966%
Acetone	5100	0.7127%
Metyl Ethyl Ketone	2500	0.3494%
Toluene	240	0.0335%
Isopropanol	198	0.0277%
o-Cresol	130	0.0182%
Xylene (total)	83	0.0116%
Ethanol	83	0.0116%
Naphthalene	63	0.0088%
Methlyene Chloride	60	0.0084%
Hexane	42	0.0059%
Dichloroethane (1,2)	26	0.0036%
Trichloroethene	20	0.0028%
Ethylbenzene	18	0.0025%
Carbon disulfide	15	0.0021%
1,2,4-trimethylbenzene	9.7	0.0014%
Dichloroethane (1,1)	6.2	0.0009%
Tetrachloroethene	4.8	0.0007%
Dichloroethylene (trans-1,2)	4	0.0006%
Chloroform	3	0.0004%
Benzene	2.7	0.0004%
Dichloroethylene (cis-1,2)	1.4	0.0002%
Styrene	1.1	0.0002%
TOTAL	14310.9	2.0000%

Landfill Leachate Tank Emissions Estimates

Assumed Composition of Landfill Leachate:		Molecular Weight (g/mol)	MWi*%i	Liquid Mole Fraction	Vapor Pressure, psi			Partial Pressure, psi		
					@ 57.3ºF	@ 65.8ºF	@ 48.8ºF	@ 57.3ºF	@ 65.8ºF	@ 48.8ºF
Water	98.0000%	18	17.64	91.436%	0.233337	0.3147	0.1699212	2.134E-01	2.878E-01	1.554E-01
p-Cresol	0.7966%	108.1	0.8611198	4.464%	0.0005	0.0009	0.0003	2.232E-05	4.017E-05	1.339E-05
Acetone	0.7127%	58.08	0.4139614	2.146%	2.7294	3.3933	2.1765	5.857E-02	7.281E-02	4.670E-02
Metyl Ethyl Ketone	0.3494%	72.1	0.2519059	1.306%	0.9995	1.2783	0.7733	1.305E-02	1.669E-02	1.010E-02
Toluene	0.0335%	92.13	0.0309012	0.160%	0.3032	0.3945	0.2305	4.857E-04	6.319E-04	3.692E-04
Isopropanol	0.0277%	60.09	0.0166276	0.086%	0.4346	0.315	0.592	3.746E-04	2.715E-04	5.102E-04
o-Cresol	0.0182%	108.14	0.0196468	0.102%	0.0015	0.0025	0.0009	1.528E-06	2.546E-06	9.165E-07
Xylene (total)	0.0116%	106.17	0.0123152	0.064%	0.0821	0.1105	0.0602	5.241E-05	7.054E-05	3.843E-05
Ethanol	0.0116%	46.07	0.0053439	0.028%	0.5989	0.8006	0.4431	1.659E-04	2.218E-04	1.227E-04
Naphthalene	0.0088%	128.2	0.0112873	0.059%	0.0022	0.0032	0.0015	1.287E-06	1.872E-06	8.776E-07
Methlyene Chloride	0.0084%	84.94	0.0071224	0.037%	5.2833	6.4501	4.2966	1.951E-03	2.381E-03	1.586E-03
Hexane	0.0059%	86.17	0.0050579	0.026%	1.7822	2.2206	1.4177	4.672E-04	5.822E-04	3.717E-04
Dichloroethane (1,2)	0.0036%	98.97	0.0035962	0.019%	0.8747	1.1141	0.68	1.630E-04	2.077E-04	1.268E-04
Trichloroethene	0.0028%	131.4	0.0036727	0.019%	0.7544	0.9723	0.5785	1.436E-04	1.851E-04	1.101E-04
Ethylbenzene	0.0025%	106.17	0.0026708	0.014%	0.0987	0.1324	0.0726	1.366E-05	1.833E-05	1.005E-05
Carbon disulfide	0.0021%	76.13	0.0015959	0.008%	4.5194	5.4721	3.7058	3.739E-04	4.527E-04	3.066E-04
1,2,4-trimethylbenzene	0.0014%	120.19	0.0016293	0.008%	0.0183	0.0257	0.0129	1.546E-06	2.170E-06	1.089E-06
Dichloroethane (1,1)	0.0009%	98.97	0.0008575	0.004%	2.7224	3.4055	2.1742	1.210E-04	1.514E-04	9.664E-05
Tetrachloroethene	0.0007%	165.83	0.0011124	0.006%	0.1894	0.2496	0.1421	1.092E-05	1.439E-05	8.194E-06
Dichloroethylene (trans-1,2)	0.0006%	96.95	0.000542	0.003%	4.06	4.9674	3.2923	1.141E-04	1.395E-04	9.249E-05
Chloroform	0.0004%	119.39	0.0005006	0.003%	2.2653	2.8348	1.7915	5.878E-05	7.355E-05	4.648E-05
Benzene	0.0004%	78.11	0.0002947	0.002%	1.0827	1.3687	0.8482	1.654E-05	2.091E-05	1.296E-05
Dichloroethylene (cis-1,2)	0.0002%	96.95	0.0001897	0.001%	2.4897	3.1279	1.9422	2.448E-05	3.075E-05	1.910E-05
Styrene	0.0002%	104.15	0.0001601	0.001%	0.0653	0.0878	0.0479	5.419E-07	7.287E-07	3.975E-07
TOTAL	100.0000%									
							Leachate Vapor Pressure =	0.2895	0.3828	0.2160
		Leachate Molecular Weight =	19.292111							

Vapor Pressure of Water (Perry's)

F	C	mmHg W-vp	psi
57.3	14.1	12.065	0.2333371
65.8	18.8	16.272	0.31470048
48.8	9.3	8.786	0.16992124

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt. 07
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	Above Ground 161k gallon tank for the collection and storage of landfill leachate.

Tank Dimensions

Shell Height (ft):		29.00
Diameter (ft):		31.00
Liquid Height (ft) :		28.40
Avg. Liquid Height (ft):		14.20
Volume (gallons):		160,348.46
Turnovers:		49.17
Net Throughput(gal/yr):		8,372,000.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome	
Height (ft)		9.00
Radius (ft) (Dome Roof)		31.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt. 07 - Vertical Fixed Roof Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
C&D Debris Landfill Leachate	All	57.29	48.77	65.80	52.23	0.2895	0.2160	0.3828	19.2920			19.29	
1,2,4-Trimethylbenzene						0.0183	0.0129	0.0257	120.1900	0.0001	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Acetone						2.7294	2.1765	3.3933	58.0800	0.0215	0.2023	58.08	Option 2: A=7.117, B=1210.595, C=229.664
Benzene						1.0827	0.8482	1.3687	78.1100	0.0000	0.0001	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Carbon disulfide						4.5194	3.7058	5.4721	76.1300	0.0001	0.0012	76.13	Option 2: A=6.942, B=1169.11, C=241.59
Chloroform						2.2653	1.7915	2.8348	119.3900	0.0000	0.0002	119.39	Option 2: A=6.493, B=929.44, C=196.03
Cresol (-o)						0.0015	0.0009	0.0025	108.1400	0.0010	0.0000	108.14	Option 2: A=6.911, B=1435.5, C=165.16
Cresol (-p)						0.0005	0.0003	0.0009	108.1000	0.0446	0.0001	108.10	Option 2: A=7.035, B=1511.08, C=161.85
Dichloroethane (1,1)						2.7224	2.1742	3.4055	98.9700	0.0000	0.0004	98.97	Option 1: VP50 = 2.243 VP60 = 2.901
Dichloroethane (1,2)						0.8747	0.6800	1.1141	98.9700	0.0002	0.0006	98.97	Option 2: A=7.025, B=1272.3, C=222.9
Dichloroethylene (cis-1,2)						2.4897	1.9422	3.1279	96.9500	0.0000	0.0001	96.95	Option 1: VP50 = 2.011 VP60 = 2.668
Dichloroethylene (-trans-1,2)						4.0600	3.2923	4.9674	96.9500	0.0000	0.0004	96.95	Option 2: A=6.965, B=1141.9, C=231.9
Ethyl alcohol						0.5989	0.4431	0.8006	46.0700	0.0003	0.0006	46.07	Option 2: A=8.321, B=1718.21, C=237.52
Ethylbenzene						0.0987	0.0726	0.1324	106.1700	0.0001	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.7822	1.4177	2.2206	86.1700	0.0003	0.0016	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isopropyl alcohol						0.4346	0.3150	0.5920	60.0900	0.0009	0.0013	60.09	Option 2: A=8.1177, B=1580.92, C=219.61
Methyl ethyl ketone						0.9995	0.7733	1.2783	72.1000	0.0131	0.0451	72.10	Option 2: A=6.8645, B=1150.207, C=209.246
Methylene chloride						5.2833	4.2966	6.4501	84.9400	0.0004	0.0068	84.94	Option 2: A=7.409, B=1325.9, C=252.6
Naphthalene						0.0022	0.0015	0.0032	128.2000	0.0006	0.0000	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Styrene						0.0653	0.0479	0.0878	104.1500	0.0000	0.0000	104.15	Option 2: A=7.14, B=1574.51, C=224.09
Tetrachloroethylene						0.1894	0.1421	0.2496	165.8300	0.0001	0.0000	165.83	Option 2: A=6.98, B=1386.92, C=217.53
Toluene						0.3032	0.2305	0.3945	92.1300	0.0016	0.0017	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Trichloroethylene						0.7544	0.5785	0.9723	131.4000	0.0002	0.0005	131.40	Option 2: A=6.518, B=1018.6, C=192.7
Unidentified Components						0.2709	0.2648	0.2648	15.5005	0.9143	0.7368	18.00	
Xylenes (mixed isomers)						0.0821	0.0602	0.1105	106.1700	0.0006	0.0002	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt. 07 - Vertical Fixed Roof Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
C&D Debris Landfill Leachate	864.82	309.49	1,174.32
Cresol (-p)	0.07	0.03	0.10
Acetone	174.97	62.62	237.59
Methyl ethyl ketone	39.00	13.96	52.95
Toluene	1.45	0.52	1.97
Isopropyl alcohol	1.12	0.40	1.52
Cresol (-o)	0.00	0.00	0.01
Xylenes (mixed isomers)	0.16	0.06	0.21
Ethyl alcohol	0.50	0.18	0.68
Naphthalene	0.00	0.00	0.01
Methylene chloride	5.84	2.09	7.93
Hexane (-n)	1.38	0.50	1.88
Dichloroethane (1,2)	0.50	0.18	0.67
Trichloroethylene	0.43	0.15	0.58
Ethylbenzene	0.04	0.01	0.06
Carbon disulfide	1.08	0.39	1.47
1,2,4-Trimethylbenzene	0.00	0.00	0.01
Dichloroethane (1,1)	0.33	0.12	0.44
Tetrachloroethylene	0.03	0.01	0.05
Dichloroethylene (-trans-1,2)	0.36	0.13	0.49
Chloroform	0.20	0.07	0.28
Benzene	0.06	0.02	0.09
Dichloroethylene (cis-1,2)	0.07	0.03	0.10
Styrene	0.00	0.00	0.00
Unidentified Components	637.21	228.04	865.25

Landfill Leachate Tank Emissions Estimates - TANKS 4.0.9d Output

	Losses (lbs/yr)			Losses (tons/yr)			Losses (lbs/hr)		
Components	**Working Loss**	**Breathing Loss**	**Total Emissions**	**Working Loss**	**Breathing Loss**	**Total Emissions**	**Working Loss**	**Breathing Loss**	**Total Emissions**
C&D Debris Landfill Leachate	864.82	309.49	1,174.32	4.32E-01	1.55E-01	5.87E-01	9.87E-02	3.53E-02	1.34E-01
Water Vapor	637.21	228.04	865.25	3.19E-01	1.14E-01	4.33E-01	7.27E-02	2.60E-02	9.88E-02
Acetone	174.97	62.62	237.59	8.75E-02	3.13E-02	1.19E-01	2.00E-02	7.15E-03	2.71E-02
Methyl Ethyl Ketone, V/H	39.00	13.96	52.95	1.95E-02	6.98E-03	2.65E-02	4.45E-03	1.59E-03	6.04E-03
Methlyene Chloride, H	5.84	2.09	7.93	2.92E-03	1.05E-03	3.97E-03	6.67E-04	2.39E-04	9.05E-04
Toluene, V/H	1.45	0.52	1.97	7.25E-04	2.60E-04	9.85E-04	1.66E-04	5.94E-05	2.25E-04
Hexane, V/H	1.38	0.50	1.88	6.90E-04	2.50E-04	9.40E-04	1.58E-04	5.71E-05	2.15E-04
Isopropanol, V	1.12	0.40	1.52	5.60E-04	2.00E-04	7.60E-04	1.28E-04	4.57E-05	1.74E-04
Carbon disulfide, V/H	1.08	0.39	1.47	5.40E-04	1.95E-04	7.35E-04	1.23E-04	4.45E-05	1.68E-04
Ethanol, V	0.50	0.18	0.68	2.50E-04	9.00E-05	3.40E-04	5.71E-05	2.05E-05	7.76E-05
Dichloroethane (1,2), V/H	0.50	0.18	0.67	2.50E-04	9.00E-05	3.35E-04	5.71E-05	2.05E-05	7.65E-05
Trichloroethylene, V/H	0.43	0.15	0.58	2.15E-04	7.50E-05	2.90E-04	4.91E-05	1.71E-05	6.62E-05
Dichloroethylene (trans-1,2), V	0.36	0.13	0.49	1.80E-04	6.50E-05	2.45E-04	4.11E-05	1.48E-05	5.59E-05
Dichloroethane (1,1), V/H	0.33	0.12	0.44	1.65E-04	6.00E-05	2.20E-04	3.77E-05	1.37E-05	5.02E-05
Chloroform, V/H	0.20	0.07	0.28	1.00E-04	3.50E-05	1.40E-04	2.28E-05	7.99E-06	3.20E-05
Xylene (total), V/H	0.16	0.06	0.21	8.00E-05	3.00E-05	1.05E-04	1.83E-05	6.85E-06	2.40E-05
p-Cresol, V	0.07	0.03	0.10	3.50E-05	1.50E-05	5.00E-05	7.99E-06	3.42E-06	1.14E-05
Dichloroethylene (cis-1,2), V	0.07	0.03	0.10	3.50E-05	1.50E-05	5.00E-05	7.99E-06	3.42E-06	1.14E-05
Benzene, V/H	0.06	0.02	0.09	3.00E-05	1.00E-05	4.50E-05	6.85E-06	2.28E-06	1.03E-05
Ethylbenzene, V/H	0.04	0.01	0.06	2.00E-05	5.00E-06	3.00E-05	4.57E-06	1.14E-06	6.85E-06
Tetrachloroethylene, H	0.03	0.01	0.05	1.50E-05	5.00E-06	2.50E-05	3.42E-06	1.14E-06	5.71E-06
o-Cresol, V	< 0.01	< 0.01	0.01	<5.00E-06	<5.00E-06	5.00E-06	<1.14E-06	<1.14E-06	1.14E-06
Naphthalene, V/H	< 0.01	< 0.01	0.01	<5.00E-06	<5.00E-06	5.00E-06	<1.14E-06	<1.14E-06	1.14E-06
1,2,4-Trimethylbenzene, V	< 0.01	< 0.01	0.01	<5.00E-06	<5.00E-06	5.00E-06	<1.14E-06	<1.14E-06	1.14E-06
Styrene, V	< 0.01	< 0.01	< 0.01	<5.00E-06	<5.00E-06	<5.00E-06	<1.14E-06	<1.14E-06	<1.14E-06
(V) **Total VOCs**	**46.8**	**16.8**	**63.5**	**0.0234**	**0.0084**	**0.0318**	**0.0053**	**0.0019**	**0.0073**
(H) **Total HAPs**	**50.5**	**18.1**	**68.6**	**0.0253**	**0.0090**	**0.0343**	**0.0058**	**0.0021**	**0.0078**

APPENDIX G

Calculation of Emission Estimates from the Petroleum Liquids Storage Tanks

(Emission Points 08-12)

Petroleum Liquid Storage Tank Input Summary

Emission Point	Contents	Represented in TANKS 4.0.9d by	Volume (gallons)	Diameter (feet)	Length (feet)	Net Throughput (Rounded to nearest 10) (gallons/year)	Color	Represented in TANKS 4.0.9d by
08	Waste Oil	Crude oil (RVP 5)	1,500	5.33	9	4,100	Red	Red/Primer
09	Motor Oil	Crude oil (RVP 5)	500	4	5.42	1,220	Brown	Red/Primer
10	Hydraulic Oil	Residual Oil No. 6	500	4	5.42	2,880	Silver	Aluminum/Diffuse
11	Gasoline	Gasoline (RVP 9)	300	3.17	5	7,080	White	White/White
12	Diesel Fuel	Distillate Fuel Oil No. 2	8,000	10	14	167,200	Yellow	Gray/Light

Petroleum Liquid Storage Tank Volatile Organic Compounds Emissions Summary

Emission Point	Tank Output			Total Annual Emissions	Total Hourly Emissions
	Working Loss (lbs/yr)	Breathing Loss (lbs/yr)	Total Emissions (lbs/yr)	(tons/yr)	(lbs/hr)
08	10.53	149.99	160.52	0.0803	0.0183
09	3.13	54.83	57.96	0.0290	0.0066
10	0.00	0.00	0.00	0.0000	0.0000
11	43.28	29.55	72.83	0.0364	0.0083
12	2.90	1.78	4.68	0.0023	0.0005
Total VOCs	59.84	236	296	0.148	0.034

Calculation of Fuel and Lubricant Usage

Equipment	Fuel Type	Load Factor	GHP hp	Fuel Usage L/hr	Fuel Usage gal/hr	Motor Oil L/hr	Motor Oil gal/hr	Hydraulic Oil L/hr	Hydraulic Oil gal/hr
Cat 826 Landfill Compactor	Diesel	High	401	57	15	0.24	0.06	0.040	0.011
D25 Off-Road Dump	Diesel	High	350	50	13	0.21	0.06	0.035	0.009
D25 Off-Road Dump	Diesel	Medium	350	38	10	0.21	0.06	0.035	0.009
D6 Bulldozer	Diesel	High	229	32	9	0.14	0.04	0.023	0.006
D6 Bulldozer	Diesel	Medium	229	25	7	0.14	0.04	0.023	0.006
IR SD-100 Soil Compactor	Diesel	Medium	96	10	3	0.06	0.02	0.010	0.003
336D Excavator	Diesel	High	268	38	10	0.16	0.04	0.027	0.007
416E Backhoe	Diesel	Medium	96	10	3	0.06	0.02	0.010	0.003
962 Loader	Diesel	Medium	230	25	7	0.14	0.04	0.023	0.006
2,000 Gallon Water Truck	Diesel	Low	190	15	4	NA	NA	NA	NA
Equipment Maintenance Truck	Diesel	Low	250	19	5	NA	NA	NA	NA
Tool Truck	Diesel	Low	300	23	6	NA	NA	NA	NA
Fuel/Lube Truck	Diesel	Low	210	16	4	NA	NA	NA	NA
Tractor	Diesel	Low	105	8	2	0.06	0.02	NA	NA
Pickup Truck[1]	Gasoline	Low	411	6	2	NA	NA	NA	NA
Pickup Truck[1]	Gasoline	Low	411	6	2	NA	NA	NA	NA
Vacuum Sweeper	Diesel	Medium	82	9	2	0.05	0.01	NA	NA
Tub Grinder	Diesel	High	875	124	33	0.53	0.14	0.088	0.023
Impact Crusher[2]	Diesel	High	300	60	16	0.18	0.05	0.030	0.008
Shaker Screen[3]	Diesel	High	84	13	4	0.05	0.01	0.008	0.002
Stacking Conveyor	Diesel	Medium	48	5	1	0.03	0.01	0.005	0.001

NA = Not Applicable

Fuel Usage:

$$LPMH = \frac{K \times GHP \times LF}{KPL}$$

where:
LPMH = liters per machine hour
K = kg of fuel used per brake hp-hour
GHP = gross engine horsepower, hp
LF= load factor, %
KPL = weight of the fuel, kg/L

Typical Values

Fuel Type	*KPL* kg/L	*K* kg/brake hp-hour	Load Factor % Low	Load Factor % Medium	Load Factor % High
Gasoline	0.72	0.21	0.38	0.54	0.70
Diesel	0.84	0.17	0.38	0.54	0.70

[1] Rated fuel economy(city) = 12 mpg; assume travelling at an average speed of 20 mph
[2] From Cat Engine Spec for use at a performance rating of IND-B.
[3] From equipment brochure: 75 gallon fuel tank gets approximately 22 hour runtime.

Crankcase oil (i.e., motor oil) usage (L/hr) = 0.0006 * GHP

Hydrualic Oil Usage (L/hr) = 0.0001 * GHP

All formulas from "Cost Control in Forest Harvesting and Road Construction" by Food and Agriculture Organization of the United Nations
http://www.fao.org/docrep/T0579E/T0579E00.htm

Carroll SWMF Lubricant Usage Estimate

Equipment	Empty Weight (tons)	Gross Operating Weight (tons)	Consumption: Motor Oil (gallons/hour)	Consumption: Crankcase Capacity (gallons)	Consumption: Hydraulic Oil (gallons/hour)	Consumption: Tank Capacity (gallons)	Lubricant Change Frequency (hours of usage)	Equipment Use (% per day)	Equipment Use (days/year)	Equipment Use (hours/year)	Motor Oil Consumption (gallons/year)	Hydraulic Oil Consumption (gallons/year)	
Cat 826 Landfill Compactor	41	41	0.06	9	0.011	23	250[1]	0.73	307	2,126	204	219	423
D25 Off-Road Dump	18	43	0.06	9	0.009	53	250[1]	0.55	307	1,602	154	354	508
D25 Off-Road Dump	18	43	0.06	9	0.009	53	250[1]	0.55	307	1,602	154	354	508
D6 Bulldozer	23	23	0.04	8	0.006	12.5	500[1]	0.73	307	2,126	119	66	185
D6 Bulldozer	23	23	0.04	8	0.006	12.5	500[1]	0.36	307	1,048	59	32	91
IR SD-100 Soil Compactor	11	11	0.02	3	0.003	54	500	0.5	120	569	15	63	78
336D Excavator	39	41	0.04	11	0.007	108	250[1]	0.75	307	2,184	183	959	1,142
416E Backhoe	7.5	11	0.02	2	0.003	10	500[1]	0.5	100	474	11	11	22
962 Loader	11	21	0.04	8	0.006	29	250[1]	0.55	307	1,602	115	195	311
2,000 Gallon Water Truck	5	13	NA	8	NA	NA	500[1]	0.55	164	856	14	NA	
Equipment Maintenance Truck	10	17	NA	7	NA	NA	500	0.18	260	444	6	NA	
Tool Truck	10	12	NA	2.5	NA	NA	500[1]	0.18	260	444	2	NA	
Fuel/Lube Truck	9	17	NA	7	NA	NA	500[1]	0.3	307	874	12	NA	
Tractor	4	4	0.02	2	NA	NA	300	0.18	130	222	6	NA	
Pickup Truck	2	3	NA	1.5	NA	NA	250[2]	0.91	307	2,650	16	NA	
Pickup Truck	2	3	NA	1.5	NA	NA	250[2]	0.36	260	888	5	NA	
Vacuum Sweeper	3	4	0.01	2	NA	NA	500[1]	0.36	260	888	12	NA	
Tub Grinder	37	37	0.14	18	0.023	115	250	0.5	52	247	52	119	171
Impact Crusher	40	40	0.05	8.5	0.008	105	250[1]	0.68	104	671	56	287	343
Shaker Screen	26	26	0.01	1.5	0.002	120	300[1]	0.32	156	474	7	190	197
Stacking Conveyor	8	8	0.01	1	0.001	10[3]	500[1]	0.44	307	1,281	15	27	42
Average =		**21**								**Total Usage/Year =**	**1,219**	**2,877**	
										Minimum Tank Size (Annual Usage÷4) =	305		
										Minimum Tank Size (Annual Usage÷6) =		479	

[1] Estimated based on comparison of load factor and GHP with those equipment having reported oil change intervals.
[2] Estimated as 5,000 miles between oil changes and operation at an average speed of 20 miles per hour.
[3] Estimated from backhoe engine of similar size.

Waste Fuel Oil Production Rate (motor+hydraulic consumption; gal/yr) = 4,096
Monthly Production Rate (Annual Rate÷12) = 341
Minimum Tank Size (Monthly production rate * 4) = 1,365

Carroll SWMF Fuel Usage Estimate

Equipment	Empty Weight	Gross Operating Weight	Fuel Type	Load Factor	Consumption Rate	Equipment Use			Fuel Consumption
	(tons)	(tons)			(gallons/hour)	(% per day)	(days/year)	(hours/year)	(gallons/year)
Cat 826 Landfill Compactor	41	41	Diesel	High	15	0.73	307	2,126	31,886
D25 Off-Road Dump	18	43	Diesel	Medium	13	0.55	307	1,602	20,821
D25 Off-Road Dump	18	43	Diesel	Medium	10	0.55	307	1,602	16,016
D6 Bulldozer	23	23	Diesel	High	9	0.73	307	2,126	19,132
D6 Bulldozer	23	23	Diesel	Medium	7	0.36	307	1,048	7,338
IR SD-100 Soil Compactor	11	11	Diesel	Medium	3	0.5	120	569	1,707
336D Excavator	39	41	Diesel	High	10	0.75	307	2,184	21,840
416E Backhoe	7.5	11	Diesel	Medium	3	0.5	100	474	1,423
962 Loader	11	21	Diesel	Medium	7	0.55	307	1,602	11,211
2,000 Gallon Water Truck	5	13	Diesel	Low	4	0.55	164	856	3,422
Equipment Maintenance Truck	10	17	Diesel	Low	5	0.18	260	444	2,220
Tool Truck	10	12	Diesel	Low	6	0.18	260	444	2,663
Fuel/Lube Truck	9	17	Diesel	Low	4	0.3	307	874	3,494
Tractor	4	4	Diesel	Low	2	0.18	130	222	444
Vacuum Sweeper	3	4	Diesel	Medium	2	0.36	260	888	1,776
Tub Grinder	37	37	Diesel	High	33	0.5	52	247	8,138
Impact Crusher	40	40	Diesel	High	16	0.68	104	671	10,733
Shaker Screen	26	26	Diesel	High	3.5	0.32	156	474	1,657
Stacking Conveyor	8	8	Diesel	Medium	1	0.44	307	1,281	1,281
								Diesel Usage/Year =	**167,204**
								Minimum Tank Size (Annual Usage÷26) =	6,431
Pickup Truck	2	3	Gasoline	Low	2	0.91	307	2,650	5,300
Pickup Truck	2	3	Gasoline	Low	2	0.36	260	888	1,776
								Total Gasoline Usage/Year =	**7,075**
								Minimum Tank Size (Annual Usage÷26) =	272

Highland Tank & Mfg. Co. STORAGE TANK QUOTATION

TO: DAIGLER ENGINEERING
1711 GRAND ISLAND BOULEVARD

GRAND ISLAND NY 14072
Attention: JACOB ANASTASIA
Phone: 716-773-6872
Email: jacob@jadenvegr.com

Payment Terms: All orders subject to credit approval by Highland Tank.
Upon credit approval Highland Tank payment terms are Net 30.
All first-time orders under $2,000 require payment before delivery.

Estimated Delivery: 7-8 WEEKS
from date of receipt of approved drawing.

RE:

Freight to: CARROLL LANDFILL EXPANSION
CARROLL NY

QTY	DESCRIPTION	UNIT PRICE	AMOUNT
1	**500 Gallon BDH with Light Supports Bulk Storage Tank** Application: ABOVEGROUND Type: DOUBLE WALL Material: Mild Carbon Steel Diameter: 4' Length: 5'5" 10GA Shell 10GA Head 10GA Outer Shell 10GA Outer Head Fittings: Standard Exterior Coating: PRIMER (1)4" threaded fitting for primary emergency vent use (1)4" threaded fitting for secondary emergency vent use (4)2" threaded fittings (1)2" threaded fitting-secondary monitor tube ul142 label	1,807.00	1,807.00
2	**4" MNPT Emergency Vent - 119,750 CFH @ 2.5 psi, 8 oz/sq in**	131.00	262.00
1	**500 Gallon BDH with Light Supports Bulk Storage Tank** Application: ABOVEGROUND Type: DOUBLE WALL Material: Mild Carbon Steel Diameter: 4' Length: 5'5" 10GA Shell 10GA Head 10GA Outer Shell 10GA Outer Head Fittings: Standard (1)4" threaded fitting for primary emergency vent use (1)4" threaded fitting for secondary emergency vent use (4)2" threaded fittings (1)2" threaded fitting-secondary monitor tube ul142 label	1,807.00	1,807.00
1	**500 GAL URETHANE TOPCOAT - SP-6 BLAST INCLUDED (ALUMINUM)**	358.00	358.00

Quote No. 299629 Date 6/05/2012

Prices quoted valid for 20 days.

Quoted by:
STEPHEN ONDREJICKA
SONDREJICKA@HIGHLANDTANK.COM
4535 Elizabethtown Rd
Manheim PA 17545
PH: 717-664-0600 FAX: 717-664-0617

Representative:
CHRISTOPHER CARDONA

958 19TH ST
WATERVLIET NY 12189-1752
Phone: 518-817-5890

Description, prices and conditions accepted. Please return signed copy when placing order.

Accepted by:______________________________ Date:____/____/________

Per Highland Tank Standard Terms and Conditions: www.HighlandTank.com/Terms/TermsConditionsALL.pdf

Highland Tank & Mfg. Co. STORAGE TANK QUOTATION

TO: DAIGLER ENGINEERING
1711 GRAND ISLAND BOULEVARD

GRAND ISLAND NY 14072
Attention: JACOB ANASTASIA
Phone: 716-773-6872
Email: jacob@jadenvegr.com

Payment Terms: All orders subject to credit approval by Highland Tank.
Upon credit approval Highland Tank payment terms are Net 30.
All first-time orders under $2,000 require payment before delivery.

Estimated Delivery: 7-8 WEEKS
from date of receipt of approved drawing.

RE:

Freight to: CARROLL LANDFILL EXPANSION

CARROLL NY

QTY	DESCRIPTION	UNIT PRICE	AMOUNT
2	**4" MNPT Emergency Vent - 119,750 CFH @ 2.5 psi, 8 oz/sq in**	131.00	262.00
1	**300 Gallon BDH with Light Supports Bulk Storage Tank** Application: ABOVEGROUND Type: DOUBLE WALL Material: Mild Carbon Steel Diameter: 3'2" Length: 5' 12GA Shell 12GA Head 10GA Outer Shell 10GA Outer Head Fittings: Standard (1)3" threaded fitting for primary emergency vent use (1)3" threaded fitting fot secondary emergency vent use (4)2" threaded fittings (1)2" threaded fitting-secondary monitor tube ul142 label	1,361.00	1,361.00
1	**300 GAL URETHANE TOPCOTE - SP-6 BLAST INCLUDED (WHITE ONLY)**	165.00	165.00
2	**3" MNPT Emergency Vent - 59,900 CFH @ 2.5 psi, 8 oz/sq in**	88.00	176.00
1	**1500 Gallon HORIZONTAL Storage Tank** Application: ABOVEGROUND Type: DOUBLE WALL TYPE I 360 Material: Mild Carbon Steel Diameter: 5'4" Length: 9' 7GA Shell 7GA Head 10GA Outer Shell 10GA Outer Head Fittings: Standard (1)6" threaded fitting for primary emergency vent use (1)6" threaded fitting for secondary emergency vent use (4)4" threaded fittings (2)2" threaded fittings	3,883.00	3,883.00

Quote No. 299629 Date 6/05/2012

Prices quoted valid for 20 days.

Quoted by:
STEPHEN ONDREJICKA
SONDREJICKA@HIGHLANDTANK.COM
4535 Elizabethtown Rd
Manheim PA 17545
PH: 717-664-0600 FAX: 717-664-0617

Representative:
CHRISTOPHER CARDONA

958 19TH ST
WATERVLIET NY 12189-1752
Phone: 518-817-5890

Description, prices and conditions accepted. Please return signed copy when placing order.

Accepted by:____ Date:____/____/_________

Per Highland Tank Standard Terms and Conditions: www.HighlandTank.com/Terms/TermsConditionsALL.pdf

Highland Tank & Mfg. Co. STORAGE TANK QUOTATION

TO: DAIGLER ENGINEERING
1711 GRAND ISLAND BOULEVARD

GRAND ISLAND NY 14072
Attention: JACOB ANASTASIA
Phone: 716-773-6872
Email: jacob@jadenvegr.com

Payment Terms: All orders subject to credit approval by Highland Tank.
Upon credit approval Highland Tank payment terms are Net 30.
All first-time orders under $2,000 require payment before delivery.

Estimated Delivery: 7-8 WEEKS
from date of receipt of approved drawing.

RE:

Freight to: CARROLL LANDFILL EXPANSION

CARROLL NY

QTY	DESCRIPTION	UNIT PRICE	AMOUNT
	(1)2" threaded fitting-secondary monitor tube		
	ul142 label		
2	**64" UL STYLE SADDLE (SHIPPED LOOSE)**	762.00	1,524.00
2	**6" MNPT Emergency Vent - 246,130 CFH @ 2.5 psi, 8 oz/sq in**	189.00	378.00
1	**8000 Gallon HORIZONTAL Storage Tank**	16,905.00	16,905.00
	Application: ABOVEGROUND		
	Type: DOUBLE WALL TYPE I 360		
	Material: Mild Carbon Steel		
	Diameter: 10' Length: 14'		
	1/4"GA Shell 5/16" Head 7GA Outer Shell 7GA Outer Head		
	Fittings: Standard		
	(1)18" loose bolt manway for primary emergency vent use		
	(1)8"ff flange for secondary emergency vent use		
	(6)4" threaded fittings		
	(1)2" threaded fitting-secondary monitor tube		
	ul142 label		
2	**120" UL STYLE SADDLE (SHIPPED LOOSE)**	2,008.00	4,016.00
1	**8,000 GAL 120" DIA. URETHANE TOPCOAT-SP-6 BLAST INCLUDED(LT.GRAY)**	2,019.00	2,019.00
1	**8" Flanged Emergency Vent - 509,550 CFH @ 2.5 psi, 8 oz/sq in**	301.00	301.00
	Includes gasket, nuts and bolts		
	No components or accessories are included unless specifically listed.		
	Quotation based on e-mailed request.		
	customer is responsible for compliance to local codes per the installation of these tanks.		

Quote No. 299629 Date 6/05/2012

Prices quoted valid for 20 days.

Quoted by:
STEPHEN ONDREJICKA
SONDREJICKA@HIGHLANDTANK.COM
4535 Elizabethtown Rd
Manheim PA 17545
PH: 717-664-0600 FAX: 717-664-0617

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Highland Tank & Mfg. Co. STORAGE TANK QUOTATION

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All first-time orders under $2,000 require payment before delivery.

Estimated Delivery: 7-8 WEEKS
from date of receipt of approved drawing.

RE:

Freight to: CARROLL LANDFILL EXPANSION

CARROLL NY

QTY	DESCRIPTION	UNIT PRICE	AMOUNT
	Product Subtotal		35,224.00
	FREIGHT		1,262.00
	Net Price (Excluding Taxes)		36,486.00

Quote No. 299629 Date 6/05/2012

Prices quoted valid for 20 days.

Quoted by:
STEPHEN ONDREJICKA
SONDREJICKA@HIGHLANDTANK.COM
4535 Elizabethtown Rd
Manheim PA 17545
PH: 717-664-0600 FAX: 717-664-0617

Representative:
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958 19TH ST
WATERVLIET NY 12189-1752
Phone: 518-817-5890

Description, prices and conditions accepted. Please return signed copy when placing order.

Accepted by:______________________________ Date:____/____/________

Per Highland Tank Standard Terms and Conditions: www.HighlandTank.com/Terms/TermsConditionsALL.pdf

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt 08
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Horizontal Tank
Description:	1,500 Waste Oil Storage Tank

Tank Dimensions

Shell Length (ft):		9.00
Diameter (ft):		5.33
Volume (gallons):		1,500.00
Turnovers:		2.73
Net Throughput(gal/yr):		4,100.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt 08 - Horizontal Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	59.97	49.70	70.24	53.49	2.8762	2.3414	3.5051	50.0000			207.00	Option 4: RVP=5

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt 08 - Horizontal Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	10.53	149.99	160.52

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt 09
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Horizontal Tank
Description:	500 gallon Motor Oil Tank

Tank Dimensions

Shell Length (ft):	5.42
Diameter (ft):	4.00
Volume (gallons):	500.00
Turnovers:	2.53
Net Throughput(gal/yr):	1,220.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt 09 - Horizontal Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	59.97	49.70	70.24	53.49	2.8762	2.3414	3.5051	50.0000			207.00	Option 4: RVP=5

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt 09 - Horizontal Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	3.13	54.83	57.96

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt 10
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Horizontal Tank
Description:	500 gallon Hydraulic Oil Tank

Tank Dimensions

Shell Length (ft):	5.42
Diameter (ft):	4.00
Volume (gallons):	500.00
Turnovers:	5.76
Net Throughput(gal/yr):	2,880.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Aluminum/Diffuse
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt 10 - Horizontal Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Residual oil no. 6	All	56.26	48.42	64.11	51.75	0.0000	0.0000	0.0000	190.0000			387.00	Option 1: VP50 = .00003 VP60 = .00004

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt 10 - Horizontal Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Residual oil no. 6	0.00	0.00	0.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt 11
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Horizontal Tank
Description:	300 gallon Gasoline Tank

Tank Dimensions

Shell Length (ft):	5.00
Diameter (ft):	3.17
Volume (gallons):	300.00
Turnovers:	23.52
Net Throughput(gal/yr):	7,080.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt 11 - Horizontal Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	50.76	46.51	55.02	49.17	3.8321	3.5111	4.1764	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt 11 - Horizontal Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	43.28	29.55	72.83

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Emission Pt 12
City:	Carroll
State:	New York
Company:	Sealand Waste, LLC
Type of Tank:	Horizontal Tank
Description:	8,000 gallon Diesel Fuel Tank

Tank Dimensions

Shell Length (ft):	14.00
Diameter (ft):	10.00
Volume (gallons):	8,000.00
Turnovers:	20.90
Net Throughput(gal/yr):	167,200.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Erie, Pennsylvania (Avg Atmospheric Pressure = 14.36 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Emission Pt 12 - Horizontal Tank
Carroll, New York

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	55.50	48.15	62.84	51.39	0.0056	0.0042	0.0072	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Emission Pt 12 - Horizontal Tank
Carroll, New York

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	2.90	1.78	4.68

APPENDIX H

Calculation of Greenhouse Gas Emission Estimates for the Carroll Facility

Calculation of Greenhouse Gas Emissions

The NYSDEC Policy for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements was followed in developing the greenhouse gas (GHG) emissions estimates for the proposed Carroll Landfill. Per this policy, emissions sources include both direct and indirect sources. The focus of this emissions estimate will be on the direct sources as follows:

A. Direct Emissions from Stationary Sources; and,
B. Direct Emissions from Non-Stationary Sources.

Emissions estimates from each of these categories are detailed below.

A. <u>DIRECT EMISSIONS FROM STATIONARY SOURCES</u>

Direct emissions from stationary sources at the proposed Carroll Landfill will include landfill gases from the decomposition of waste in both the existing and the proposed landfill, emissions from the decomposition of yard waste in the proposed composting operation, and carbon dioxide emissions from the two waste oil space heaters.

<u>A.1. Existing Landfill Gases</u>

Existing landfill gas emissions were estimated using LandGEM as detailed in Appendix A. Two compounds in landfill gas contribute to total GHG emissions; carbon dioxide and methane. In the year of maximum emissions, 2029, the existing landfill is expected to contribute the following GHG emissions.

Uncontrolled PTE GHG Emissions for the Existing Landfill

Compound	lbs/hr	TPY	GWP	CO_2-e (TPY)
CH_4	5.56	24.35	21	511.35
CO_2	22.88	100.22	1	100.22
Total GHG	**28.4**	**125**		**612**

GWP = global warming potential

By the year 2029, the waste from the existing landfill will have been relocated to within the lined area of the proposed landfill. Therefore, the emissions from its waste will be subject to the same landfill gas collection and control system installed as part of the proposed landfill. The controlled GHG emissions for the existing landfill will then be as detailed in Appendix A and summarized below.

Controlled GHG Emissions for the Existing Landfill

Compound	lbs/hr	TPY	GWP	CO_2-e (TPY)
CH_4	5.37	23.52	21	493.92
CO_2	22.10	96.80	1	96.80
Total GHG	**27.5**	**120**		**591**

GWP = global warming potential

A.2. Proposed Landfill Gases

Proposed landfill gas emissions were estimated using LandGEM as detailed in Appendix A. Two compounds in landfill gas contribute to total GHG emissions; carbon dioxide and methane. In the year of maximum emissions, 2029, the existing landfill is expected to contribute the following GHG emissions. .

Uncontrolled PTE GHG Emissions for the Proposed Carroll Landfill

Compound	lbs/hr	TPY	GWP	CO_2-e (TPY)
CH_4	610	2,671	21	56,095
CO_2	2,510	10,994	1	10,994
Total GHG	**3,120**	**13,665**		**67,089**

GWP = global warming potential

By the year 2029 the landfill gas collection and control system will be fully operational. The controlled GHG emissions for the proposed landfill will be as detailed in Appendix A and summarized below.

Controlled GHG Emissions for the Proposed Carroll Landfill

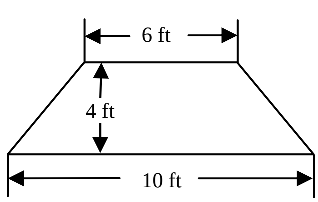
Compound	lbs/hr	TPY	GWP	CO_2-e (TPY)
CH_4	589	2,580	21	54,180
CO_2	2,424	10,618	1	10,618
Total GHG	**3,013**	**13,198**		**64,798**

GWP = global warming potential

A.3. Composting Operation

An anticipated maximum of 400 TPY of yard waste will be handled by the composting operation proposed for the Carroll Landfill. An uncompacted density for yard waste material of 375 lb/cy is assumed. Therefore, in terms of volume the maximum acceptance rate of compost stock materials is 2,100 cy/yr.

The composting operation will utilize windrows assumed to have a trapezoidal shape with a ten foot base, six foot top, and four foot height.



$$\text{Cross-sectional Area} = \tfrac{1}{2}(B + T) \times H = \tfrac{1}{2}(10\text{ ft} + 6\text{ ft}) \times 4\text{ ft} = 32\text{ ft}^2$$

$$\text{Total length of windrow annually} = \left(\frac{2{,}100\, cy/yr}{32\, ft^2}\right)\left(\frac{27\, ft^3}{cy}\right) = 1{,}772\text{ ft}$$

Surface Area = Length × Cross-sectional exposed length
= L × (Top length + 2*Side Length)
$= 1{,}772\ \text{ft} \times (6\ \text{ft} + 2\times\sqrt{4^2 + \left(\frac{10-6}{2}\right)^2})$
= 26,480 ft^2

Methane Emissions:

$$CH_4 = E_{CH4} \times SA$$

where;
E_{CH4} = methane emission rate, maximum emission rate from a mature compost pile
= 2,500 mg CH_4 /m^2·d (source: Jäckel, U., Thummes, K., and Kämpfer, P. (2005). Thermophilic methane production and oxidation in compost. *FEMS Microbiology Ecology*, 52, 175-184.)

SA = surface area of the compost windrows

- PTE Annual Emissions = $\dfrac{\left(\frac{2{,}500mg}{m^2day}\right)\left(26{,}480\,ft^2\right)\left(\frac{1m^2}{10.764\,ft^2}\right)\left(\frac{1lb}{453{,}592mg}\right)\left(\frac{365day}{1year}\right)}{2000lbs/ton}$
  = 2.47 TPY CH_4
- PTE Hourly Emissions = $\left(\frac{2{,}500mg}{m^2day}\right)\left(26{,}480\,ft^2\right)\left(\frac{1m^2}{10.764\,ft^2}\right)\left(\frac{1lb}{453{,}592mg}\right)\left(\frac{1day}{24hours}\right)$
  = 0.56 lbs/hr CH_4

Carbon Dioxide Emissions:

$$CO_2 = E_{CO2} \times PR$$

where;
E_{CO2} = carbon dioxide emission rate
= 220 g C/dry kg (source: Komilis, D.P. and Ham, R.K. (2006). Carbon dioxide and ammonia emissions during composting of mixed paper, yard waste and food waste. *Waste Management*, 26, 62-70. Table 4, yard waste without seed)

PR = processing rate
= 400 TPY

- PTE Annual Emissions $= \left(\frac{220 gC}{kg}\right)\left(\frac{44\, gCO_2/mol}{12\, gC/mol}\right)\left(\frac{400 ton}{year}\right)\left(\frac{1kg}{1000g}\right)$
  = 323 TPY CO_2

- PTE Hourly Emissions $= \left(\frac{323 ton}{year}\right)\left(\frac{1 year}{365 days}\right)\left(\frac{1 day}{24 hr}\right)\left(\frac{2000 lbs}{ton}\right)$
  = 73.7 lbs/hr CO_2

Total GHG Emissions from Composting Operation:

$$GHG = CO_2 + CH_4$$

$$GHG_{CO2\text{-}e} = CO_2 + (GWP_{CH4} \times CH_4)$$

where;

GHG = greenhouse gas emission rate

$GHG_{CO2\text{-}e}$ = greenhouse gas emission rate in CO_2-equivalents

GWP_{CH4} = global warming potential for methane
= 21

- PTE Annual Emissions: GHG = 323 TPY + 2.47 TPY
  = 325 TPY

  $GHG_{CO2\text{-}e}$ = 323 TPY + (21 × 2.47 TPY)
  = 375 TPY CO_2-e

- PTE Hourly Emissions: GHG = 73.7 lbs/hr + 0.56 lbs/hr
  = 74.3 lbs/hr

  $GHG_{CO2\text{-}e}$ = 73.7 lbs/hr + (21 × 0.56 lbs/hr)
  = 85.5 lbs/hr CO_2-e

A.4. Waste Oil Space Heaters

Emissions estimates from the waste oil space heaters proposed for use in the equipment maintenance building are provided in Appendix D. Carbon dioxide is the only GHG. The hourly estimate of 106 lbs/hr of CO_2-e emissions is both the proposed average and the PTE estimate. The annual average and PTE estimates are 269 and 463 TPY, respectively.

<u>Summary of GHG Emissions from Stationary Sources</u> (A.1. + A.2. + A.3. + A.4.):

Source	Proposed Average			Potential-to-Emit		
	Hourly (lbs/hr)	Annual (TPY)	CO_2-e (TPY)	Hourly (lbs/hr)	Annual (TPY)	CO_2-e (TPY)
A.1.: Existing Landfill	27.5	120	591	28.4	125	612
A.2.: Proposed Landfill	3,013	13,198	64,798	3,120	13,665	67,089
A.3.: Composting Operations	74.3	325	375	74.3	325	375
A.4. Waste Oil Space Heaters	106	269	269	106	463	463
TOTAL	**3,180**	**14,200**	**65,100**	**3,910**	**15,100**	**68,600**

B. DIRECT EMISSIONS FROM NON-STATIONARY SOURCES

Direct GHG emissions from non-stationary sources at the proposed Carroll Landfill would include combustion of carbon containing fuels in fleet vehicles, equipment, and machinery used onsite.

B.1. Carbon Dioxide Emissions:

$$CO_2 = E_{CO2} \times \text{Fuel Consumption}$$

where;

CO_2 = carbon dioxide emissions rate (TPY)

E_{CO2} = carbon dioxide emission factor (kg/gal)

= 10.15 kg CO_2/gal for diesel fuel consumption

= 8.91 kg CO_2/gal for gasoline fuel consumption

(Source: U.S. Energy Information Administration (2011) Voluntary Reporting of Greenhouse Gases Program Fuel Carbon Dioxide Emission Coefficients, Table 2. Available at: http://www/eia.gov/oiaf/1605/coefficients.html. Last updated on January 31, 2011. Accessed on 11/2/2012.)

Fuel Consumption (gal/year) = See spreadsheet B.1.; estimate same as Appendix G

= 167,204 gal/yr diesel fuel (projected average)

= 7,075 gal/yr gasoline fuel (projected average)

= 278,963 gal/yr diesel fuel (PTE)

= 9,375 gal/yr gasoline fuel (PTE)

- Average Annual CO_2 Emissions =

$$\frac{\left[\left(167{,}204\frac{gal-diesel}{yr}\right)\left(10.15\frac{kg-CO_2}{gal-diesel}\right)+\left(7{,}075\frac{gal-gas}{yr}\right)\left(8.91\frac{kg-CO_2}{gal-gas}\right)\right]}{907.185\frac{kg}{ton}}$$

= 1,940 TPY

- PTE Annual CO_2 Emissions =

$$\frac{\left[\left(278{,}963\frac{gal-diesel}{yr}\right)\left(10.15\frac{kg-CO_2}{gal-diesel}\right)+\left(9{,}375\frac{gal-gas}{yr}\right)\left(8.91\frac{kg-CO_2}{gal-gas}\right)\right]}{907.185\frac{kg}{ton}}$$

= 3,213 TPY

- Hourly CO_2 Emissions = CO_2 (TPY) × 2,000 (lb/ton) ÷ Hours of Facility Operation (2,912 hrs/yr; see Appendix B)

Appendix H
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

B.1. CO_2 Emissions from Proposed Carroll Landfill Fleet Vehicles, Equipment, and Machinery Non-Stationary Combustion Engines.

Equipment	Consumption Rate (gallons/hour)	Average Equipment Use (% per day)	(days/year)	(hours/year)	Projected Fuel Consumption (gallons/year)	PTE Usage (hours/year)	PTE Fuel Consumption (gallons/year)	
Cat 826 Landfill Compactor	15	0.73	307	2,126	31,886	2,912	43,680	
D25 Off-Road Dump	13	0.55	307	1,602	20,821	2,912	37,856	
D25 Off-Road Dump	10	0.55	307	1,602	16,016	2,912	29,120	
D6 Bulldozer	9	0.73	307	2,126	19,132	2,912	26,208	
D6 Bulldozer	7	0.36	307	1,048	7,338	2,097	14,676	
IR SD-100 Soil Compactor	3	0.5	120	569	1,707	1,138	3,415	
336D Excavator	10	0.75	307	2,184	21,840	2,912	29,120	
416E Backhoe	3	0.5	100	474	1,423	949	2,846	
962 Loader	7	0.55	307	1,602	11,211	2,912	20,384	
2,000 Gallon Water Truck	4	0.55	164	856	3,422	1,711	6,845	
Equipment Maintenance Truck	5	0.18	260	444	2,220	888	4,439	
Tool Truck	6	0.18	260	444	2,663	888	5,327	
Fuel/Lube Truck	4	0.3	307	874	3,494	1,747	6,989	
Tractor	2	0.18	130	222	444	444	888	
Vacuum Sweeper	2	0.36	260	888	1,776	1,776	3,551	
Tub Grinder	33	0.5	52	247	8,138	493	16,277	
Impact Crusher	16	0.68	104	671	10,733	1,342	21,466	
Shaker Screen	3.5	0.32	156	474	1,657	947	3,315	
Stacking Conveyor	1	0.44	307	1,281	1,281	2,563	2,563	
				Total Diesel Usage/Year =	**167,204**		**278,963**	gals/yr
				$E\text{-}CO_2$ (diesel) =	**10.15**		**10.15**	kg/gal
Pickup Truck	2	0.91	307	2,650	5,300	2,912	5,824	
Pickup Truck	2	0.36	260	888	1,776	1,776	3,551	
				Total Gasoline Usage/Year =	**7,075**		**9,375**	gals/yr
				$E\text{-}CO_2$ (gasoline) =	**8.91**		**8.91**	kg/gal
				Total Annual CO_2 Emissions (TPY) =	**1,940**		**3,213**	
				Hours of Facility Operation per Year =	2,912		2,912	
				Total Hourly CO_2 Emissions (lbs/hr) =	**1,333**		**2,207**	

B.2. Methane and Nitrous Oxide Emissions from Construction Vehicles

(See spreadsheet B.2.): Construction vehicles only, including 2 compactors, 2 off-road dump trucks, 2 bulldozers, excavator, backhoe, loader, tractor, tub grinder, impact crusher, shaker screen, and stacking conveyor

$$X = E_x \times \text{Fuel Consumption}$$

where;

X = emission rate for Compound X (TPY)

E_X = emission factor for Compound X (g/gal)

= 0.58 g CH_4/gal for diesel fuel consumption

= 0.26 g N_2O/gal for diesel fuel consumption

(Source: U.S. Energy Information Administration (2011) Voluntary Reporting of Greenhouse Gasses Program Fuel Carbon Dioxide Emission Coefficients, Table 7. Available at: http://www/eia.gov/oiaf/1605/coefficients.html. Last updated on January 31, 2011. Accessed on 11/2/2012.)

Fuel Consumption (gal/year) = 153,628 gals/yr diesel fuel average

= 251,812 gals/yr diesel fuel PTE

Hourly X Emissions = X (TPY) × 2,000 (lbs/ton) ÷ Hours of Facility Operation (2,912 hrs/yr)

Total GHG Emissions = ∑ X (TPY or lbs/hr)

GHG (CO_2-e) Emissions = ∑ [X (TPY or lbs/hr) × Global Warming Potential of X]

where; Global Warming Potential of CH_4 = 21

Global Warming Potential of N_2O = 310

B.2. N_2O & CH_4 Emissions from Proposed Carroll Landfill Construction Vehicle Non-Stationary Combustion Engines.

Equipment	**Consumption Rate** (gallons/hour)	**Average Equipment Use** (% per day)	(days/year)	(hours/year)	**Projected Fuel Consumption** (gallons/year)	**PTE Usage** (hours/year)	**PTE Fuel Consumption** (gallons/year)
Cat 826 Landfill Compactor	15	0.73	307	2,126	31,886	2,912	43,680
D25 Off-Road Dump	13	0.55	307	1,602	20,821	2,912	37,856
D25 Off-Road Dump	10	0.55	307	1,602	16,016	2,912	29,120
D6 Bulldozer	9	0.73	307	2,126	19,132	2,912	26,208
D6 Bulldozer	7	0.36	307	1,048	7,338	2,097	14,676
IR SD-100 Soil Compactor	3	0.5	120	569	1,707	1,138	3,415
336D Excavator	10	0.75	307	2,184	21,840	2,912	29,120
416E Backhoe	3	0.5	100	474	1,423	949	2,846
962 Loader	7	0.55	307	1,602	11,211	2,912	20,384
Tractor	2	0.18	130	222	444	444	888
Tub Grinder	33	0.5	52	247	8,138	493	16,277
Impact Crusher	16	0.68	104	671	10,733	1,342	21,466
Shaker Screen	3.5	0.32	156	474	1,657	947	3,315
Stacking Conveyor	1	0.44	307	1,281	1,281	2,563	2,563
				Total Diesel Usage/Year =	**153,628**		**251,812**
				Hours of Facility Operation per Year =	2,912		2,912

	Ex , Diesel Emission Factor (g/gal)	Projected Emissions (lbs/hr)	(TPY)	PTE Emissions (lbs/hr)	(TPY)	Global Warming Potential
N_2O	0.26	0.030	0.044	0.050	0.072	310
CH_4	0.58	0.067	0.098	0.111	0.161	21
TOTAL GHG		0.098	0.142	0.160	0.233	
GHG (CO_2-e)		**10.8**	**15.7**	**17.7**	**25.8**	

B.3. Methane and Nitrous Oxide Emissions from Onsite Fleet of Highway Vehicles (See spreadsheet B.3.): While not being used on the highway, all highway worthy vehicles in the onsite fleet are included in this estimate. This includes the water truck, maintenance truck, tool truck, fuel/lube truck, vacuum sweeper, and two pickup trucks.

$$X = E_x \times \text{VMT}$$

where;

X = emission rate for Compound X (TPY)

E_X = emission factor for Compound X (g/gal)

= 0.0051 g CH_4/gal for diesel fuel consumption (assumed Advanced, Heavy-Duty Vehicles)

= 0.048 g N_2O/gal for diesel fuel consumption (assumed Advanced, Heavy-Duty Vehicles)

= 0.0163 g CH_4/gal for gasoline fuel consumption (assumed EPA Tier 2, Light-Duty Trucks)

= 0.0066 g N_2O/gal for gasoline fuel consumption (assumed EPA Tier 2, Light-Duty Trucks)

(Source: U.S. Energy Information Administration (2011) Voluntary Reporting of Greenhouse Gasses Program Fuel Carbon Dioxide Emission Coefficients, Table 5. Available at: http://www/eia.gov/oiaf/1605/coefficients.html. Last updated on January 31, 2011. Accessed on 11/2/2012.)

VMT = vehicle miles traveled (miles/year)

= 26,170 mi/yr diesel fuel, average

= 35,229 mi/yr diesel fuel, PTE

= 70,775 mi/yr gasoline fuel, average

= 93,753 mi/yr gasoline fuel, PTE

(VMT calculated by multiplying the average or PTE usage by an estimated average vehicle speed as was presented in A.2. in Appendix B. A difference between Appendix B and here is the Vacuum Sweeper was included with an assumed average speed of 10 mph and the water truck was included in the PTE emissions estimate at two times its proposed average usage).

Hourly X Emissions = X (TPY) × 2,000 (lbs/ton) ÷ Hours of Facility Operation (2,912 hrs/yr)

Total GHG Emissions = ∑ X (TPY or lbs/hr)

GHG (CO_2-e) Emissions = ∑ [X (TPY or lbs/hr) × Global Warming Potential of X]

where; Global Warming Potential of CH_4 = 21
Global Warming Potential of N_2O = 310

Summary of GHG Emissions from Direct Non-Stationary Sources (B.1. + B.2. + B.3.):

	Projected Emissions		**PTE Emissions**	
	(lb/hr)	**(TPY)**	**(lb/hr)**	**(TPY)**
CO_2	1,333	1,940	2,207	3,213
N_2O	0.032	0.046	0.052	0.076
CH_4	0.068	0.100	0.112	0.163
GHG	**1,333**	**1,940**	**2,207**	**3,213**
GHG (CO_2-e)	**1,344**	**1,957**	**2,225**	**3,240**

B.3. N_2O & CH_4 Emissions from Proposed Carroll Landfill Onsite Fleet of Highway Vehicle Non-Stationary Combustion Engines.

DIESEL Equipment	**Proposed Average Equipment Use** (% per day)	(days/year)	(hours/year)	**PTE Usage** (hours/year)	**Assumed Average Speed** (mph)	**Average VMT** (miles/year)	**PTE VMT** (miles/year)
2,000 Gallon Water Truck	0.55	164	856	1,711	10	8,556	17,112
Equipment Maintenance Truck	0.18	260	444	888	10	4,439	8,878
Tool Truck	0.18	260	444	888	10	4,439	8,878
Fuel/Lube Truck	0.3	307	874	1,747	10	8,736	17,472
					TOTAL =	**26,170**	**52,340**

Diesel Heavy-Duty Vehicles (Advanced)	Diesel Emission Factor (g/mile)	Proposed (lbs/hr)	Proposed (TPY)	Potential-To-Emit (lbs/hr)	Potential-To-Emit (TPY)	Global Warming Potential
N_2O	0.0480	0.0010	0.0014	0.0019	0.0028	310
CH_4	0.0051	0.0001	0.0001	0.0002	0.0003	21
Total GHG		0.0011	0.0015	0.0021	0.0031	
GHG (CO_2-e)		0.30	0.43	0.59	0.86	

GASOLINE Equipment	**Proposed Average Equipment Use** (% per day)	(days/year)	(hours/year)	**PTE Usage** (hours/year)	**Assumed Average Speed** (mph)	**Average VMT** (miles/year)	**PTE VMT** (miles/year)
Pickup Truck	0.91	307	2,650	2,912	20	52,998	58,240
Pickup Truck	0.36	260	888	1,776	20	17,757	35,513
					TOTAL =	**70,755**	**93,753**

Gasoline Light-Duty Trucks (EPA Tier 2)	Gasoline Emission Factor (g/mile)	Proposed (lb/hr)	Proposed (TPY)	Potential-To-Emit (lb/hr)	Potential-To-Emit (TPY)	Global Warming Potential
N_2O	0.0066	0.0004	0.0005	0.0005	0.0007	310
CH_4	0.0163	0.0009	0.0013	0.0012	0.0017	21
Total GHG		0.0012	0.0018	0.0016	0.0024	
GHG (CO_2-e)		0.13	0.19	0.17	0.25	

TOTAL FOR B.3. (Onsite Fleet of Highway Vehicles)				
Emissions:	**Proposed**		**Potential-To-Emit**	
	(lbs/hr)	**(TPY)**	**(lbs/hr)**	**(TPY)**
N_2O	**0.001**	**0.002**	**0.002**	**0.003**
CH_4	**0.001**	**0.001**	**0.001**	**0.002**
Total GHG	**0.002**	**0.003**	**0.004**	**0.005**
GHG (CO_2-e)	**0.4**	**0.6**	**0.8**	**1.1**

APPENDIX I

Estimated Emissions Summary Tables for the Carroll Facility

Appendix I
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT CRITERIA POLLUTANT EMISSIONS FOR THE CARROLL FACILITY (TPY)

Em. Pt.	Source	CO	H_2S	NOx	Pb	PM	PM-10	PM-2.5	SOx	VOC	GHG	CO_2-e
01	Existing Jones-Carroll Landfill Gases[1]	0.01	0.56							0.06	125	612
02	Proposed Landfill Gases[1]	1.63	61.15							6.45	13,665	67,088
	Composting Fugitive Gases										325	375
03	Facility Operations[2]					131.36	36.61	4.95			3,213	2,207
04	Stationary Internal Combustion Engines	4.28		1.72		0.03	0.03	0.03	0.01	0.29	NOTE 3	NOTE 3
05	Waste Oil Space Heaters	0.04		0.34	0.005	0.90	0.78		1.12	0.02	463	463
06	Electric Arc Welder					0.001	0.001					
07	Landfill Leachate Tank									0.03		
08-12	Petroleum Liquids Storage Tanks									0.15		
	TOTAL	**5.98**	**61.71**	**2.05**	**0.005**	**132.3**	**37.41**	**4.98**	**1.13**	**7.01**	**17,790**	**70,744**

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[3] GHG emissions included in Facility Operations.

SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT CRITERIA POLLUTANT EMISSIONS FOR THE CARROLL FACILITY (lbs/hr)

Em. Pt.	Source	CO	H_2S	NOx	Pb	PM	PM-10	PM-2.5	SOx	VOC	GHG	CO_2-e
01	Existing Jones-Carroll Landfill Gases[1]	0.003	0.13							0.01	28.4	140
02	Proposed Landfill Gases[1]	0.37	13.96							1.47	3,120	15,317
	Composting Fugitive Gases										74.3	85.5
03	Facility Operations[2]					118.88	33.44	7.97			2,207	3,213
04	Stationary Internal Combustion Engines	8.87		6.56		0.08	0.08	0.08	0.02	0.53	NOTE 4	NOTE 4
05	Waste Oil Space Heaters	0.01		0.08	0.001	0.21	0.18		0.26	0.005	106	106
06	Electric Arc Welder[3]											
07	Landfill Leachate Tank									0.01		
08-12	Petroleum Liquids Storage Tanks									0.03		
	TOTAL	**9.26**	**14.09**	**6.64**	**0.001**	**119.2**	**33.70**	**8.05**	**0.27**	**2.07**	**5,535**	**18,861**

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[3] Not calculated.
[4] GHG emissions included in Facility Operations.

Appendix I
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED CRITERIA POLLUTANT EMISSIONS FOR THE CARROLL FACILITY (TPY)

Em. Pt.	Source	CO	H_2S	NOx	Pb	PM	PM-10	PM-2.5	SOx	VOC	GHG	CO_2-e
01	Existing Jones-Carroll Landfill Gases[1]	0.01	0.02							0.06	120	591
02	Proposed Landfill Gases[1]	1.58	2.13							6.23	13,199	64,799
	Composting Fugitive Gases[2]										325	375
03	Facility Operations[3]					29.27	8.21	1.45			1,940	1,333
04	Stationary Internal Combustion Engines	2.92		1.15		0.02	0.02	0.02	0.01	0.20	NOTE 4	NOTE 4
05	Waste Oil Space Heaters	0.03		0.20	0.003	0.52	0.45		0.65	0.01	269	269
06	Electric Arc Welder					0.001	0.001					
07	Landfill Leachate Tank									0.03		
08-12	Petroleum Liquids Storage Tanks									0.15		
	TOTAL	**4.54**	**2.15**	**1.35**	**0.003**	**29.81**	**8.68**	**1.47**	**0.66**	**6.68**	**15,852**	**67,366**

[1] Controlled, LandGEM estimated maximum emissions for Year 2029.
[2] Conservatively assumed to be the same as PTE.
[3] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[4] GHG emissions included in Facility Operations.

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED CRITERIA POLLUTANT EMISSIONS FOR THE CARROLL FACILITY (lbs/hour)

Em. Pt.	Source	CO	H_2S	NOx	Pb	PM	PM-10	PM-2.5	SOx	VOC	GHG	CO_2-e
01	Existing Jones-Carroll Landfill Gases[1]	0.003	0.004							0.01	27.5	135
02	Proposed Landfill Gases[1]	0.36	0.49							1.42	3,013	14,794
	Composting Fugitive Gases[2]										74.3	85.5
03	Facility Operations[3]					62.49	17.68	5.79			1,333	1,940
04	Stationary Internal Combustion Engines	8.87		6.56		0.08	0.08	0.08	0.02	0.53	NOTE 5	NOTE 5
05	Waste Oil Space Heaters	0.01		0.08	0.001	0.21	0.18		0.26	0.005	106	106
06	Electric Arc Welder[4]											
07	Landfill Leachate Tank									0.01		
08-12	Petroleum Liquids Storage Tanks									0.03		
	TOTAL	**9.24**	**0.49**	**6.64**	**0.001**	**62.77**	**17.94**	**5.87**	**0.27**	**2.02**	**4,554**	**17,061**

[1] Controlled, LandGEM estimated maximum emissions for Year 2029.
[2] Conservatively assumed to be the same as PTE.
[3] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[4] Not calculated.
[5] GHG emissions included in Facility Operations.

Appendix I
Air Emissions Inventory
Carroll Landfill Expansion Application
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SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY
(TPY)

Emission Point	Source	1,1,1-Trichloroethane (methyl chloroform)	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane (ethylidene dichloride)	1,1-Dichloroethene (vinylidene chloride)	1,2-Dichloroethane (ethylene dichloride)	1,2-Dichloropropane (propylene dichloride)	Acetaldehyde	Acrolein	Acrylonitrile	Antimony	Arsenic	Benzene	Beryllium	Butadiene (1,3 isomer)	Carbon disulfide	Carbon tetrachloride	Carbonyl sulfide	Cadmium	Chlorobenzene	Chloroethane (ethyl chloride)	Chloroform
01	Existing Jones-Carroll Landfill Gases[1]	2.43E-04	7.01E-04	9.01E-04	7.36E-05	1.54E-04	7.72E-05			1.27E-03			5.63E-04			1.68E-04	2.34E-06	1.12E-04		1.07E-04	3.18E-04	1.36E-05
02	Proposed Landfill Gases[1]	2.67E-02	7.69E-02	9.89E-02	8.07E-03	1.69E-02	8.47E-03			1.39E-01			6.18E-02			1.84E-02	2.56E-04	1.23E-02		1.17E-02	3.49E-02	1.49E-03
03	Facility Operations																					
04	Stationary Internal Combustion Engines[2]																					
05	Waste Oil Space Heaters										9.46E-05	1.26E-03		3.78E-05					2.52E-04			
06	Electric Arc Welder																					
07	Landfill Leachate Tank			2.20E-04		3.35E-04							4.50E-05			7.35E-04						1.40E-04
08-12	Petoleum Liquids Storage Tanks																					
	TOTAL (TPY)	2.69E-02	7.76E-02	1.00E-01	8.15E-03	1.74E-02	8.54E-03	--	--	1.40E-01	9.46E-05	1.26E-03	6.24E-02	3.78E-05	--	1.93E-02	2.59E-04	1.24E-02	2.52E-04	1.18E-02	3.52E-02	1.64E-03
	TOTAL (lbs/yr)	53.81	155.14	200.02	16.29	34.76	17.09	--	--	280.88	0.19	2.52	124.79	0.08	--	38.57	0.52	24.73	0.50	23.64	70.48	3.29

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Not itemized. Total HAPs estimated only.

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY
(TPY)

Emission Point	Source	1,1,1-Trichloroethane (methyl chloroform)	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane (ethylidene dichloride)	1,1-Dichloroethene (vinylidene chloride)	1,2-Dichloroethane (ethylene dichloride)	1,2-Dichloropropane (propylene dichloride)	Acetaldehyde	Acrolein	Acrylonitrile	Antimony	Arsenic	Benzene	Beryllium	Butadiene (1,3 isomer)	Carbon disulfide	Carbon tetrachloride	Carbonyl sulfide	Cadmium	Chlorobenzene	Chloroethane (ethyl chloride)	Chloroform
01	Existing Jones-Carroll Landfill Gases[1]	2.35E-04	6.77E-04	8.71E-04	7.11E-05	1.49E-04	7.46E-05			1.23E-03			5.44E-04			1.62E-04	2.26E-06	1.08E-04		1.03E-04	3.07E-04	1.31E-05
02	Proposed Landfill Gases[1]	2.58E-02	7.42E-02	9.55E-02	7.80E-03	1.63E-02	8.18E-03			1.34E-01			5.97E-02			1.78E-02	2.47E-04	1.18E-02		1.13E-02	3.37E-02	1.44E-03
03	Facility Operations																					
04	Stationary Internal Combustion Engines[2]																					
05	Waste Oil Space Heaters										5.50E-05	7.33E-04		2.20E-05					1.47E-04			
06	Electric Arc Welder																					
07	Landfill Leachate Tank			2.20E-04		3.35E-04							4.50E-05			7.35E-04						1.40E-04
08-12	Petoleum Liquids Storage Tanks																					
	TOTAL (TPY)	2.60E-02	7.49E-02	9.66E-02	7.87E-03	1.68E-02	8.25E-03	--	--	1.36E-01	5.50E-05	7.33E-04	6.03E-02	2.20E-05	--	1.87E-02	2.50E-04	1.19E-02	1.47E-04	1.14E-02	3.40E-02	1.59E-03
	TOTAL (lbs/yr)	51.97	149.85	193.21	15.73	33.60	16.51	--	--	271.29	0.11	1.47	120.54	0.04	--	37.31	0.50	23.89	0.29	22.84	68.07	3.19

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Not itemized. Total HAPs estimated only.

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Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY, CONTINUED (TPY)

Chloromethane (methyl chloride)	Chromium	Cobalt	Dibutylphthalate	Dichlorobenzene (1,4 isomer)	Dichloromethane (methylene chloride)	Ethylbenzene	Ethylene dibromide	Formaldehyde	Hexane	Lead	Manganese	Mercury (total)	Methyl ethyl ketone	Methyl isobutyl ketone	Napthalene	Nickel	Perchloroethylene (tetrachloroethylene)	Phenol	Toluene	Trichloroethylene (trichloroethene)	Vinyl chloride	Xylenes	**TOTAL**
2.30E-04				1.17E-04	4.51E-03	1.85E-03	7.13E-07		2.16E-03			2.21E-07	1.94E-03	7.22E-04			2.33E-03		1.36E-02	1.40E-03	1.73E-03	4.83E-03	**4.02E-02**
2.52E-02				1.29E-02	4.95E-01	2.03E-01	7.82E-05		2.37E-01			2.42E-05	2.13E-01	7.92E-02			2.55E-01		1.50E+00	1.53E-01	1.90E-01	5.30E-01	**4.41E+00**
																							--
																							2.77E-02
	3.78E-03	1.09E-04	7.15E-07							5.05E-03	1.05E-03				1.93E-06	3.36E-03		5.89E-07					**1.50E-02**
	2.40E-06	5.00E-08									4.76E-04					3.32E-06							**4.82E-04**
					3.97E-03	3.00E-05			9.40E-04				2.65E-02		5.00E-06		2.50E-05		9.85E-04	2.90E-04		1.05E-04	**3.43E-02**
																							--
2.55E-02	3.79E-03	1.09E-04	7.15E-07	1.30E-02	5.04E-01	2.05E-01	7.89E-05	--	2.40E-01	5.05E-03	1.53E-03	2.44E-05	2.42E-01	8.00E-02	6.93E-06	3.37E-03	2.58E-01	5.89E-07	1.51E+00	1.55E-01	1.92E-01	5.35E-01	**4.52**
50.91	7.57	0.22	0.00	25.94	1,007.12	410.39	0.16	--	479.81	10.09	3.05	0.05	483.14	159.90	0.01	6.73	515.60	0.00	3,021.06	309.73	383.37	1,070.62	**9,048**

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY, CONTINUED (TPY)

Chloromethane (methyl chloride)	Chromium	Cobalt	Dibutylphthalate	Dichlorobenzene (1,4 isomer)	Dichloromethane (methylene chloride)	Ethylbenzene	Ethylene dibromide	Formaldehyde	Hexane	Lead	Manganese	Mercury (total)	Methyl ethyl ketone	Methyl isobutyl ketone	Napthalene	Nickel	Perchloroethylene (tetrachloroethylene)	Phenol	Toluene	Trichloroethylene (trichloroethene)	Vinyl chloride	Xylenes	**TOTAL**
2.22E-04				1.13E-04	4.36E-03	1.79E-03	6.89E-07		2.09E-03			2.13E-07	1.88E-03	6.98E-04			2.25E-03		1.32E-02	1.35E-03	1.67E-03	4.67E-03	**3.88E-02**
2.44E-02				1.24E-02	4.78E-01	1.96E-01	7.56E-05		2.29E-01			2.34E-05	2.06E-01	7.65E-02			2.47E-01		1.44E+00	1.48E-01	1.83E-01	5.12E-01	**4.26E+00**
																							--
																							1.86E-02
	2.20E-03	6.35E-05	4.15E-07							2.93E-03	6.11E-04				1.12E-06	1.95E-03		3.42E-07					**8.71E-03**
	2.40E-06	5.00E-08									4.76E-04					3.32E-06							**4.82E-04**
					3.97E-03	3.00E-05			9.40E-04				2.65E-02		5.00E-06		2.50E-05		9.85E-04	2.90E-04		1.05E-04	**3.43E-02**
																							--
2.46E-02	2.20E-03	6.35E-05	4.15E-07	1.25E-02	4.87E-01	1.98E-01	7.62E-05	--	2.32E-01	2.93E-03	1.09E-03	2.36E-05	2.34E-01	7.72E-02	6.12E-06	1.96E-03	2.49E-01	3.42E-07	1.46E+00	1.50E-01	1.85E-01	5.17E-01	**4.36**
49.17	4.40	0.13	0.00	25.05	973.03	396.38	0.15	--	463.50	5.86	2.17	0.05	468.46	154.45	0.01	3.91	498.01	0.00	2,918.03	299.18	370.28	1,034.10	**8,714**

Appendix I
Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY
(lbs/hr)

Emission Point	Source	1,1,1-Trichloroethane (methyl chloroform)	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane (ethylidene dichloride)	1,1-Dichloroethene (vinylidene chloride)	1,2-Dichloroethane (ethylene dichloride)	1,2-Dichloropropane (propylene dichloride)	Acetaldehyde	Acrolein	Acrylonitrile	Antimony	Arsenic	Benzene	Beryllium	Butadiene (1,3 isomer)	Carbon disulfide	Carbon tetrachloride	Carbonyl sulfide	Cadmium	Chlorobenzene	Chloroethane (ethyl chloride)	Chloroform
01	Existing Jones-Carroll Landfill Gases[1]	5.55E-05	1.60E-04	2.06E-04	1.68E-05	3.52E-05	1.76E-05			2.90E-04			1.29E-04			3.83E-05	5.33E-07	2.55E-05		2.44E-05	7.27E-05	3.10E-06
02	Proposed Landfill Gases[1]	6.09E-03	1.76E-02	2.26E-02	1.84E-03	3.86E-03	1.93E-03			3.18E-02			1.41E-02			4.20E-03	5.85E-05	2.80E-03		2.67E-03	7.97E-03	3.40E-04
03	Facility Operations																					
04	Stationary Internal Combustion Engines[2]																					
05	Waste Oil Space Heaters										2.16E-05	2.88E-04		8.64E-06					5.76E-05			
06	Electric Arc Welder[3]																					
07	Landfill Leachate Tank			5.02E-05		7.65E-05							1.03E-05			1.68E-04						3.20E-05
08-12	Petoleum Liquids Storage Tanks																					
	TOTAL (lbs/hr)	6.14E-03	1.77E-02	2.28E-02	1.86E-03	3.97E-03	1.95E-03	--	--	3.21E-02	2.16E-05	2.88E-04	1.42E-02	8.64E-06	--	4.40E-03	5.90E-05	2.82E-03	5.76E-05	2.70E-03	8.05E-03	3.76E-04

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Not itemized. Total HAPs estimated only.
[3] Not calculated.

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY
(lbs/hr)

Emission Point	Source	1,1,1-Trichloroethane (methyl chloroform)	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane (ethylidene dichloride)	1,1-Dichloroethene (vinylidene chloride)	1,2-Dichloroethane (ethylene dichloride)	1,2-Dichloropropane (propylene dichloride)	Acetaldehyde	Acrolein	Acrylonitrile	Antimony	Arsenic	Benzene	Beryllium	Butadiene (1,3 isomer)	Carbon disulfide	Carbon tetrachloride	Carbonyl sulfide	Cadmium	Chlorobenzene	Chloroethane (ethyl chloride)	Chloroform
01	Existing Jones-Carroll Landfill Gases[1]	5.36E-05	1.55E-04	1.99E-04	1.62E-05	3.40E-05	1.70E-05			2.80E-04			1.24E-04			3.70E-05	5.15E-07	2.46E-05		2.36E-05	7.02E-05	3.00E-06
02	Proposed Landfill Gases[1]	5.88E-03	1.70E-02	2.18E-02	1.78E-03	3.73E-03	1.87E-03			3.07E-02			1.36E-02			4.05E-03	5.65E-05	2.70E-03		2.58E-03	7.70E-03	3.29E-04
03	Facility Operations																					
04	Stationary Internal Combustion Engines[2]																					
05	Waste Oil Space Heaters										2.16E-05	2.88E-04		8.64E-06					5.76E-05			
06	Electric Arc Welder[3]																					
07	Landfill Leachate Tank			5.02E-05		7.65E-05							1.03E-05			1.68E-04						3.20E-05
08-12	Petoleum Liquids Storage Tanks																					
	TOTAL (lbs/hr)	5.93E-03	1.71E-02	2.21E-02	1.80E-03	3.84E-03	1.88E-03	--	--	3.10E-02	2.16E-05	2.88E-04	1.38E-02	8.64E-06	--	4.26E-03	5.70E-05	2.73E-03	5.76E-05	2.61E-03	7.77E-03	3.64E-04

[1] Controlled, LandGEM estimated maximum emissions for Year 2029.
[2] Not itemized. Total HAPs estimated only.
[3] Not calculated.

SUMMARY OF ESTIMATED POTENTIAL-TO-EMIT HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY, CONTINUED
(lbs/hr)

Chloromethane (methyl chloride)	Chromium	Cobalt	Dibutylphthalate	Dichlorobenzene (1,4 isomer)	Dichloromethane (methylene chloride)	Ethylbenzene	Ethylene dibromide	Formaldehyde	Hexane	Lead	Manganese	Mercury (total)	Methyl ethyl ketone	Methyl isobutyl ketone	Napthalene	Nickel	Perchloroethylene (tetrachloroethylene)	Phenol	Toluene	Trichloroethylene (trichloroethene)	Vinyl chloride	Xylenes	**TOTAL**
5.25E-05				2.67E-05	1.03E-03	4.23E-04	1.63E-07		4.93E-04			5.04E-08	4.44E-04	1.65E-04			5.32E-04		3.11E-03	3.19E-04	3.95E-04	1.10E-03	**9.17E-03**
5.76E-03				2.93E-03	1.13E-01	4.64E-02	1.79E-05		5.41E-02			5.53E-06	4.87E-02	1.81E-02			5.83E-02		3.42E-01	3.50E-02	4.34E-02	1.21E-01	**1.01E+00**
																							--
																							6.10E-02
	8.64E-04	2.50E-05	1.63E-07							1.15E-03	2.40E-04				4.42E-07	7.68E-04		1.34E-07					**3.43E-03**
																							--
					9.05E-04	6.85E-06			2.15E-04				6.04E-03		1.14E-06		5.74E-06		2.25E-04	6.62E-05		2.40E-05	**7.83E-03**
																							--
5.81E-03	8.64E-04	2.50E-05	1.63E-07	2.96E-03	1.15E-01	4.68E-02	1.80E-05	--	5.48E-02	1.15E-03	2.40E-04	5.58E-06	5.51E-02	1.83E-02	1.58E-06	7.68E-04	5.89E-02	1.34E-07	3.45E-01	3.54E-02	4.38E-02	1.22E-01	**1.09**

SUMMARY OF ESTIMATED EXPECTED/CONTROLLED HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS FOR THE CARROLL FACILITY, CONTINUED
(lbs/hr)

Chloromethane (methyl chloride)	Chromium	Cobalt	Dibutylphthalate	Dichlorobenzene (1,4 isomer)	Dichloromethane (methylene chloride)	Ethylbenzene	Ethylene dibromide	Formaldehyde	Hexane	Lead	Manganese	Mercury (total)	Methyl ethyl ketone	Methyl isobutyl ketone	Napthalene	Nickel	Perchloroethylene (tetrachloroethylene)	Phenol	Toluene	Trichloroethylene (trichloroethene)	Vinyl chloride	Xylenes	**TOTAL**
5.07E-05				2.58E-05	9.95E-04	4.09E-04	1.57E-07		4.76E-04			4.87E-08	4.28E-04	1.59E-04			5.14E-04		3.01E-03	3.08E-04	3.82E-04	1.07E-03	**8.86E-03**
5.56E-03				2.83E-03	1.09E-01	4.48E-02	1.72E-05		5.22E-02			5.34E-06	4.70E-02	1.75E-02			5.63E-02		3.30E-01	3.38E-02	4.19E-02	1.17E-01	**9.72E-01**
																							--
																							6.10E-02
	8.64E-04	2.50E-05	1.63E-07							1.15E-03	2.40E-04				4.42E-07	7.68E-04		1.34E-07					**3.43E-03**
																							--
					9.05E-04	6.85E-06			2.15E-04				6.04E-03		1.14E-06		5.74E-06		2.25E-04	6.62E-05		2.40E-05	**7.83E-03**
																							--
5.61E-03	8.64E-04	2.50E-05	1.63E-07	2.86E-03	1.11E-01	4.52E-02	1.74E-05	--	5.29E-02	1.15E-03	2.40E-04	5.39E-06	5.35E-02	1.76E-02	1.58E-06	7.68E-04	5.69E-02	1.34E-07	3.33E-01	3.42E-02	4.23E-02	1.18E-01	**1.05**

AIR QUALITY MODELING REPORT

By: Conestoga-Rovers & Associates

October 2014

CONESTOGA-ROVERS
& ASSOCIATES

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Air Quality Modeling Report

Carroll Construction and Demolition Debris Landfill Carroll, New York

Prepared For: Sealand Waste, LLC

Conestoga-Rovers & Associates
2055 Niagara Falls Boulevard, Suite 3
Niagara Falls, New York 14304

October 2014 • 080169 • Report No. 2

Partners in Sustainability

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Section 1.0 Introduction

This report describes the air quality dispersion modeling completed for the Carroll Construction and Demolition Debris (C&D) Landfill (the Facility) located near Frewsburg, New York in Chautauqua County. A regional map indicating site location is presented in Figure 1. The air quality dispersion modeling was completed to support the proposed expansion of the Facility.

The pollutants evaluated in the ambient air quality impact analysis include particulate matter less than 2.5 micrometers ($PM_{2.5}$), particulate matter less than 10 micrometers (PM_{10}) and hydrogen sulfide (H_2S).

1.1 Proposed Project

The Facility consists of the existing 3 acre landfill and 32 acre expansion within a parcel of property totaling 53.3 acres. Activities to support landfill operations also include (C&D) waste recycling and yard waste composting.

This air quality dispersion modeling was completed in accordance with the guidelines provided in the following documentation:

- DAR-10/New York State Department of Environmental Conservation (NYSDEC) Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis (May 9, 2006)
- Appendix W of 40 CFR Part 51, EPA (November 2005)
- NYSDEC Policy C-33/Assessing and Mitigating Impacts of Fine Particulate Matter Emissions (CP-33)(December 29, 2003)
- Draft Guidance for PM-2.5 Permit Modeling (USEPA, March 4, 2013)

This analysis has been completed at the request of Region 9 NYSDEC personnel and is voluntary. Since proposed $PM_{2.5}$ and PM_{10} emissions are less than 15 TPY, CP-33 would not technically apply to the project. As stated in the policy, “If primary PM_{10} emissions from the project do not equal or exceed 15 tons per year, then the $PM_{2.5}$ impacts from the project shall be deemed insignificant and no further assessment shall be required under this policy.”

1.2 Emission Sources

Thirteen air emission sources are identified for the Facility:

1. Existing 142, 350 yd^3 C&D Debris Land Disposal Unit – Fugitive Emissions
2. Proposed 5,448,710 yd^3 C&D Debris Land Disposal Unit – Fugitive Emissions
3. Particulates from Facility Operations – Fugitive Emissions

4. Exhaust from Sulfatreat Stack - 1 Point Source
5. Four Stationary Compression Ignition Internal Combustion Engines – Fugitive Emissions
6. Exhaust from two Waste Oil Space Heater Stacks – 2-Point Sources
7. Electric Arc Welder Vent
8. Landfill Leachate Aboveground Storage Tank (AST) Vent
9. Waste Oil AST Vent
10. Diesel Motor Oil AST Vent
11. Hydraulic Oil AST Vent
12. Gasoline AST Vent
13. Diesel Fuel AST Vent

Sources to be modeled include:

- Fugitive PM emissions from active disposal and construction areas (area sources)
- PM emissions from roads (line sources)
- Fugitive H_2S emissions from active disposal and construction areas (area sources)
- H_2S emissions from the Sulfatreat system (point source)

Other Facility emission sources were not included in the model as they are not considered significant sources of $PM_{2.5}$, PM_{10}, or H_2S.

Section 2.0 Modeling Methodology

Modeling was performed using the USEPA AERMOD modeling system which includes the following components:

- AERMET, Version 12345
- AERSURFACE, Version 13016
- AERMAP, Version 11103
- AERMOD, Version 14134
- BPIP-PRIME, Version 04274

Modeling was facilitated using the Lakes Environmental graphical user interface AERMOD View (Version 8.7.0).

2.1 Modeling Input Parameters

The model was run using "regulatory default" mode, which specified the use of the following options:

- Stack-tip downwash-reduces effective stack height when plume exit velocity is less than 1.5 times the wind speed
- Plume buoyancy induces dispersion-increases the dispersion coefficient to account for the vertical movement of the plume
- Calms processing
- Allow missing meteorological data
- Elevated terrain

Source specific input parameters were entered into the Source Pathway of the model. Input parameters for area sources and point sources are presented in Table 1, following this text, and input parameters for line sources are presented in Table 2, following this text.

2.2 Modeled Receptors

For each pollutant, a multi-tier, uniform Cartesian grid centered on the Facility was established. The following receptor node spacing was used at various downwind distances.

- Facility Boundary to 1 km 70 m
- 1 km to 2 km 200 m
- 2 km to 10 km 500 m

A property boundary receptor grid was established along the property boundary of the Facility with a spacing of 70 m to capture the maximum property boundary concentration. A depiction of the receptor grid layout is presented in Figure 3.

All receptors located within the Facility property boundary were removed, as Sealand Waste, L.L.C. will prohibit public access to the facility with a fence or other effective physical barrier at the property boundary.

2.3 Land Use Classification

According to NYSDEC's DAR-10 guidance, the land use within the 3 km radius of the Facility was classified according to Auer, A.H. (1978): *Correlation of land use and cover with meteorological anomalies*, Journal of Applied meteorology, 17:636-634. The major land use classification covering the area surrounding the Facility is Forest or Wild Land. Given this classification the area is classified as rural for the purposes of the air quality dispersion modeling.

2.4 Topography

Elevated terrain data was utilized, and the model was run using the elevated terrain option. Elevations above mean sea level corresponding to the base elevation of the Facility were assigned to all of the Facility structures, sources, and receptors modeled.

Digital terrain elevation was obtained by processing 7.5 minute DEMs (30 m resolution) data from WebGIS using the USEPA AERMAP executable.

2.5 Meteorological Data

On-site meteorological data for the Facility is not available; therefore, the 2008-2012 Jamestown surface meteorological data with Buffalo upper air data, as provided by the NYSDEC, was used in the analysis. Meteorological data from Jamestown, New York was utilized as representative meteorological data for the Facility as Jamestown, New York and the Facility have similar weather patterns and the major land use surrounding both areas is classified as rural. The Jamestown, New York meteorological station is also in the closest proximity to the Facility compared to other stations with similar weather patterns and land use.

The surface and profile meteorological data was processed using the USEPA AERMET according to standard USEPA methods for air dispersion modeling.

2.6 Plant Boundary

A site plan of the Facility is presented in Figure 2, following this text, which depicts the following plant boundaries:

- Property boundary
- Active landfill
- Construction area
- Borrowing/Fill area
- Recycling area
- Haul-roads (line sources)

2.7 Building Downwash Analysis

A building downwash analysis was not completed for this model as there are no buildings located in the vicinity of the Sulfatreat point source. In addition, area and volume sources are not affected by downwash.

2.8 Background Concentration

Background concentrations for the most recent three years, 2010-2012, were obtained from the DEC Air Quality Reports for 2010 through 2012. The years 2010-2012 were the most recent and available PM background data at the time of the analysis. Background concentration for $PM_{2.5}$ was taken from the Westfield monitoring station. As PM_{10} data was not available for the Westfield monitoring station representative background data was instead taken from the Niagara Falls (R&P) station. Based on proximity and land use the Niagara Falls (R&P) station is the most representative station with available background concentration data.

Background concentrations of H_2S are not available through data that is maintained by NYSDEC.

According to information provided by the Agency for Toxic Substances and Disease Registry (ATSDR), ambient air concentrations of hydrogen sulfide from natural sources range between 0.11 parts per billion (ppb) (or 0.15 micrograms per cubic meter ($\mu g/m^3$)) and 0.33 ppb (or 0.46 $\mu g/m^3$). Therefore, a conservative background H_2S concentration of 0.46 $\mu g/m^3$ was assumed for the modeling analysis.

2.9 Environmental Justice Analysis

The Facility is not subject to an Environmental Justice Analysis as this is not a project with Potential for Significant Deterioration (PSD) applicable to NYSDEC Commissioner Policy 29, for Environmental Justice and Permitting. Furthermore, this project is not applicable to NYSDEC Part 487, Analyzing Environmental Justice Issues in Siting of Major Electric Generating Facilities Pursuant to Public Service Law Article 10 as the project does not include an electric generating unit greater than 25 megawatts.

Section 3.0 Modeled Parameters

The modeling was performed for $PM_{2.5}$, PM_{10}, and H_2S.

3.1 Particulate Matter

As this is not a PSD project PM2.5 modeling was performed in accordance with NYSDEC Policy CP-33, Assessing and Mitigating Impact of Fine Particulate Matter (CP-33) and USEPA's Draft

Guidance for PM-2.5 Permit Modeling. The significance analysis or what CP-33 refers to as Thresholds for Determining Potential Significance was conducted.

Facility emission sources to be modeled for PM2.5 and PM10 include haul-roads (line sources) and the C&D landfill (area sources). The area sources include active landfilling, linear construction, borrowing/fill area, and the recycling facility area. Figure 2 presents these sources and represents conditions resulting in maximum PM2.5 and PM10 emissions from the Facility.

3.2 Hydrogen Sulfide

Facility emission sources modeled for H_2S include the C&D landfill (area sources) and the Sulfatreat system (point source). As outlined in the NYSDEC comment letter dated April 17, 2014, it is proposed to conduct surface scans of the landfill for H_2S using a Jerome Gold Film analyzer or similar device. The device will monitor the concentration of H_2S at a distance of 3-5 centimeters (cm) above the landfill surface. If an exceedance is detected, corrective actions could be implemented and re-monitoring would be performed similar to the program specified in the New Source Performance Standards (NSPS) for Municipal Solid Waste (MSW) Landfills (40 CFR, 60, Subpart WWW).

The site-specific Health and Safety Plan for the Site lists a maximum breathing zone concentration of 10 ppm for hydrogen sulfide before requiring advanced personal protective equipment. This concentration is based on the National Institute for Occupational Safety and Health's (NIOSH) time-weighted average which is the cumulative average concentration over a 10 hour-per-day, 40 hour-per-week period to which a worker can be safely exposed. It is proposed to use a H2S limit of 10 ppm for surface monitoring of the landfill. This proposed limit is considered very conservative since the NIOSH value represents the breathing zone of the worker (~ 5-6 feet above the ground) and surface monitoring would take place 3-5 cm above the landfill surface (measured surface concentrations with monitoring instrument would not account for dispersion that occurs between the landfill surface and the breathing zone).

Assuming a landfill gas generation rate of 800 standard cubic feet per minute (scfm) conservatively rounded up from the maximum flow rate of total landfill gas resulting from the LandGEM models and a collection efficiency of 86.35 percent based on assumed cover conditions during the years of maximum emissions, a H_2S concentration of 10 ppm corresponds with a mass emission rate of 7.3 x 10-4 grams per second (g/s) from the landfill. The point source (Sulfatreat unit) has a maximum mass emission rate of 0.0014 g/s (assuming a control efficiency of 99.925 percent).

3.3 Significant Impact Level Analysis ($Pm_{2.5}$ and Pm_{10})

The significance analysis is performed to determine if the modeled concentrations from the Facility do not cause or contribute to an exceedance of a significant impact level (SIL). To determine this, the project alone was modeled and the ambient impacts from the project were compared against the SILs for the air pollutant(s) of concern, in this case $PM_{2.5}$ and PM_{10}. If the predicted concentrations based on the modeling are below the SIL for an air contaminant, no further analysis is required for that air pollutant. By not exceeding the SIL, the project demonstrates that it cannot significantly contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS). Model results are compared to the most recent SIL as many of the SIL and NAAQS values have been revised since CP-33 was published. The maximum allowable emissions and corresponding averaging times from the Facility were used to predict pollutant concentrations for comparison to the SILs. Table 3, following this text, presents the comparison of modeling results to the most recent SIL values.

Although this analysis was voluntary, since the SILs were shown to potentially be exceeded an evaluation of mitigation measures to reduce $PM_{2.5}$ and PM_{10} emissions (to the extent practicable) should be included in the Draft Environmental Impact Statement for the project as required by CP-33.

3.4 National Ambient Air Quality Analysis ($Pm_{2.5}$ and Pm_{10})

As SILs were exceeded the model results were compared to NAAQS, using applicable concentration rankings and averaging times, in accordance with the October 2013 Air Quality Modeling Protocol prepared for the proposed expansion of the Carroll C&D Landfill and subsequently revised by the comments received by the NYSDEC on April 7, 2014. As this is not a PSD project and comparison to NAAQS standards is beyond the requirements of CP-33 the impact from existing onsite and surrounding sources were not included. Rather it is assumed that existing onsite sources contribute minimal emissions in comparison to the Facility sources and other offsite sources are represented in the background concentrations. For these reasons the modeled results for the Facility and background concentrations, as obtained from the DEC Air Quality Reports from 2010-2012 for the Westfield monitoring station (PM2.5) and Niagara Falls (R&P) station (PM10), were summed for comparison to NAAQS. None of the NAAQS were exceeded under this analysis. Table 4, following this text, presents the comparison of modeling results to NAAQS.

3.5 National Ambient Air Quality Analysis (H_2s)

The AERMOD model was run using the mass emission rates specified in Section 3.2 and compared with the short-term (1-hour) guidance concentration (SGC) and annual guidance concentration (AGC) as specified in the NYSDEC DAR-1 Tables. The AERMOD modeled results are below the SGC and AGC limits for H_2S. Table 4, following this text, presents the comparison of modeling results to the NYSDEC DAR-1 SCG and AGC values for H_2S.

Section 4.0 Modeling Results

Modeling results are presented in Table 3 and Table 4 following this text. Table 3 presents the maximum modeled results per year compared to the most recent SIL values. Table 4 presents the maximum modeled result per year with their respective background concentrations, and that total result compared to their respective NAAQS limits. As seen in Table 4 all pollutants are below their respective NAAQS limits. AERMOD modeling input and output files are presented in Appendix B following this text.

Isopleths for each pollutant analyzed for each year are presented in the figures as listed below, following the text:

- Figure 4 2010 $PM_{2.5}$ 24 Hour, First High Isopleth
- Figure 5 2011 $PM_{2.5}$ 24 Hour, First High Isopleth
- Figure 6 2012 $PM_{2.5}$ 24 Hour, First High Isopleth
- Figure 7 2010 PM_{10} 24 Hour, First High Isopleth
- Figure 8 2011 PM_{10} 24 Hour, First High Isopleth
- Figure 9 2012 PM_{10} 24 Hour, First High Isopleth
- Figure 10 2010 $PM_{2.5}$ 24 Hour, Eighth High Isopleth
- Figure 11 2011 $PM_{2.5}$ 24 Hour, Eighth High Isopleth
- Figure 12 2012 $PM_{2.5}$ 24 Hour, Eighth High Isopleth
- Figure 13 2008 $PM_{2.5}$ Annual Isopleth
- Figure 14 2009 $PM_{2.5}$ Annual Isopleth
- Figure 15 2010 $PM_{2.5}$ Annual Isopleth
- Figure 16 2011 $PM_{2.5}$ Annual Isopleth
- Figure 17 2012 $PM_{2.5}$ Annual Isopleth
- Figure 18 2010 H_2S 1 Hour, First High Isopleth
- Figure 19 2011 H_2S 1 Hour, First High Isopleth
- Figure 20 2012 H_2S 1 Hour, First High Isopleth
- Figure 21 2010 H_2S Annual, First High Isopleth
- Figure 22 2011 H_2S Annual, First High Isopleth
- Figure 23 2012 H_2S Annual, First High Isopleth

- Figure 24 2008 $PM_{2.5}$ 24-Hour, Eighth High Isopleth
- Figure 25 2009 $PM_{2.5}$ 24-Hour, Eighth High Isopleth

Section 5.0 Visibility Analysis

A visibility analysis was completed for $PM_{2.5}$ and PM_{10}.

5.1 Methods

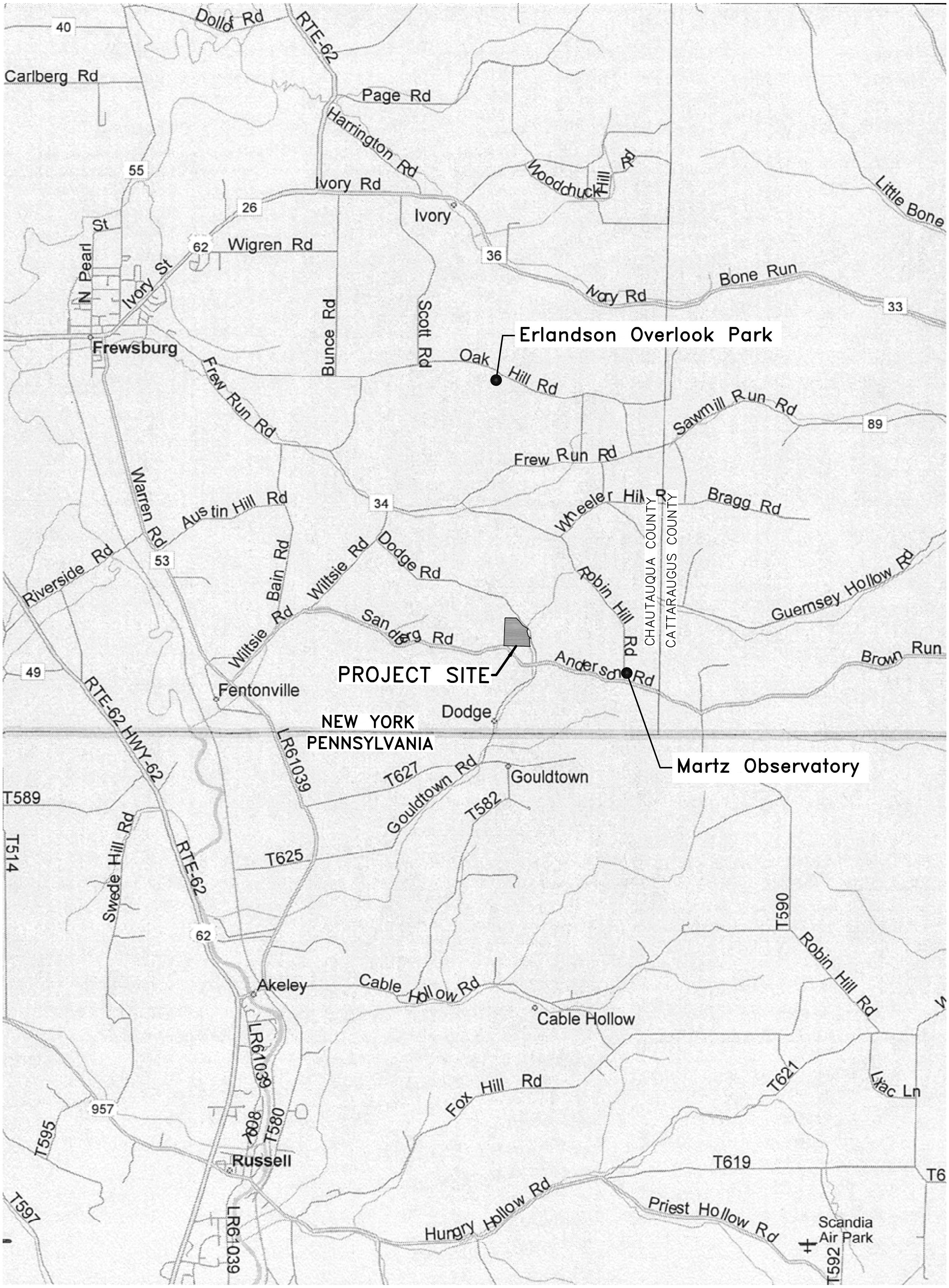
A visibility analysis was completed using the USEPA VISCREEN model to determine the impacts the proposed project would have on the sensitive areas Martz Observatory and Erlandson Overlook located near the Facility. This analysis is not typically completed for non-Class 1 Areas and was completed at the request of Region 9 NYSDEC. The analysis was completed according to the USEPA's "Workbook for Plume Visual Screening and Analysis (Revised)" (October 1992; EPA-454/R-92-023) guidelines for a Level 1 screening analysis.

5.2 Results

The Level 1 screening analysis results are designed to provide a conservative estimate of plume visual impacts by using worst-case meteorological conditions. The results were also based on the Facility's worse case year; these operating conditions will only occur for a brief period of time during the life of the landfill.

The screening analysis results determined using these conservative conditions resulted in a marginal exceedence of screening criteria at the Erlandson Overlook given a terrain plume-viewing background when the sun is at an angle of 10^o to the observer's line of sight and the observer is in a direct line with the assumed worst-case plume centerline and the sun. Given the location of the Erlandson Overlook with respect to the landfill, however, this is not possible. The results of the visibility analysis for the Erlandson Overlook are presented in Appendix A following the text.

Similarly, the Martz Observatory screening analysis results indicate an impact on terrain plume-viewing background when the sun is at an angle of 10^o to the observer's line of sight, when the observer is in a direct line between the emission source and the sun. Thus the view from the Martz Observatory will be most obstructed when viewing the terrain at sunset. However, since the primary function of the Martz Observatory is the observation of astronomical objects and phenomena in the night sky only plume visual impacts on a sky plume-viewing background are pertinent. The Facility does not exceed any of the tests for the applicable sky plume-viewing background. Further, dust generating activities at the landfill will occur during daylight hours, not when the observatory will generally be in use. The results of the visibility analysis for the Martz Observatory are presented in Appendix A following the text.



REGIONAL MAP

CARROLL LANDFILL EXPANSION APPLICATION

SEALAND WASTE, LLC

TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK
October 2012	SCALE: NOT TO SCALE	REVISION # 0

FIGURE 1

DAIGLER ENGINEERING P.C.
......engineering · science · design ....
1711 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

Q:\Sealand\02-0104 Carroll Landfill\03 DEIS\Section 1\Figures\Fig 1-3 Carroll Vicinity Map.dwg 10/4/2012 1:43 PM

LEGEND:

- BORROW/FILL AREA
- LINER CONSTRUCTION
- ACTIVE LANDFILLING
- DRAINAGE CHANNEL FLOW DIRECTION
- CULVERT
- ACCESS ROAD
- LINE SOURCE

PARTICULATE EMISSION SOURCES:

LINE SOURCES	LENGTH (FEET)
L1 – INNER ACCESS ROAD	1,963 FT
a Entrance to L4	553 FT
b L4 to L3	372 FT
c L3 to L5	724 FT
d L5 to L2	314 FT
L2 – ACTIVE LANDFILL LOOP	888 FT
L3 – RECYCLING FACILITY LOOP	1,241 FT
L4 – LEACHATE LOADOUT FACILITY	595 FT
L5 – STAGING AREA LOOP	535 FT
L6 – OUTER PERIMETER ACCESS ROAD	5,878 FT

AREA SOURCES	AREA (ACRES)
A1 – ACTIVE LANDFILLING AREA	7.89 ACRES
A2 – LINER CONSTRUCTION AREA	5.11 ACRES
A3 – BORROWING/FILL AREA	4.99 ACRES
A4 – RECYCLING FACILITY AREA	4.89 ACRES

POINT SOURCES	STACK RELEASE HEIGHT (FEET)
P1a&b – WASTE OIL HEATER EXHAUST VENTS (8 INCH ID)	28 FEET

figure 2

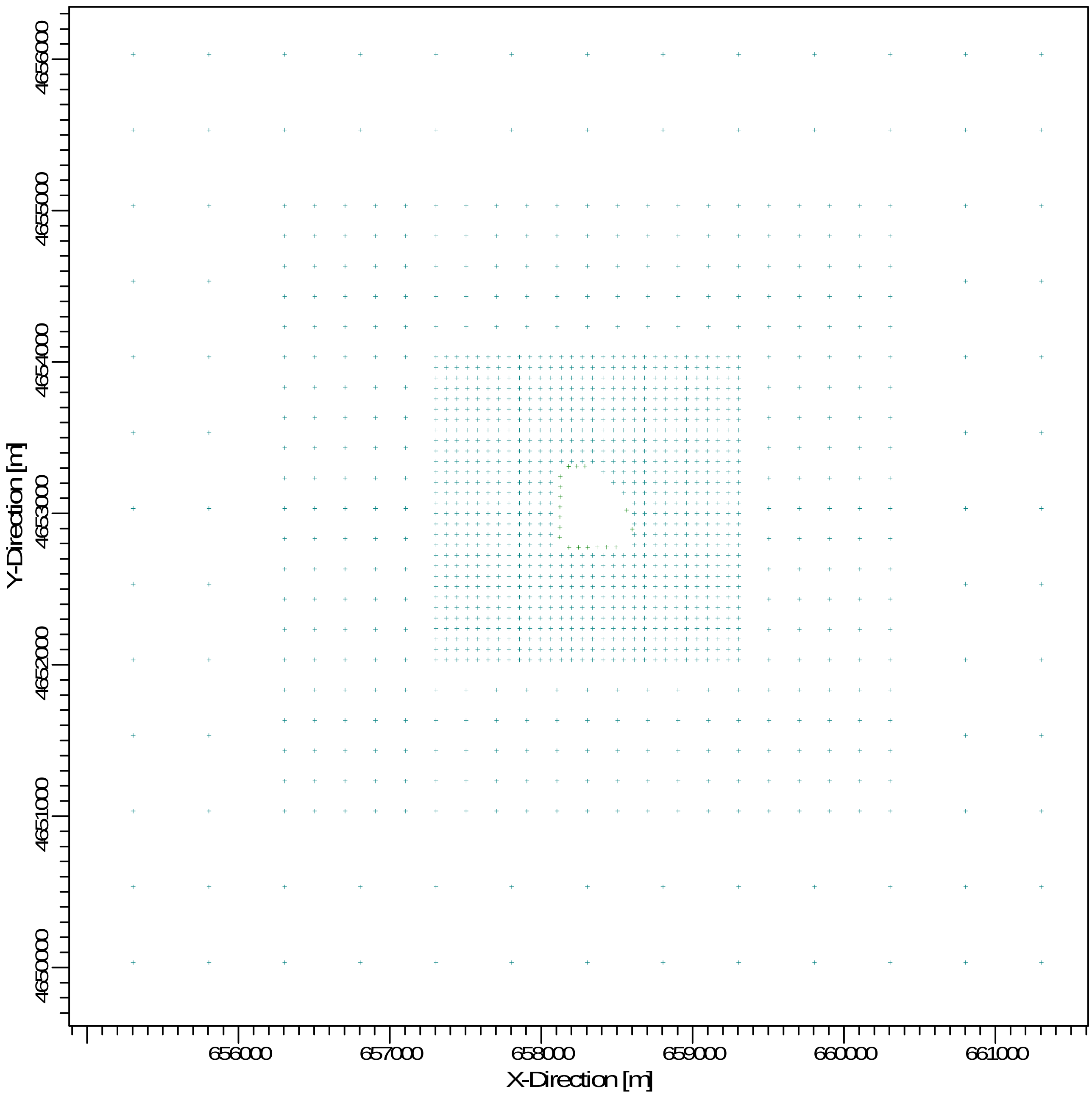
SOURCE:
DAIGLER ENGINEERING
CARROLL LANDFILL
EXPANSION APPLICATION

SITE PLAN
MAXIMUM PM EMISSIONS
CARROLL LANDFILL
Carroll, New York

80169-00(001)GN-NI001 JUL 24/2013

PROJECT TITLE:

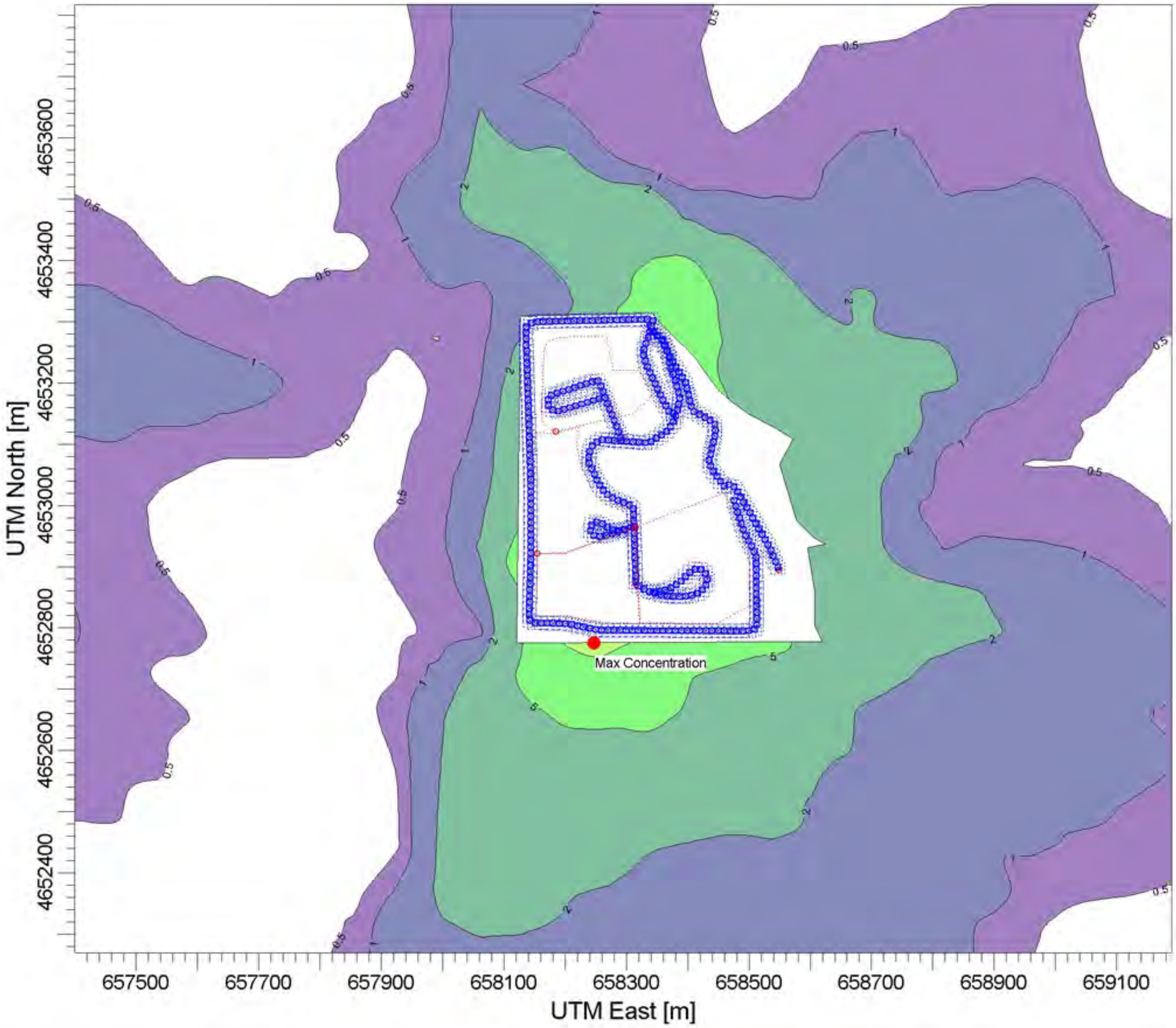
Figure 3. Receptor Grid
Carroll C&D Landfill



COMMENTS:	MODELING OPTIONS:		COMPANY NAME:	
	REGDFAULT, CONC, ELEV		**Sealand Waste, L.L.C.**	
			MODELER:	
	Concentration	RECEPTORS: **2811**	SCALE: 1:42,320 0 — 1 km	
		UNITS: **ug/m^3**	DATE: **19/12/2013**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 4. 2010 PM2.5 24-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF 1ST-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

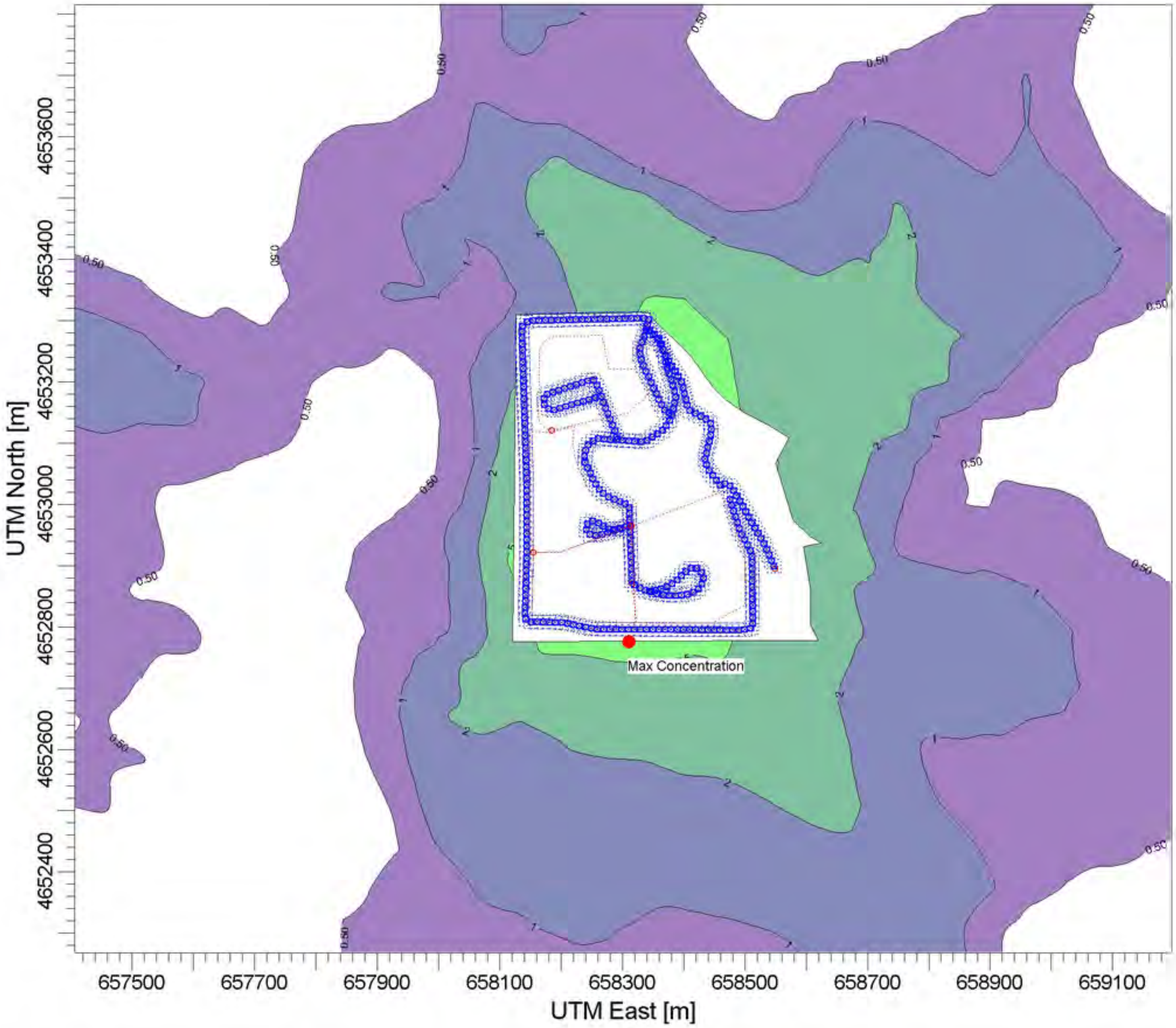
Max: 11.5 [ug/m^3] at (658245.30, 4652776.51)

0.5 1.0 2.0 5.0 10.0 20.0 50.0 55.0

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658245.30, 4652776.51)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:11,256 0 — 0.4 km	
	MAX: **11.502 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 5. 2011 PM2.5 24-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF 1ST-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

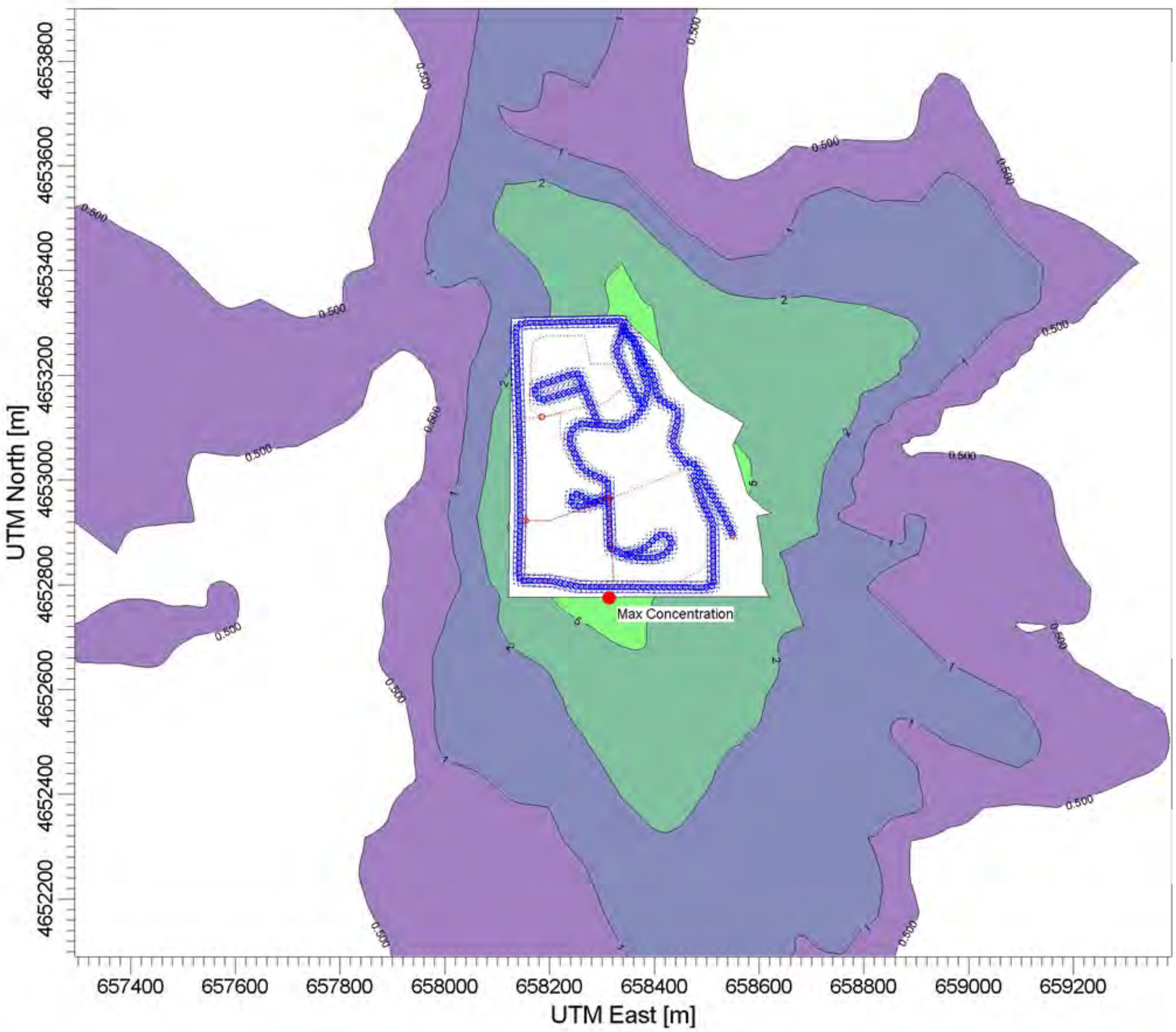
Max: 6.554 [ug/m^3] at (658307.37, 4652776.77)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:11,255 0 — 0.4 km	
	MAX: **6.554 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 6. 2012 PM2.5 24-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF 1ST-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

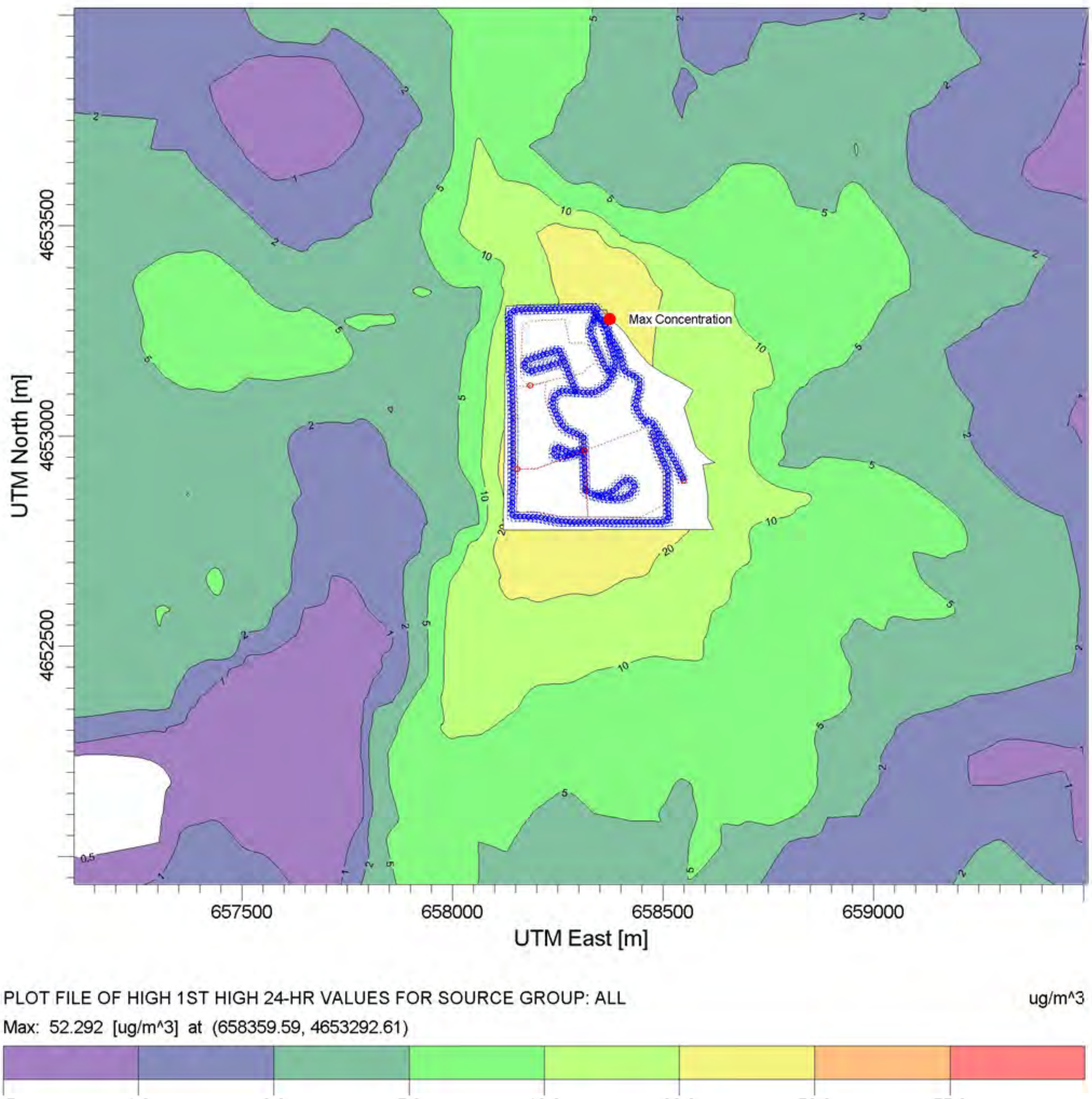
Max: 8.002 [ug/m^3] at (658307.37, 4652776.77)

0.500 1.000 2.000 5.000 10.000 20.000 50.000 55.000

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:13,168 (0 — 0.5 km)	
	MAX: **8.002 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

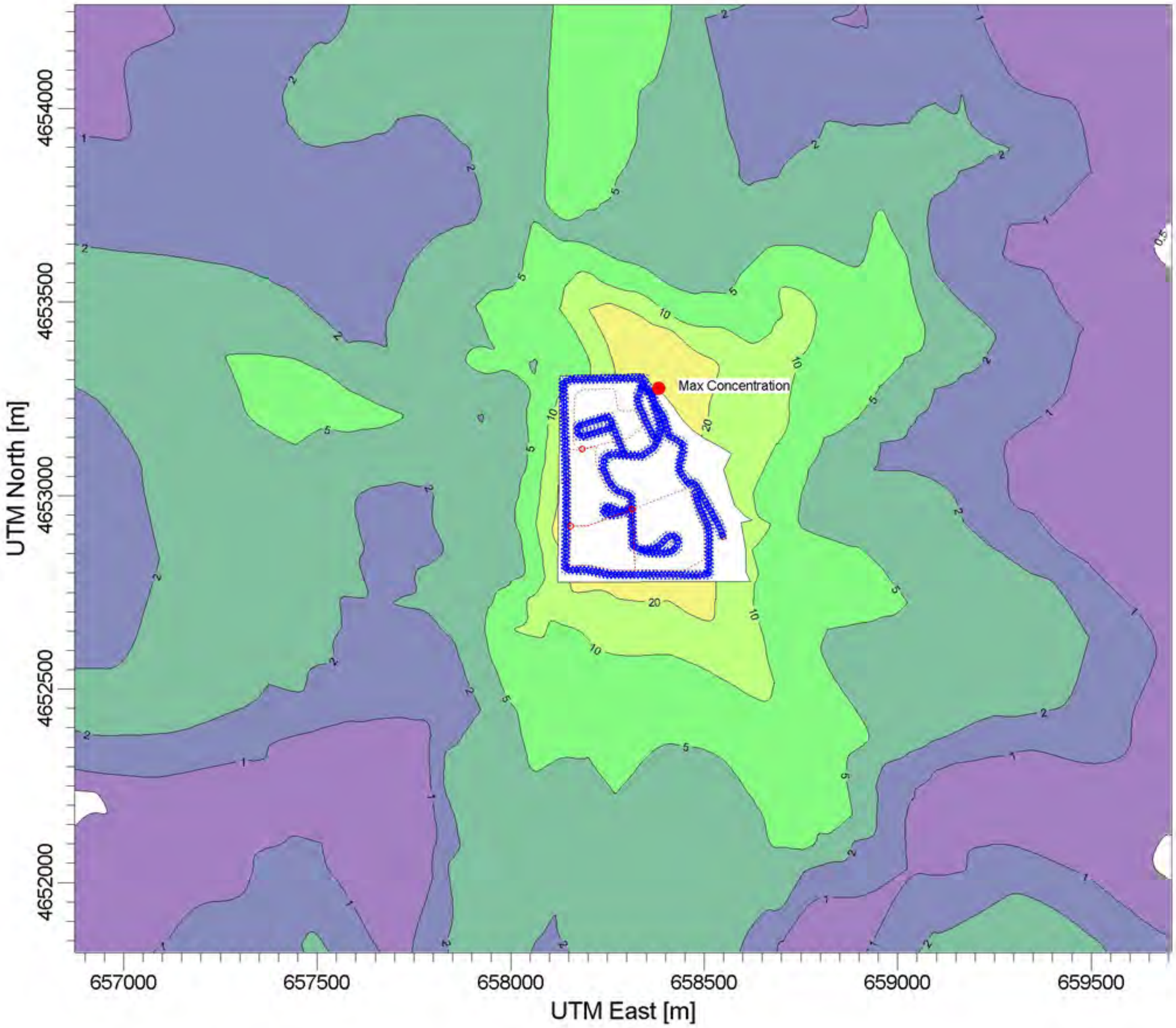
Figure 7. 2010 PM10 24-Hour, 1st High Isopleth
Carroll C&D Landfill



COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:15,148 (0 — 0.5 km)	
	MAX: **52.292 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 8. 2011 PM10 24-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

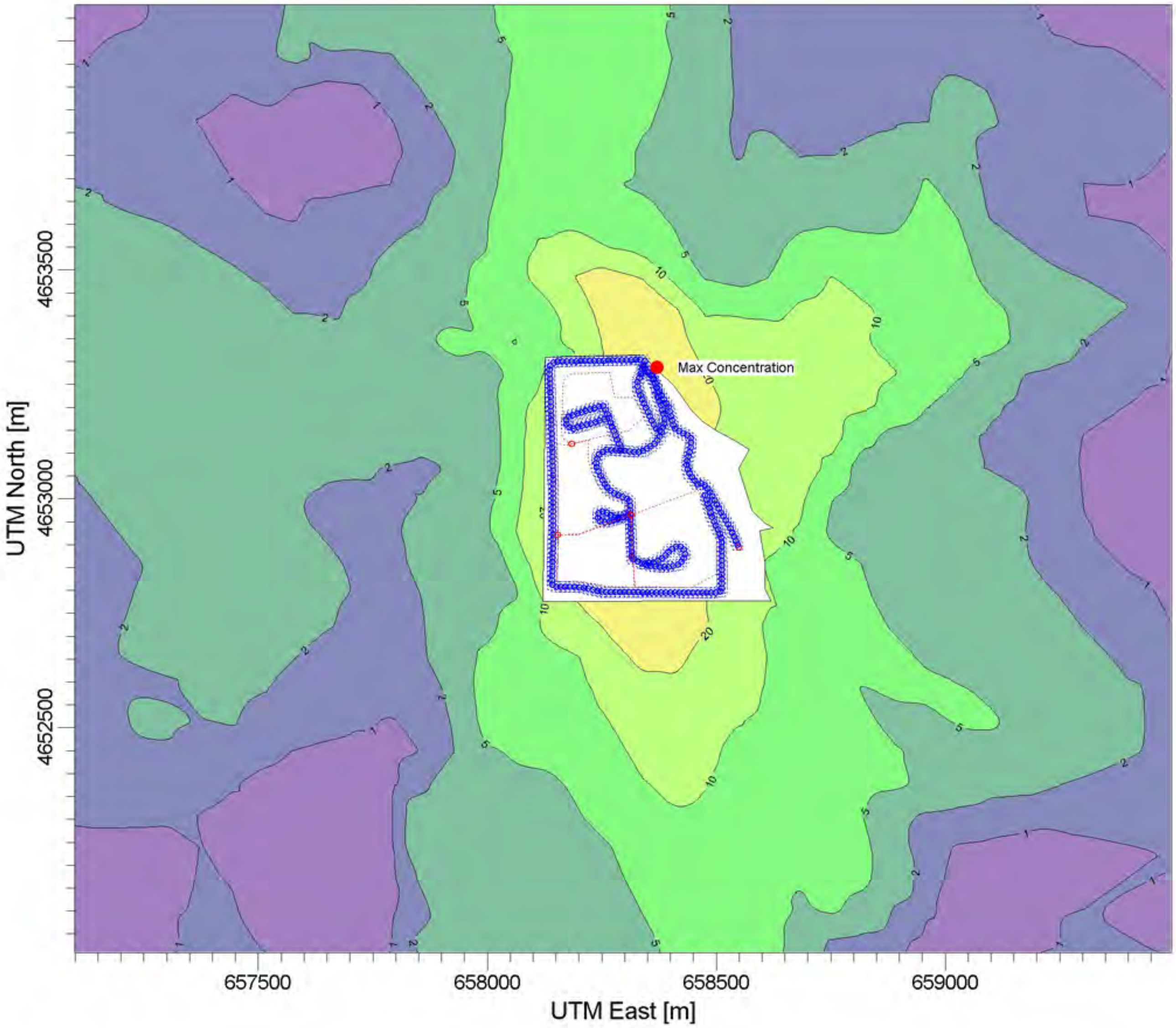
Max: 43.890 [ug/m^3] at (658359.59, 4653292.61)

0.5 1.0 2.0 5.0 10.0 20.0 50.0 55.0

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:17,822 0 — 0.5 km	
	MAX: **43.890 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 9. 2012 PM10 24-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

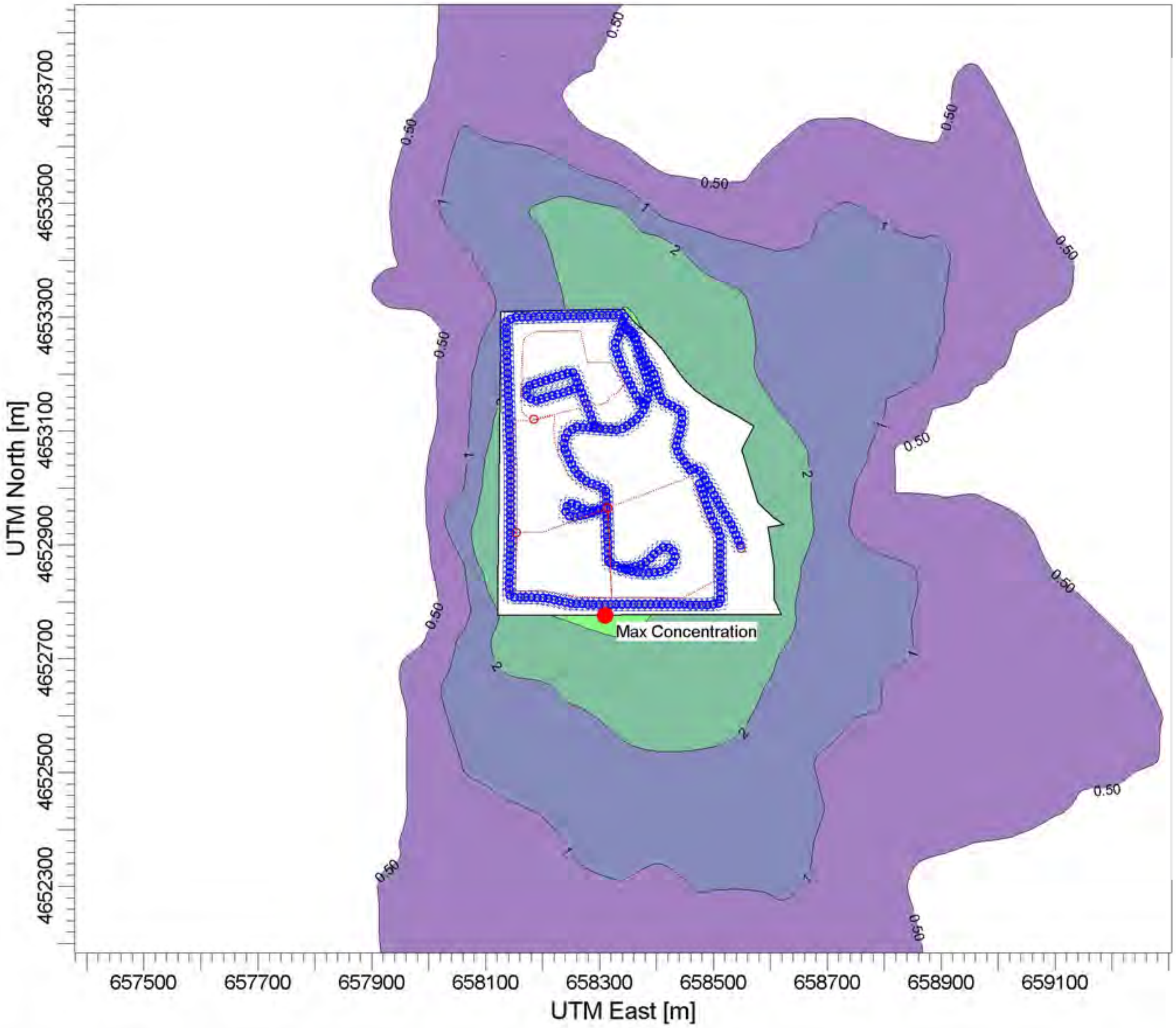
Max: 47.434 [ug/m^3] at (658359.59, 4653292.61)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:15,064 0 — 0.5 km	
	MAX: **47.434 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 10. 2010 PM2.5 24-Hour, 8th High Isopleth
Carroll C&D Landfill



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

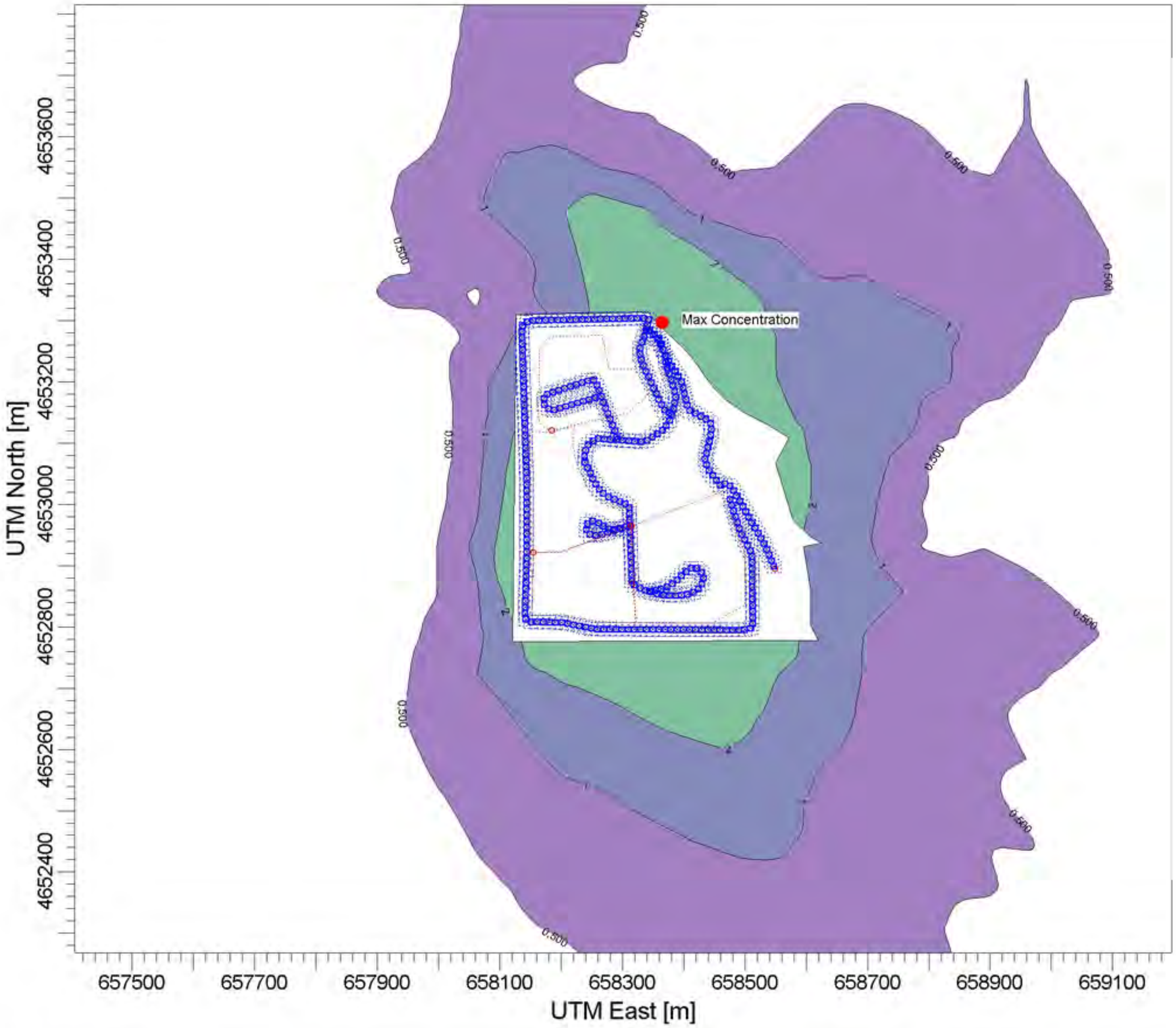
Max: 6.23 [ug/m^3] at (658307.37, 4652776.77)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:12,112 0 — 0.4 km	
	MAX: **6.23 ug/m^3**	DATE: **27/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 11. 2011 PM2.5 24-Hour, 8th High Isopleth
Carroll C&D Landfill



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

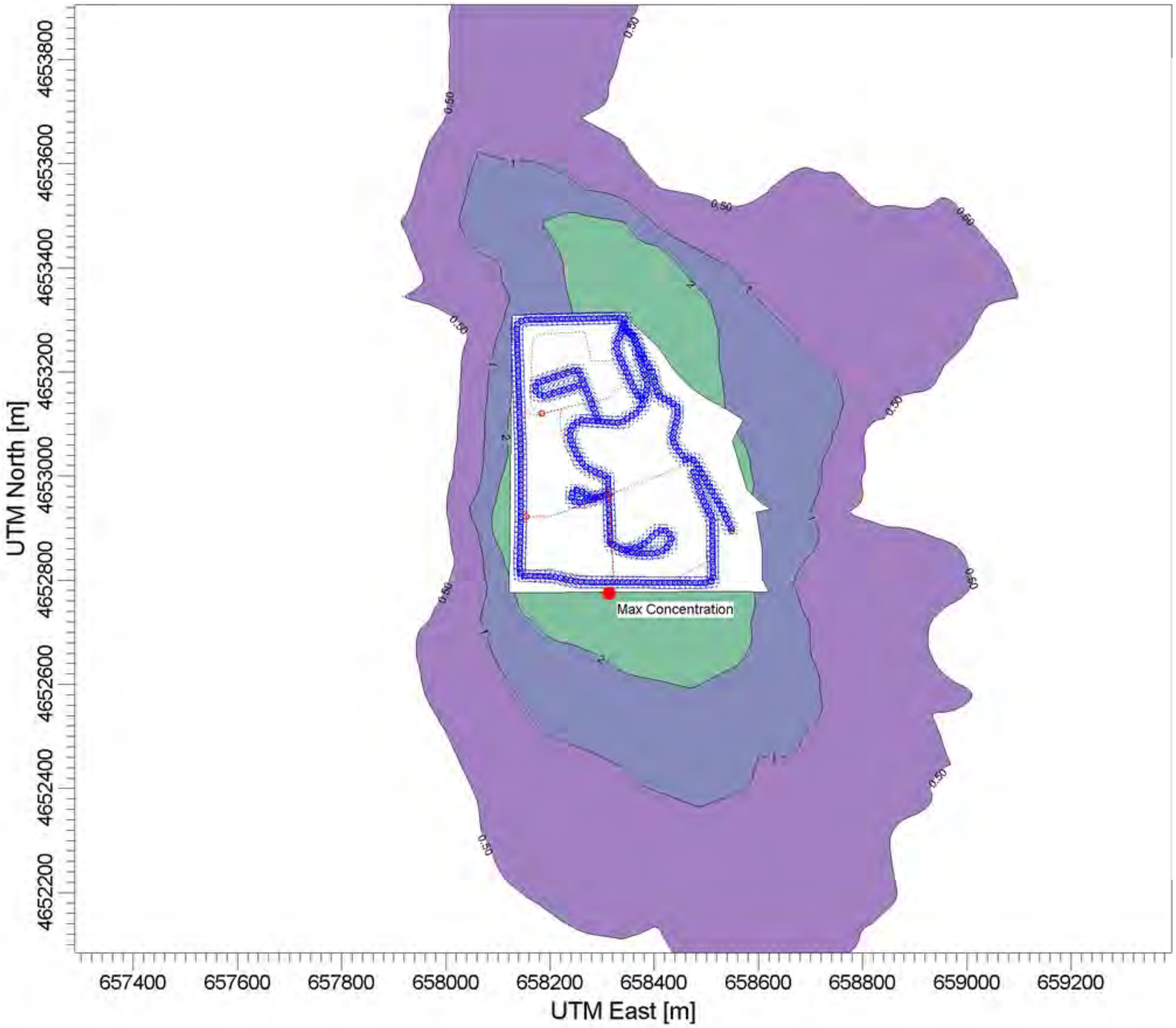
Max: 4.789 [ug/m^3] at (658359.59, 4653292.61)

0.500 1.000 2.000 5.000 10.000 20.000 50.000 55.000

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:11,255 0 — 0.4 km	
	MAX: **4.789 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 12. 2012 PM2.5 24-Hour, 8th High Isopleth
Carroll C&D Landfill



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

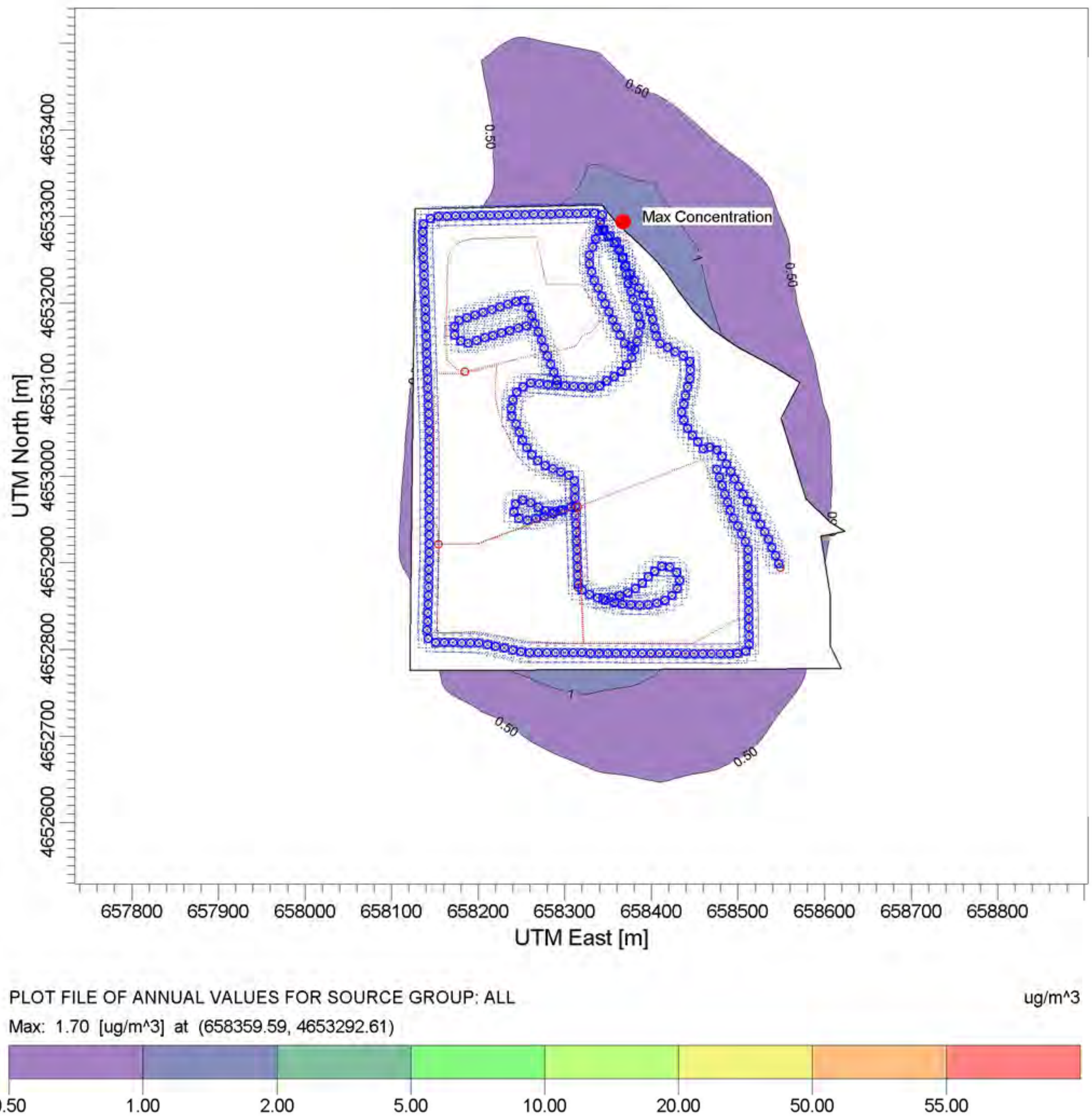
Max: 5.07 [ug/m^3] at (658307.37, 4652776.77)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:13,242 0 — 0.5 km	
	MAX: **5.07 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

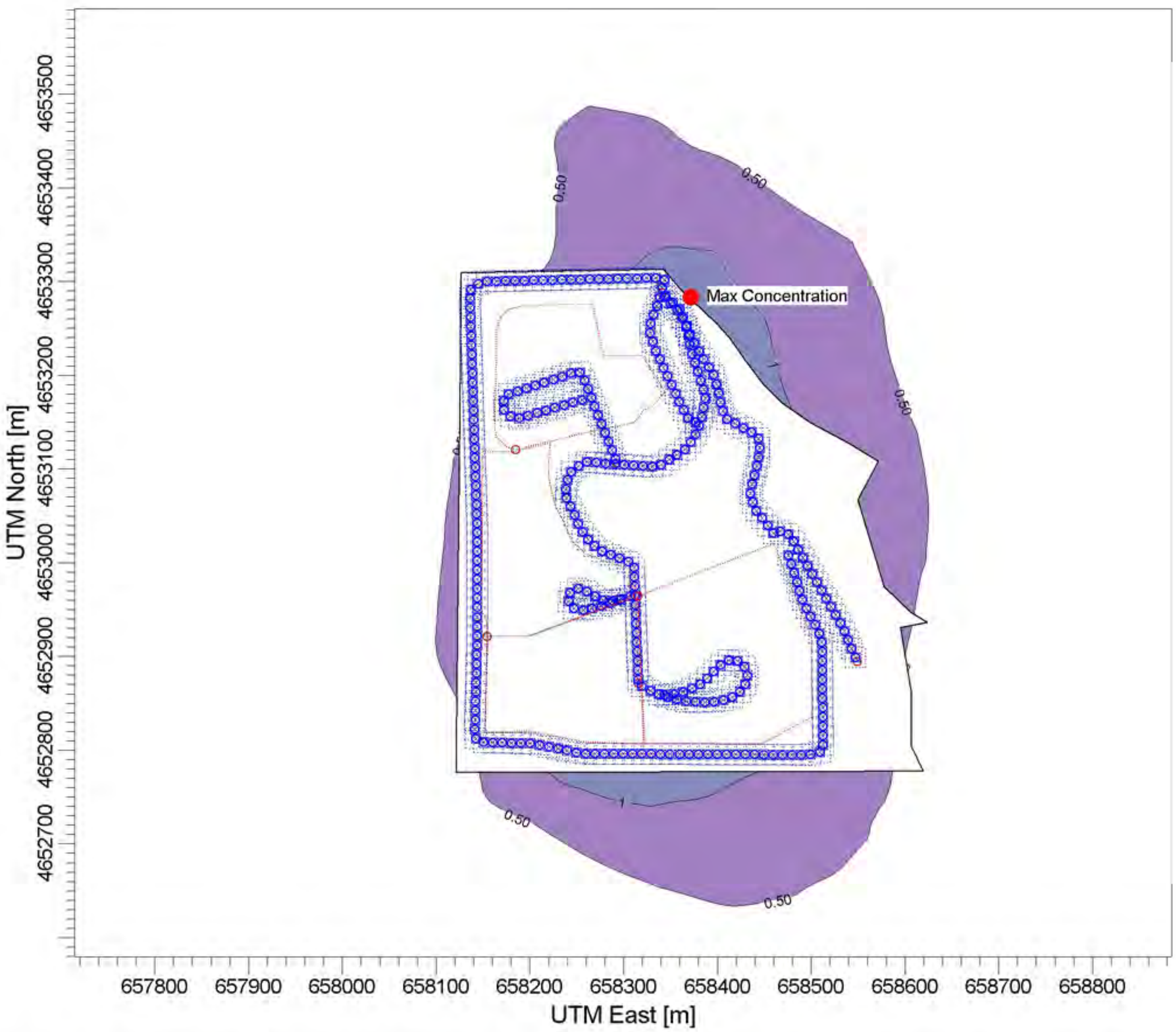
Figure 13, 2008 PM2.5 Annual Isopeths
Carroll C&D Landfill



COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:7,357 — 0 to 0.2 km	
	MAX: **1.70 ug/m^3**	DATE: **25/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 14, 2009 PM2.5 Annual Isopleths
Carroll C&D Landfill



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 1.58 [ug/m^3] at (658359.59, 4653292.61)

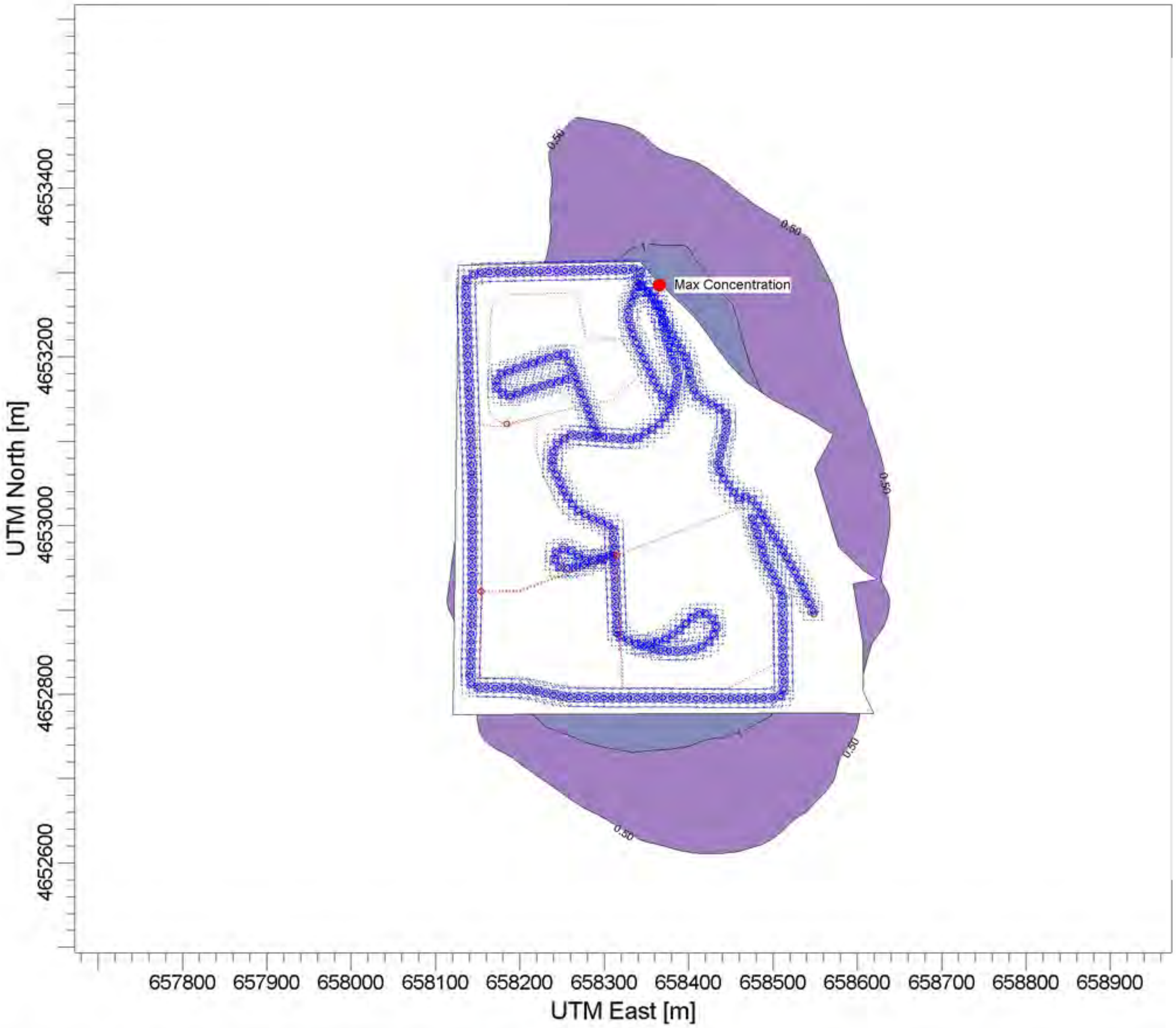
COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:7,356 0 — 0.2 km	
	MAX: **1.58 ug/m^3**	DATE: **25/08/2014**	PROJECT NO.: **080169**

AERMOD View - Lakes Environmental Software

C:\080169 Carroll LF 08-09-13\2014_07_July11\PM25_offsite\pm25_09.isc

PROJECT TITLE:

Figure 15. 2010 PM2.5 Annual Isopleth
Carroll C&D Landfill



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

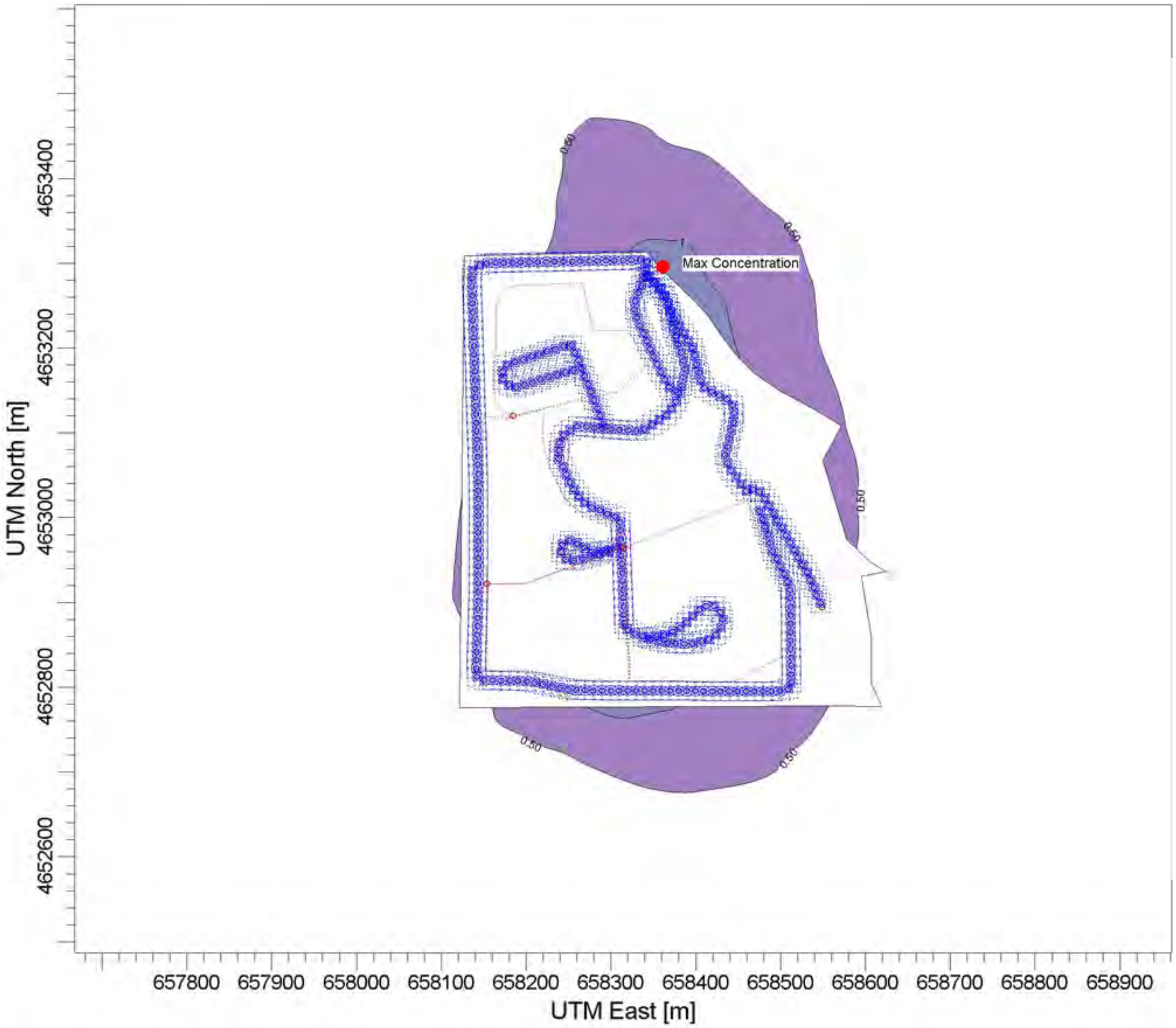
Max: 1.53 [ug/m^3] at (658359.59, 4653292.61)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,177 — 0 to 0.3 km	
	MAX: **1.53 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 16. 2011 PM2.5 Annual Isopleth
Carroll C&D Landfill



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 1.44 [ug/m^3] at (658359.59, 4653292.61)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,132 (0 – 0.3 km)	
	MAX: **1.44 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 17. 2012 PM2.5 Annual Isopleth
Carroll C&D Landfill

PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

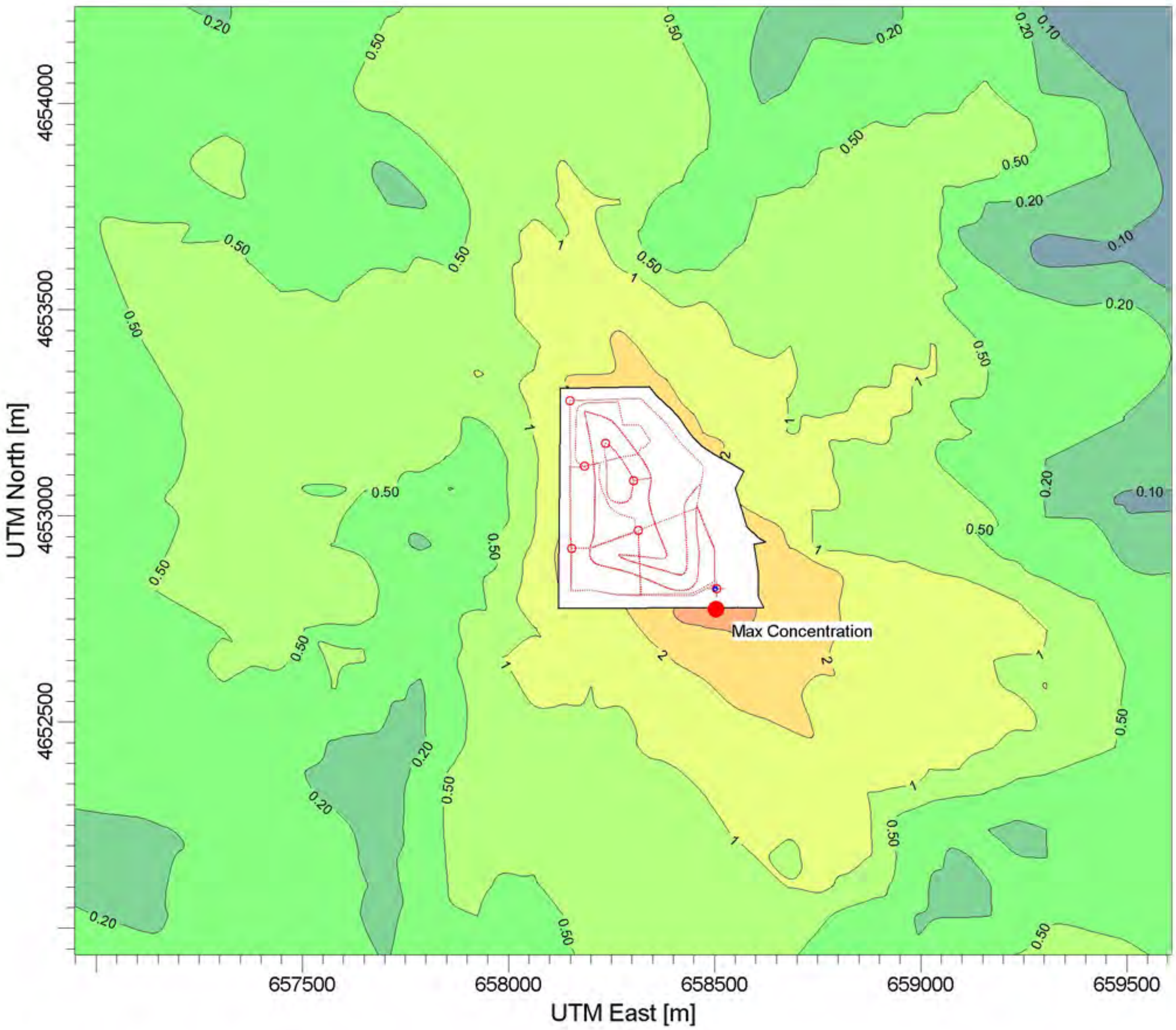
Max: 1.62 [ug/m^3] at (658359.59, 4653292.61)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658359.59, 4653292.61)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,133 0 — 0.3 km	
	MAX: **1.62 ug/m^3**	DATE: **16/07/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 18. 2010 Hydrogen Sulfide, 1-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

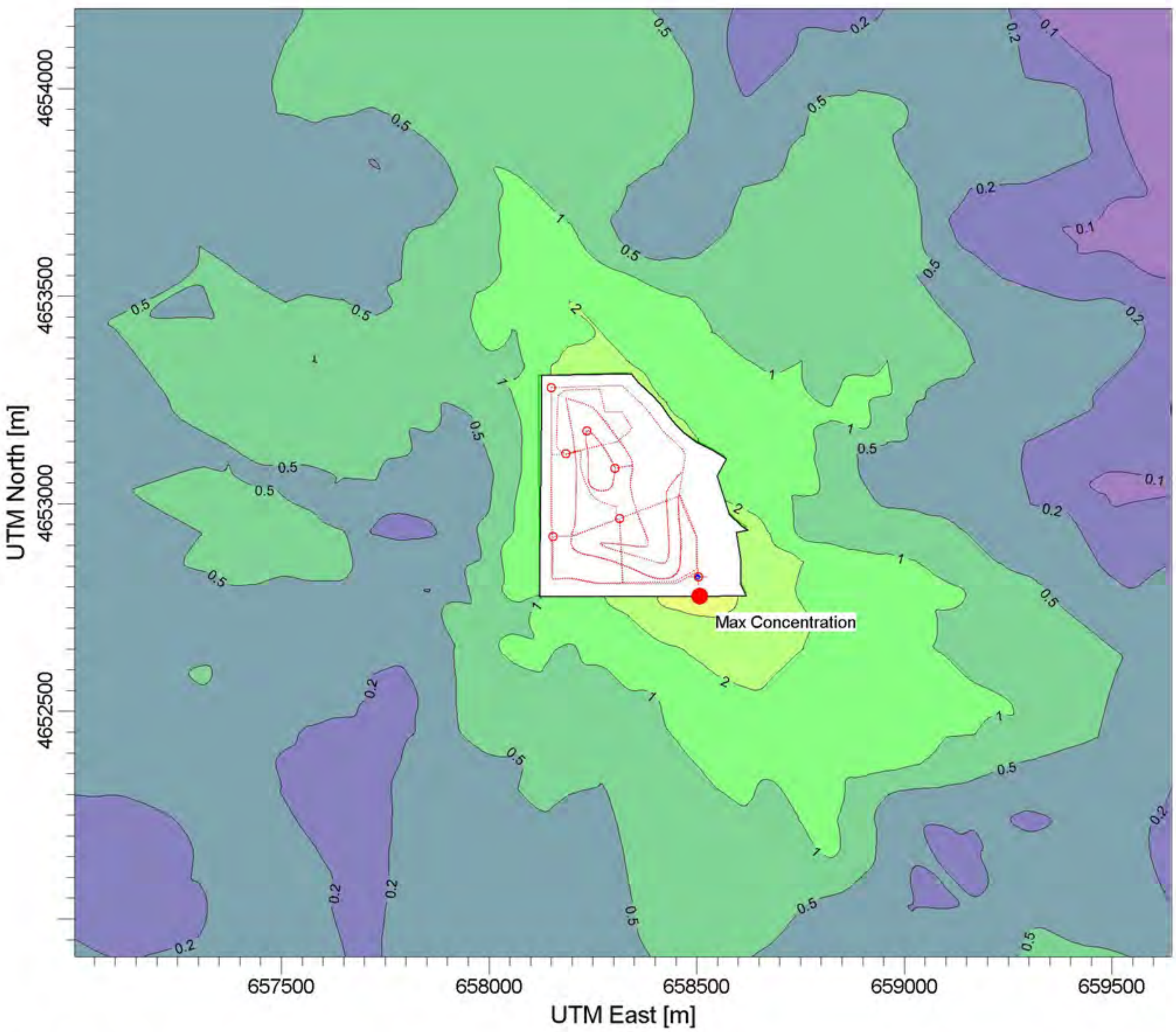
Max: 10.72 [ug/m^3] at (658493.60, 4652777.54)

0.00 0.02 0.05 0.10 0.20 0.50 1.00 2.00 5.00 10.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**14**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658493.60, 4652777.54)	RECEPTORS: **2811**	MODELER: **CRA**	CRA CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,730 0 — 0.5 km	
	MAX: **10.72 ug/m^3**	DATE: **20/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 19. 2011 Hydrogen Sulfide, 1-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

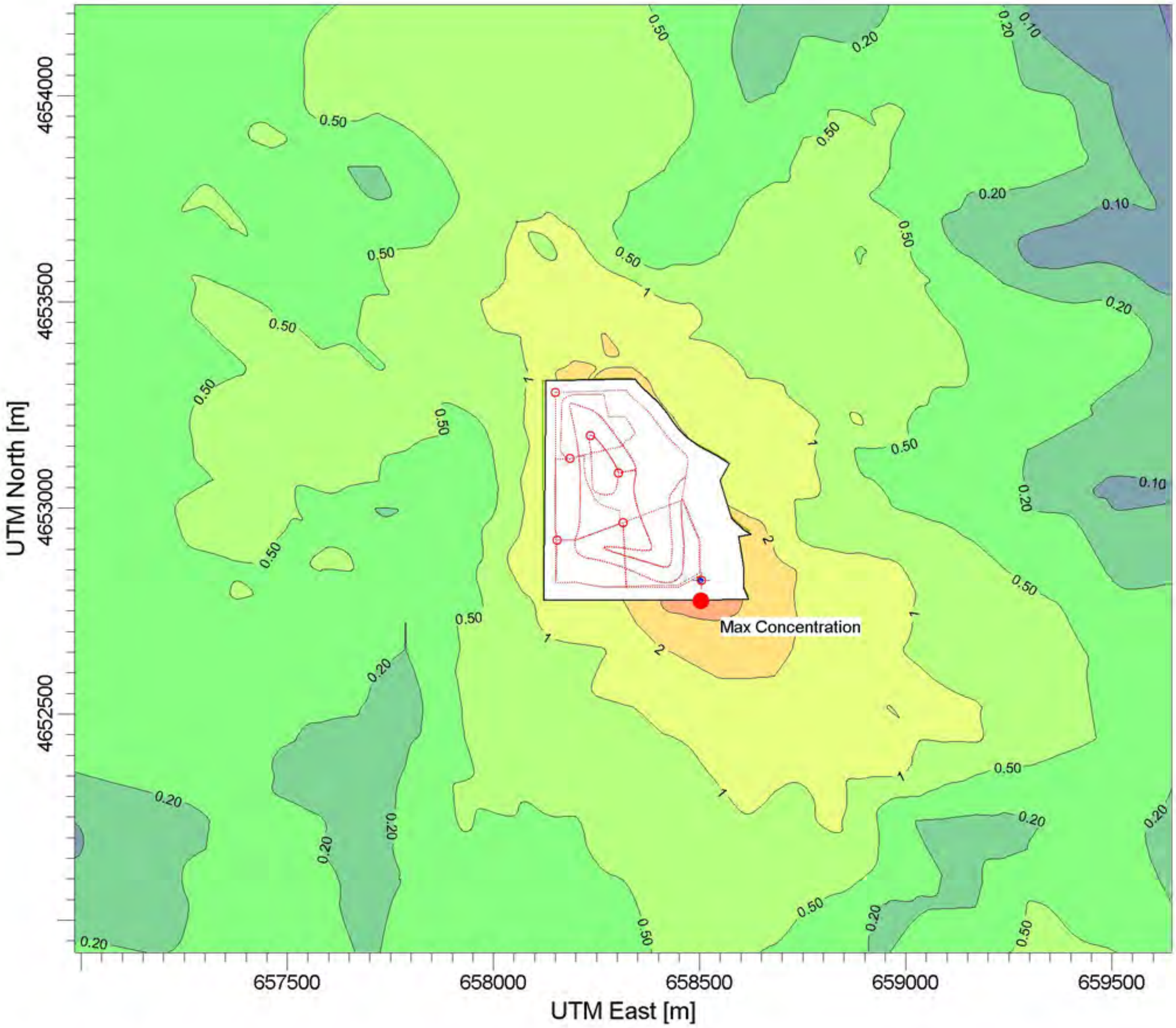
ug/m^3

Max: 9.2 [ug/m^3] at (658493.60, 4652777.54)

COMMENTS: REGDEFAULT, CONC, ELEV Maximum Concentration at (658493.60, 4652777.54)	SOURCES: **14**	COMPANY NAME: **SEALAND WASTE, L.L.C.**	
	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,608 0 — 0.5 km	
	MAX: **9.2 ug/m^3**	DATE: **20/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 20, 2012 Hydrogen Sulfide, 1-Hour, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

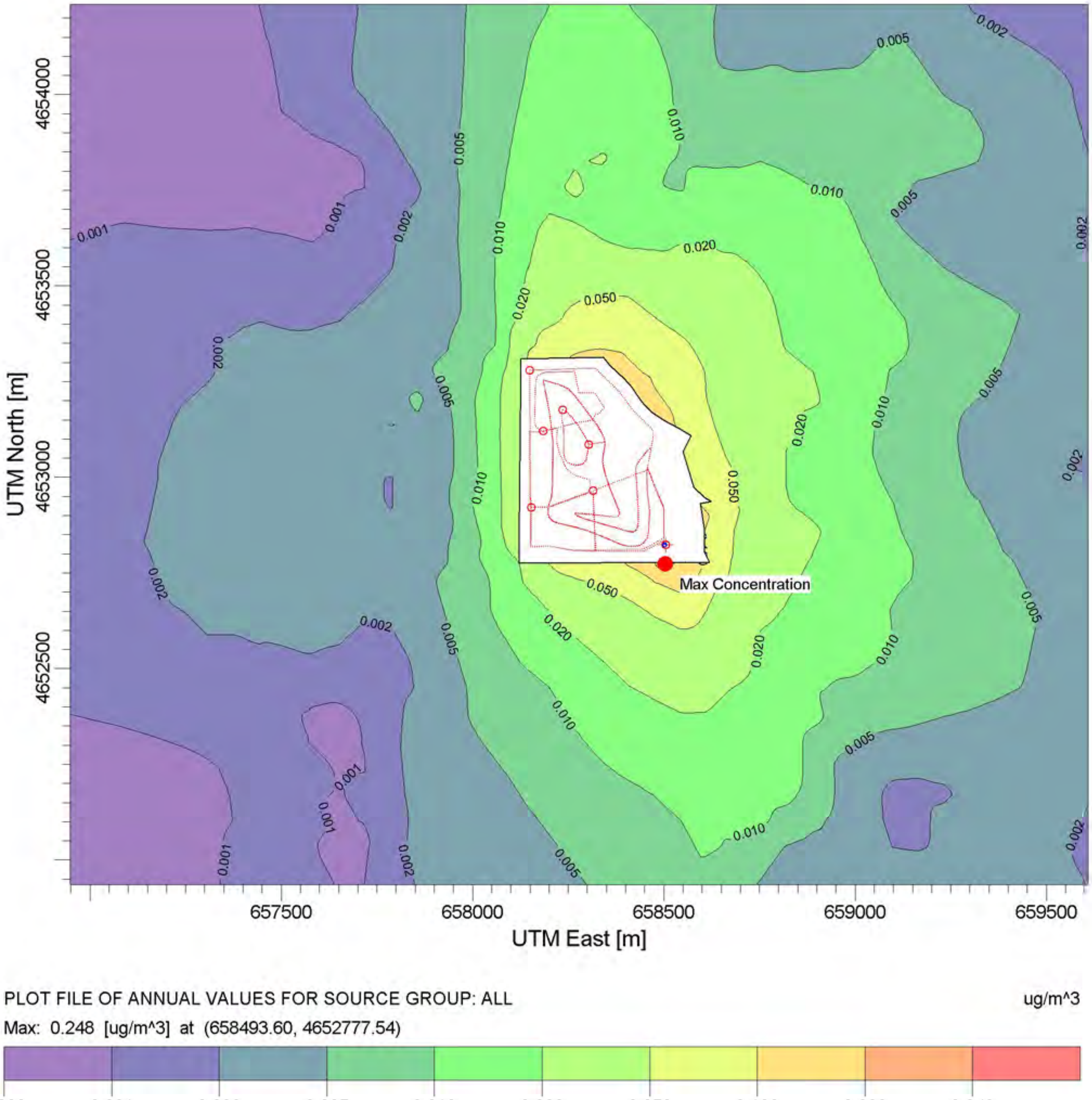
Max: 9.49 [ug/m^3] at (658493.60, 4652777.54)

0.00 | 0.02 | 0.05 | 0.10 | 0.20 | 0.50 | 1.00 | 2.00 | 5.00 | 10.00

COMMENTS: REGDEFAULT, CONC, ELEV Maximum Concentration at (658493.60, 4652777.54)	SOURCES: **14**	COMPANY NAME: **SEALAND WASTE, L.L.C.**	
	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,730 0 — 0.5 km	
	MAX: **9.49 ug/m^3**	DATE: **20/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

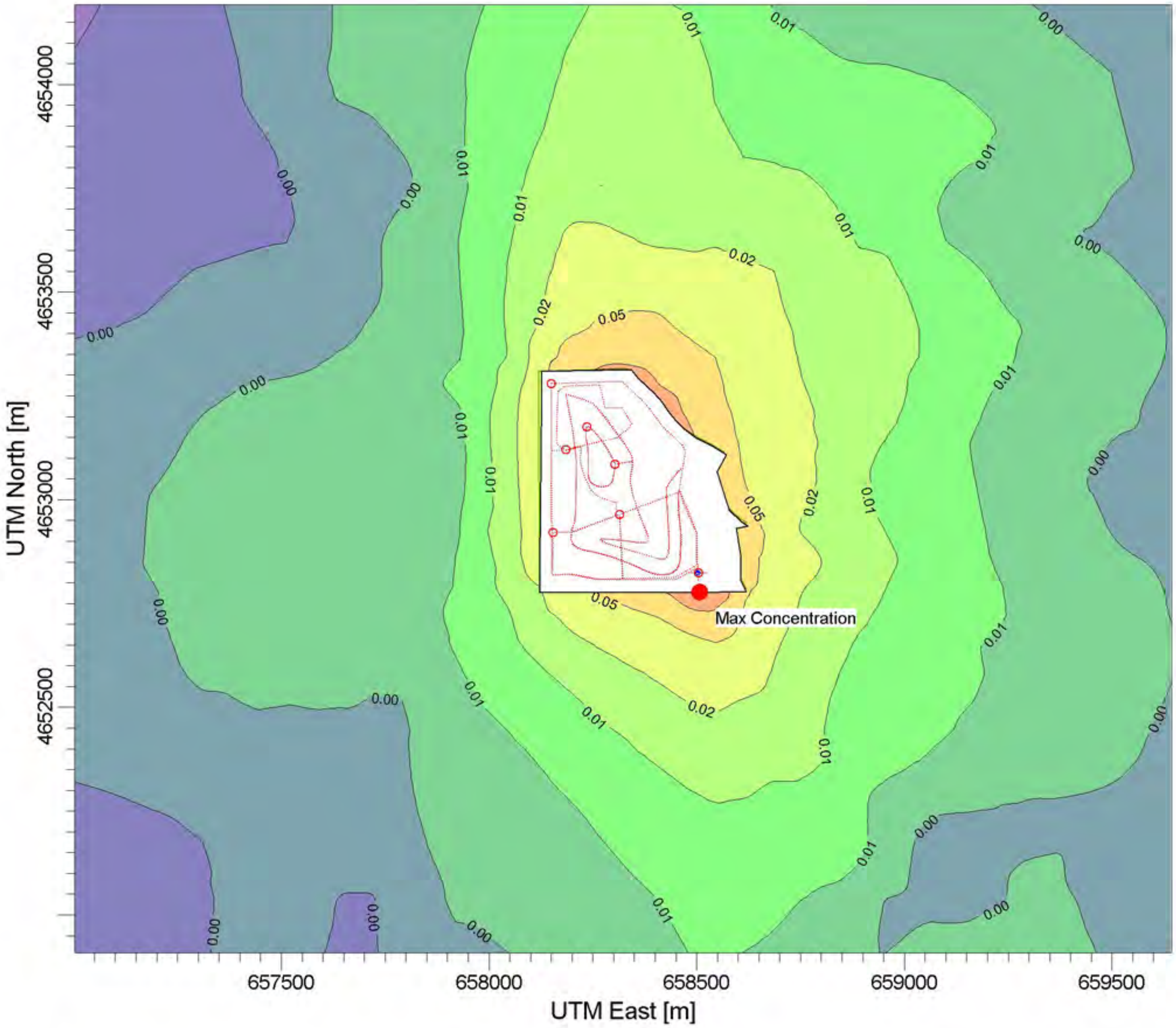
Figure 21. 2010 Hydrogen Sulfide, Annual, 1st High Isopleth
Carroll C&D Landfill



COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**14**	**SEALAND WASTE, L.L.C.**	
Maximum Concentration at (658493.60, 4652777.54)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,730 0 — 0.5 km	
	MAX: **0.248 ug/m^3**	DATE: **20/08/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 22. 2011 Hydrogen Sulfide, Annual, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 0.20 [ug/m^3] at (658493.60, 4652777.54)

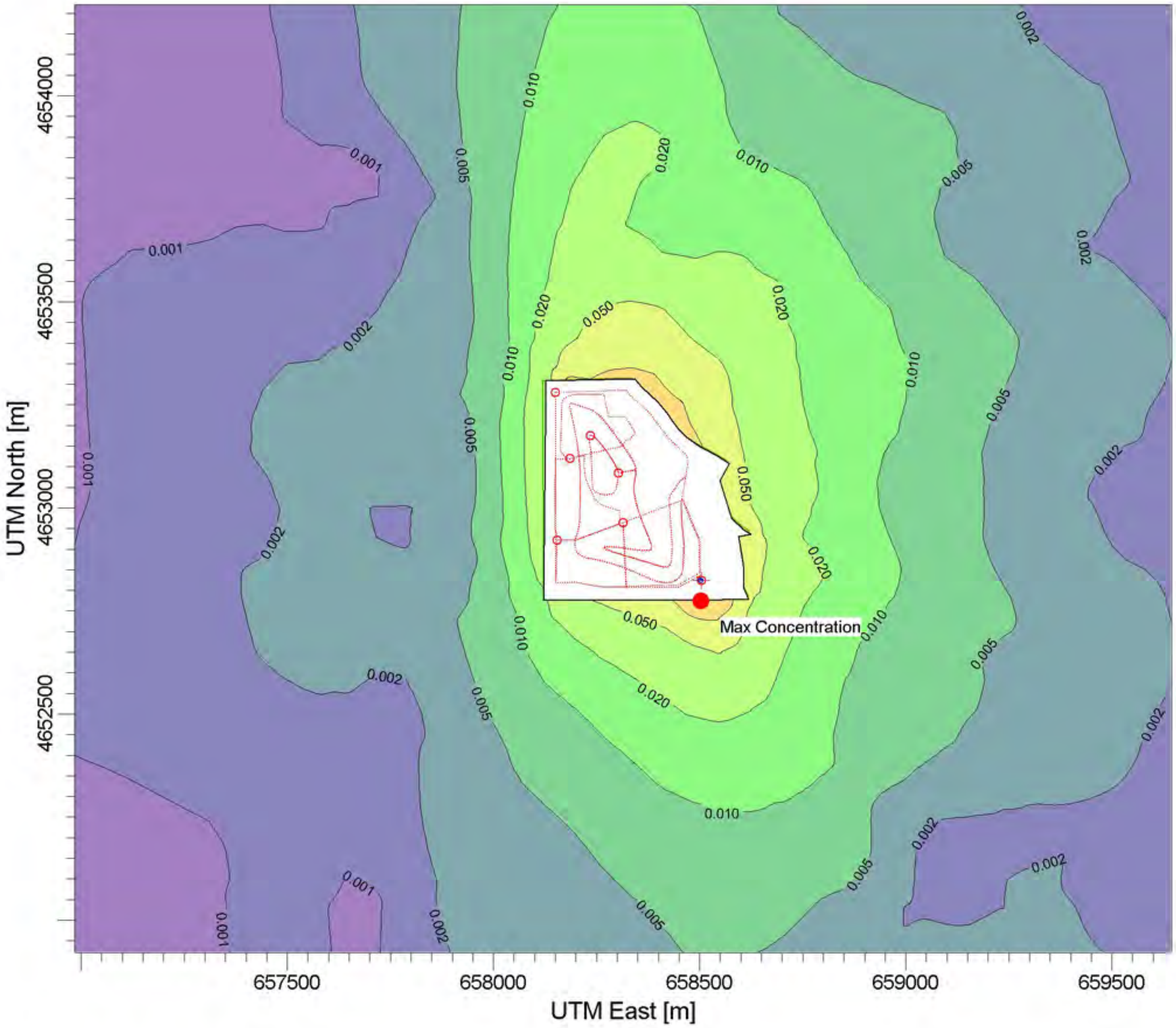
0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.05	0.10	0.20

COMMENTS: REGDEFAULT, CONC, ELEV	SOURCES: **14**	COMPANY NAME: **SEALAND WASTE, L.L.C.**
Maximum Concentration at (658493.60, 4652777.54)	RECEPTORS: **2811**	MODELER: **CRA**
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,608 (0 – 0.5 km)
	MAX: **0.20 ug/m^3**	DATE: **20/08/2014**
		PROJECT NO.: **080169**

CONESTOGA-ROVERS & ASSOCIATES

PROJECT TITLE:

Figure 23, 2012 Hydrogen Sulfide, Annual, 1st High Isopleth
Carroll C&D Landfill



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 0.214 [ug/m^3] at (658493.60, 4652777.54)

0.000 0.001 0.002 0.005 0.010 0.020 0.050 0.100 0.200 0.214

COMMENTS: REGDEFAULT, CONC, ELEV	SOURCES: **14**	COMPANY NAME: **SEALAND WASTE, L.L.C.**
Maximum Concentration at (658493.60, 4652777.54)	RECEPTORS: **2811**	MODELER: **CRA**
	OUTPUT TYPE: **Concentration**	SCALE: 1:16,730 — 0 to 0.5 km
	MAX: **0.214 ug/m^3**	DATE: **20/08/2014**
		PROJECT NO.: **080169**

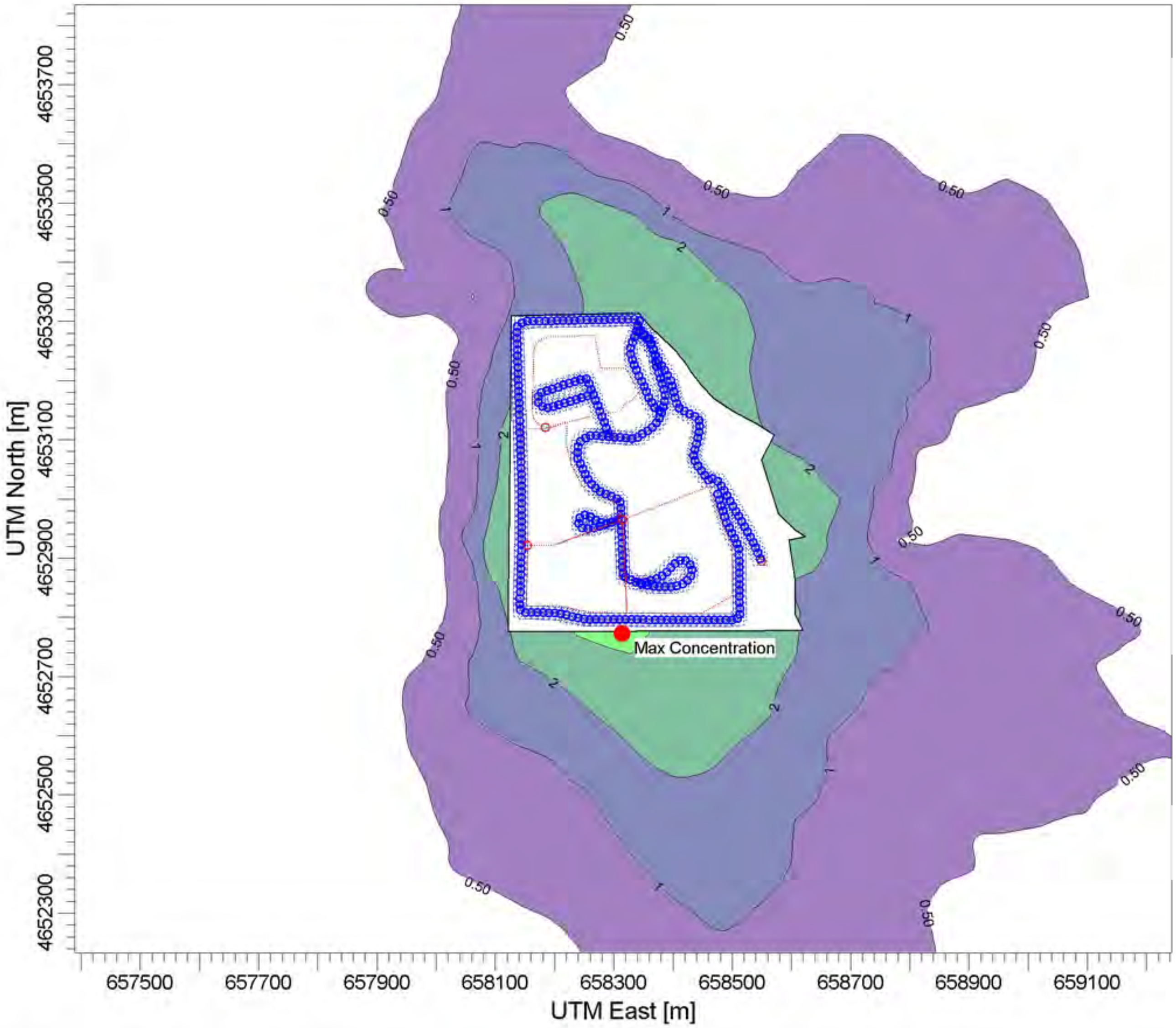
CONESTOGA-ROVERS & ASSOCIATES

AERMOD View - Lakes Environmental Software

C:\080169 Carroll LF 08-09-13\2014_08_August\HydrogenSulphide_offsite_18ftStack\h2s_2012.isc

PROJECT TITLE:

Figure 24, 2008 PM2.5 24-Hour, 8th High Isopleths
Carroll C&D Landfill



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

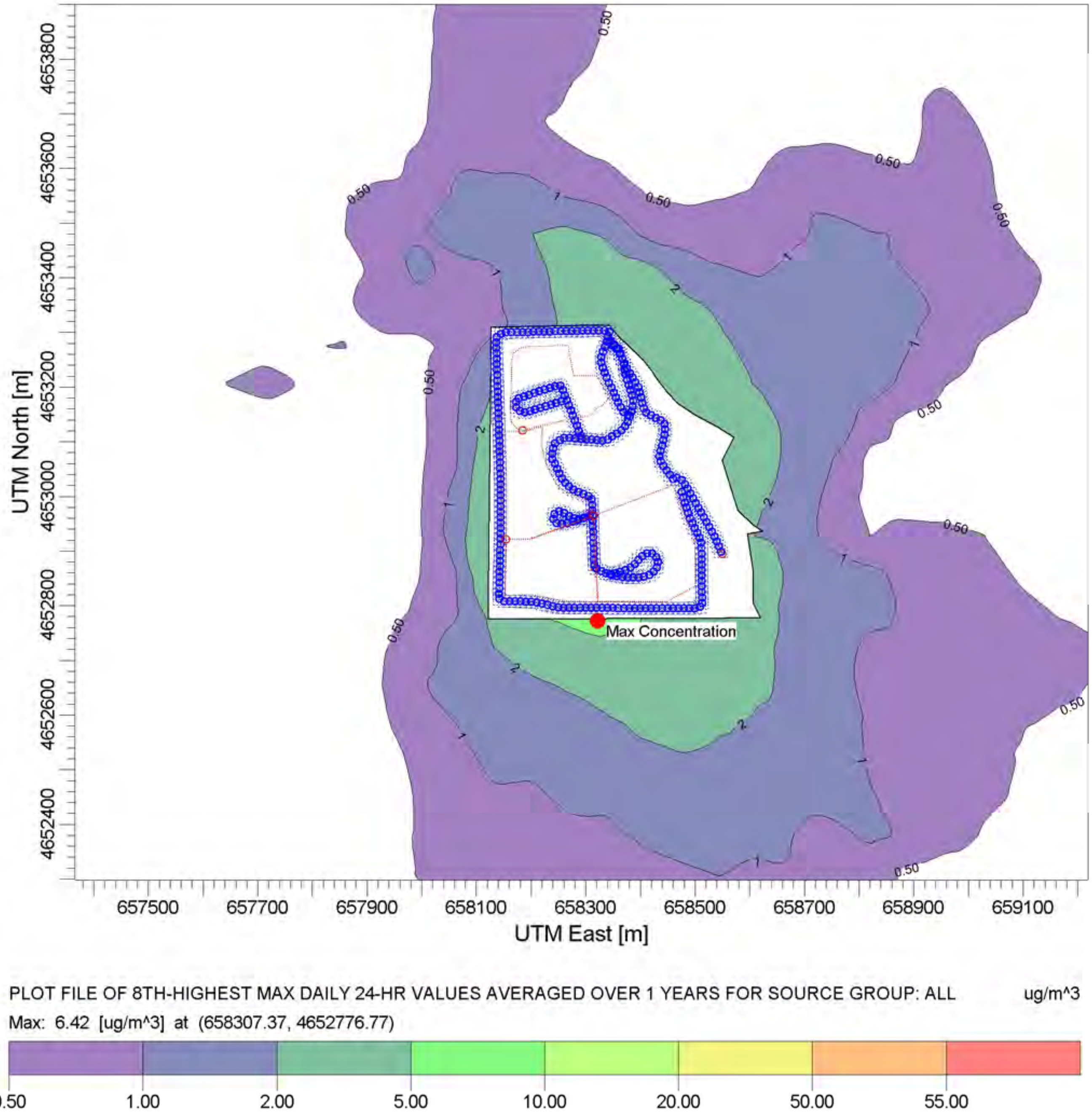
Max: 6.56 [ug/m^3] at (658307.37, 4652776.77)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:11,654 (0 – 0.4 km)	
	MAX: **6.56 ug/m^3**	DATE: **05/09/2014**	PROJECT NO.: **080169**

PROJECT TITLE:

Figure 25, 2009 PM2.5 24-Hour, 8th High Isopleths
Carroll C&D Landfill



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 1 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 6.42 [ug/m^3] at (658307.37, 4652776.77)

0.50 1.00 2.00 5.00 10.00 20.00 50.00 55.00

COMMENTS:	SOURCES:	COMPANY NAME:	
REGDEFAULT, CONC, ELEV	**10**	**SEALAND WASTE L.L.C.**	
Maximum Concentration at (658307.37, 4652776.77)	RECEPTORS: **2811**	MODELER: **CRA**	CONESTOGA-ROVERS & ASSOCIATES
	OUTPUT TYPE: **Concentration**	SCALE: 1:11,654 — 0 ... 0.4 km	
	MAX: **6.42 ug/m^3**	DATE: **05/09/2014**	PROJECT NO.: **080169**

Table 1

Area And Point Sources Modeling Input Parameters
Carroll Construction and Demolition Debris Landfill
Sealand Waste, L.L.C

Source ID	Source	X Coordinate	Y Coordinate	$PM_{2.5}$ Emission Rate	PM_{10} Emission Rate	H2S Emission Rate
		UTM	UTM	$g/s/m^2$	$g/s/m^2$	g/s/m2 or g/s
A1	Active Landfilling Area	658314.82	4652964.62	3.32E-07	5.59E-07	0.00E+00
A2	Linear Construction Area	658154.18	4652921.68	4.54E-07	1.21E-06	0.00E+00
A3	Borrowing/Fill Area	658154.09	4652921.68	2.30E-07	1.21E-06	0.00E+00
A4	Recycling Facility Area	658184.71	4653120.45	1.04E-08	5.14E-08	0.00E+00
S01	Sulfatreat Stack (Point)	658504.32	4652823.87	0.00E+00	0.00E+00	1.44E-03
FCOVER	Final Cover	658149.57	4653279.73	0.00E+00	0.00E+00	2.54E-08
ICOVER	Intermediate Cover	658303.47	4653085.6	0.00E+00	0.00E+00	9.51E-09
DCOVER	Daily Cover	658235.63	4653175.68	0.00E+00	0.00E+00	1.41E-08

Table 2

Line Sources Modeling Input Parameters
Carroll Construction and Demolition Debris Landfill
Sealand Waste, L.L.C

Source ID	Source	X Coordinate UTM	Y Coordinate UTM	Plume Height m	Plume Width m	Release Height m	Total Length m	$PM_{2.5}$ Emission Rate g/s	PM_{10} Emission Rate g/s
L1	Inner Access Road	658340.53	4653287.94	6.8	10	3.4	580.6	8.10E-03	8.10E-02
L2	Active Landfill Loop	658315.66	4652871.41	6.8	10	3.4	249.4	1.97E-03	1.97E-02
L3	Recycling Facility Loop	658292.81	4653106.15	6.8	10	3.4	299.2	1.33E-03	1.33E-02
L4	Leachate Loadout Facility	658340.53	4653287.94	6.8	10	3.4	161.6	4.84E-04	4.84E-03
L5	Staging Area Loop	658312.07	4652965.78	6.8	10	3.4	151.7	4.48E-04	4.48E-03
L6	Outer Perimeter Access Road	658549.03	4652894.62	6.8	10	3.4	1781.6	4.45E-03	4.45E-02

Table 3

Modeling Results Compared to Significant Impact Levels
Carroll Construction and Demolition Debris Landfill
Sealand Waste, L.L.C

Pollutant	Year	Averaging Time	Concentration Rank[1]	Max Modeled Concentration µg/m³	SIL Limit µg/m³
$PM_{2.5}$	2010	24-hr	H1H	11.50	1.2
$PM_{2.5}$	2011	24-hr	H1H	6.55	1.2
$PM_{2.5}$	2012	24-hr	H1H	8.00	1.2
$PM_{2.5}$	2010	Annual	H1H	1.53	0.3
$PM_{2.5}$	2011	Annual	H1H	1.44	0.3
$PM_{2.5}$	2012	Annual	H1H	1.62	0.3
PM_{10}	2010	24-hr	H1H	52.29	5.0
PM_{10}	2011	24-hr	H1H	43.89	5.0
PM_{10}	2012	24-hr	H1H	47.43	5.0

[1] SIL limit comparison is completed for screening and always utilizes high first high (H1H) concentration rank.

Table 4

Modeling Results Compared to National Ambient Air Quality Standards
Carroll Construction and Demolition Debris Landfill
Sealand Waste, L.L.C

Pollutant	Year	Averaging Time	Concentration Rank[2]	Max Modeled Concentration µg/m³	Background Concentration[1] µg/m³	Max Modeled + Background Concentration µg/m³	NAAQS Limit µg/m³	Percentage of Limit
$PM_{2.5}$	2008-2012	24-hr	H8H	5.77	23.5	29.27	35	83.62%
$PM_{2.5}$	2008-2012	Annual	H1H	1.58	7.7	9.28	12	77.30%
PM_{10}[3]	2010	24-hr	H1H	52.29	63.0	115.29	150	76.86%
PM_{10}[3]	2011	24-hr	H1H	43.89	34.0	77.89	150	51.93%
PM_{10}[3]	2012	24-hr	H1H	47.43	45.0	92.43	150	61.62%
H2S	2010	1-hr	H1H	10.72	0.46	11.18	14 (DAR-1 SGC)	79.87%
H2S	2011	1-hr	H1H	9.17	0.46	9.63	14 (DAR-1 SGC)	68.80%
H2S	2012	1-hr	H1H	9.49	0.46	9.95	14 (DAR-1 SGC)	71.06%
H2S	2010	Annual	H1H	0.25	0.46	0.71	2 (DAR-1 AGC)	35.41%
H2S	2011	Annual	H1H	0.20	0.46	0.66	2 (DAR-1 AGC)	32.81%
H2S	2012	Annual	H1H	0.21	0.46	0.67	2 (DAR-1 AGC)	33.69%

[1] Background concentration obtained from 2010-2012 NYSDEC Air Quality Reports

[2] Concentration ranks, high 1st high (H1H) or high 8th high (H8H), assigned based on applicable NAAQS.

[3] NAAQS limit is not to be exceeded more than once per year on average over three years.

Appendix A

Visibility Analysis Results

Visual Effects Screening Analysis for
Source: Carroll Landfill Expansi
Class I Area: Erlandson Overlook

*** Level-1 Screening ***

Input Emissions for

Particulates	8.21	TON/YR
NOx (as NO2)	0.00	TON/YR
Primary NO2	0.00	TON/YR
Soot	0.00	TON/YR
Primary SO4	0.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04	ppm
Background Visual Range:	25.00	km
Source-Observer Distance:	3.60	km
Min. Source-Class I Distance:	3.60	km
Max. Source-Class I Distance:	4.10	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	118.	4.1	51.	3.17	0.186	0.05	0.003
SKY	140.	118.	4.1	51.	2.00	0.028	0.05	-0.001
TERRAIN	10.	84.	3.6	84.	2.21	0.891	0.06	0.005
TERRAIN	140.	84.	3.6	84.	2.00	0.113	0.06	0.002

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	4.	1.0	164.	2.00	0.919	0.05	0.015
SKY	140.	4.	1.0	164.	2.00	0.127	0.05	-0.006
TERRAIN	10.	4.	1.0	164.	2.00	3.166*	0.05	0.025
TERRAIN	140.	4.	1.0	164.	2.00	0.486	0.05	0.013

```
"Carroll Landfill Expansi"
"Erlandson Overlook      "
    5    5
     8.210     0.000     0.000     0.000     0.000
     3.600     3.600     4.100    25.000
    1     1.500    3
    1     2.500    8
    1     2.500    6
    1     2.000    1
    1     1.500    4
    1     0.040     1.000    6
    1    11.250
  34
   1 0     5.0  163.7    1.1    2.5    3.0 1.46  0.050   2.00   0.83   2.00   0.12
2.00   2.91   2.00   0.44
   2 0    10.0  158.7    1.7    1.9    2.6 2.46  0.050   2.00   0.54   2.00   0.08
2.00   2.07   2.00   0.30
   3 0    15.0  153.8    2.1    1.6    2.3 3.37  0.050   2.00   0.42   2.00   0.06
2.00   1.73   2.00   0.24
   4 0    20.0  148.8    2.4    1.4    2.0 4.23  0.050   2.00   0.35   2.00   0.05
2.00   1.53   2.00   0.21
   5 0    25.0  143.8    2.6    1.2    1.9 5.04  0.050   2.01   0.30   2.00   0.04
2.00   1.40   2.00   0.19
   6 0    30.0  138.7    2.7    1.1    1.7 5.80  0.050   2.27   0.26   2.00   0.04
2.00   1.30   2.00   0.17
   7 0    35.0  133.7    2.9    1.0    1.6 6.51  0.050   2.52   0.24   2.00   0.04
2.00   1.23   2.00   0.16
   8 0    40.0  128.8    3.0    0.9    1.6 7.17  0.050   2.74   0.22   2.00   0.03
2.00   1.17   2.00   0.15
   9 0    45.0  123.8    3.1    0.8    1.5 7.76  0.050   2.95   0.20   2.00   0.03
2.00   1.12   2.00   0.14
  10 0    50.0  118.8    3.1    0.8    1.4 8.30  0.050   3.13   0.19   2.00   0.03
2.00   1.07   2.00   0.14
  11 0    55.0  113.7    3.2    0.8    1.4 8.77  0.053   3.29   0.18   2.00   0.03
2.00   1.04   2.00   0.13
  12 0    60.0  108.7    3.3    0.7    1.4 9.17  0.055   3.42   0.18   2.00   0.03
2.01   1.01   2.00   0.13
  13 0    65.0  103.8    3.4    0.7    1.4 9.50  0.057   3.54   0.17   2.00   0.03
2.07   0.98   2.00   0.12
  14 0    70.0   98.8    3.4    0.7    1.4 9.75  0.059   3.62   0.17   2.00   0.03
2.12   0.95   2.00   0.12
  15 0    75.0   93.8    3.5    0.7    1.4 9.94  0.060   3.69   0.16   2.00   0.02
2.16   0.93   2.00   0.12
  16 0    80.0   88.8    3.5    0.7    1.410.04  0.060   3.72   0.16   2.00   0.02
2.19   0.91   2.00   0.11
  17 1    85.0   83.8    3.6    0.7    1.410.07  0.060   3.73   0.16   2.00   0.02
2.22   0.89   2.00   0.11
  18 1    90.0   78.8    3.7    0.7    1.510.03  0.060   3.72   0.16   2.00   0.02
2.23   0.87   2.00   0.11
  19 1    95.0   73.8    3.7    0.7    1.6 9.91  0.059   3.68   0.16   2.00   0.02
2.23   0.85   2.00   0.11
  20 1   100.0   68.8    3.8    0.8    1.6 9.71  0.058   3.61   0.17   2.00   0.02
2.22   0.83   2.00   0.11
  21 1   105.0   63.8    3.9    0.8    1.7 9.44  0.057   3.52   0.17   2.00   0.03
2.20   0.81   2.00   0.10
  22 1   110.0   58.8    4.0    0.8    1.9 9.10  0.055   3.40   0.17   2.00   0.03
2.18   0.79   2.00   0.10
  23 1   115.0   53.8    4.0    0.9    2.0 8.69  0.053   3.26   0.18   2.00   0.03
2.14   0.77   2.00   0.10
  24 0   120.0   48.8    4.1    0.9    2.3 8.21  0.050   3.10   0.19   2.00   0.03
2.09   0.74   2.00   0.10
  25 0   125.0   43.8    4.3    1.0    2.6 7.66  0.050   2.91   0.20   2.00   0.03
2.03   0.71   2.00   0.09
```

```
 26 0   130.0   38.8    4.4    1.1    3.0 7.06  0.050   2.70   0.21   2.00   0.03
2.00   0.67   2.00   0.09
 27 0   135.0   33.8    4.6    1.3    3.6 6.39  0.050   2.47   0.23   2.00   0.03
2.00   0.61   2.00   0.08
 28 0   140.0   28.8    4.8    1.5    4.6 5.67  0.050   2.23   0.25   2.00   0.04
2.00   0.53   2.00   0.07
 29 0   145.0   23.8    5.1    1.7    6.4 4.90  0.050   2.00   0.28   2.00   0.04
2.00   0.41   2.00   0.06
 30 0   150.0   18.8    5.6    2.2   10.6 4.08  0.050   2.00   0.31   2.00   0.04
2.00   0.23   2.00   0.03
 31 0   155.0   13.8    6.4    3.0   31.6 3.21  0.050   2.00   0.36   2.00   0.05
2.00   0.01   2.00   0.00
 32 0     4.3  164.5    1.0    2.6    3.1 1.29  0.050   2.00   0.92   2.00   0.13
2.00   3.17   2.00   0.49
 33 1    84.4   84.4    3.6    0.7    1.410.08  0.060   3.73   0.16   2.00   0.02
2.21   0.89   2.00   0.11
 34 1   117.8   51.0    4.1    0.9    2.2 8.43  0.051   3.17   0.19   2.00   0.03
2.11   0.76   2.00   0.10
 34
  1 0   5.000  0.050  0.013  0.023 -0.005  0.011  0.013  0.019 -0.007  0.009  0.012
0.024 -0.004  0.013
  2 0  10.000  0.050  0.009  0.015 -0.003  0.007  0.008  0.013 -0.004  0.006  0.008
0.015 -0.003  0.008
  3 0  15.000  0.050  0.007  0.012 -0.003  0.005  0.007  0.010 -0.004  0.004  0.006
0.012 -0.002  0.006
  4 0  20.000  0.050  0.006  0.010 -0.002  0.004  0.006  0.009 -0.003  0.003  0.005
0.010 -0.002  0.005
  5 0  25.000  0.050  0.005  0.009 -0.002  0.004  0.005  0.008 -0.003  0.003  0.004
0.009 -0.001  0.004
  6 0  30.000  0.050  0.004  0.008 -0.002  0.003  0.004  0.007 -0.002  0.003  0.004
0.008 -0.001  0.004
  7 0  35.000  0.050  0.004  0.007 -0.002  0.003  0.004  0.006 -0.002  0.002  0.003
0.007 -0.001  0.003
  8 0  40.000  0.050  0.003  0.006 -0.001  0.003  0.004  0.006 -0.002  0.002  0.003
0.006 -0.001  0.003
  9 0  45.000  0.050  0.003  0.006 -0.001  0.002  0.003  0.006 -0.002  0.002  0.003
0.006 -0.001  0.003
 10 0  50.000  0.050  0.003  0.006 -0.001  0.002  0.003  0.005 -0.002  0.002  0.003
0.006 -0.001  0.003
 11 0  55.000  0.053  0.003  0.005 -0.001  0.002  0.003  0.005 -0.002  0.002  0.003
0.005 -0.001  0.003
 12 0  60.000  0.055  0.003  0.005 -0.001  0.002  0.003  0.005 -0.002  0.002  0.002
0.005 -0.001  0.002
 13 0  65.000  0.057  0.003  0.005 -0.001  0.002  0.003  0.005 -0.001  0.002  0.002
0.005 -0.001  0.002
 14 0  70.000  0.059  0.003  0.005 -0.001  0.002  0.003  0.005 -0.001  0.002  0.002
0.005 -0.001  0.002
 15 0  75.000  0.060  0.003  0.005 -0.001  0.002  0.003  0.005 -0.001  0.001  0.002
0.005 -0.001  0.002
 16 0  80.000  0.060  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 17 1  85.000  0.060  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 18 1  90.000  0.060  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 19 1  95.000  0.059  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 20 1 100.000  0.058  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 21 1 105.000  0.057  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 22 1 110.000  0.055  0.003  0.005 -0.001  0.002  0.003  0.004 -0.002  0.002  0.002
0.005 -0.001  0.002
```

```
 23 1 115.000  0.053  0.003  0.005 -0.001  0.002  0.003  0.004 -0.002  0.002  0.003
0.005 -0.001  0.002
 24 0 120.000  0.050  0.003  0.005 -0.001  0.002  0.003  0.005 -0.002  0.002  0.003
0.005 -0.001  0.002
 25 0 125.000  0.050  0.003  0.005 -0.001  0.002  0.003  0.005 -0.002  0.002  0.003
0.005 -0.001  0.003
 26 0 130.000  0.050  0.003  0.005 -0.001  0.002  0.003  0.004 -0.002  0.002  0.003
0.005 -0.001  0.003
 27 0 135.000  0.050  0.004  0.005 -0.001  0.002  0.004  0.004 -0.002  0.002  0.003
0.005 -0.001  0.003
 28 0 140.000  0.050  0.004  0.005 -0.002  0.002  0.004  0.004 -0.002  0.001  0.004
0.005 -0.001  0.003
 29 0 145.000  0.050  0.004  0.004 -0.002  0.002  0.004  0.003 -0.002  0.001  0.004
0.005 -0.001  0.003
 30 0 150.000  0.050  0.005  0.003 -0.002  0.001  0.005  0.001 -0.003  0.001  0.005
0.003 -0.001  0.002
 31 0 155.000  0.050  0.006  0.000 -0.002  0.000  0.005  0.000 -0.003  0.000  0.005
0.000 -0.002  0.000
 32 0   4.260  0.050  0.015  0.025 -0.006  0.013  0.014  0.021 -0.007  0.010  0.013
0.026 -0.004  0.015
 33 1  84.375  0.060  0.003  0.005 -0.001  0.002  0.003  0.004 -0.001  0.001  0.002
0.005 -0.001  0.002
 34 1 117.772  0.051  0.003  0.005 -0.001  0.002  0.003  0.005 -0.002  0.002  0.003
0.005 -0.001  0.002
```

Visual Effects Screening Analysis for
Source: Carroll Landfill Expansi
Class I Area: Martz Observatory

*** Level-1 Screening ***

Input Emissions for

Particulates	8.21	TON/YR
NOx (as NO2)	0.00	TON/YR
Primary NO2	0.00	TON/YR
Soot	0.00	TON/YR
Primary SO4	0.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	1.80 km
Min. Source-Class I Distance:	1.80 km
Max. Source-Class I Distance:	2.19 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	129.	2.2	40.	3.66	0.335	0.06	0.005
SKY	140.	129.	2.2	40.	2.00	0.051	0.06	-0.002
TERRAIN	10.	84.	1.8	84.	2.41	2.224	0.08	0.008
TERRAIN	140.	84.	1.8	84.	2.00	0.275	0.08	0.003

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	5.	0.6	164.	2.00	1.604	0.05	0.026
SKY	140.	5.	0.6	164.	2.00	0.239	0.05	-0.010
TERRAIN	10.	5.	0.6	164.	2.00	8.434*	0.05	0.049
TERRAIN	140.	5.	0.6	164.	2.00	1.199	0.05	0.022

```
"Carroll Landfill Expansi"
"Martz Observatory       "
    5    5
     8.210     0.000     0.000     0.000     0.000
     1.800     1.800     2.190    25.000
    1     1.500    3
    1     2.500    8
    1     2.500    6
    1     2.000    1
    1     1.500    4
    1     0.040     1.000    6
    1    11.250
 34
  1 0     5.0  163.7    0.6    1.3    1.5 1.81  0.050   2.00   1.60   2.00   0.24
2.00   8.43   2.00   1.20
  2 0    10.0  158.7    0.9    1.0    1.3 3.17  0.050   2.00   0.97   2.00   0.15
2.00   5.76   2.00   0.78
  3 0    15.0  153.8    1.1    0.8    1.1 4.41  0.050   2.00   0.72   2.00   0.11
2.00   4.67   2.00   0.62
  4 0    20.0  148.8    1.2    0.7    1.0 5.58  0.050   2.20   0.58   2.00   0.09
2.00   4.06   2.00   0.53
  5 0    25.0  143.8    1.3    0.6    0.9 6.69  0.050   2.58   0.49   2.00   0.08
2.00   3.66   2.00   0.47
  6 0    30.0  138.7    1.4    0.5    0.9 7.73  0.050   2.93   0.43   2.00   0.07
2.00   3.36   2.00   0.43
  7 0    35.0  133.7    1.4    0.5    0.8 8.69  0.053   3.26   0.38   2.00   0.06
2.00   3.14   2.00   0.40
  8 0    40.0  128.8    1.5    0.5    0.8 9.59  0.058   3.57   0.35   2.00   0.05
2.00   2.97   2.00   0.37
  9 0    45.0  123.8    1.5    0.4    0.710.40  0.062   3.85   0.32   2.00   0.05
2.00   2.82   2.00   0.35
 10 0    50.0  118.8    1.6    0.4    0.711.13  0.067   4.12   0.30   2.00   0.05
2.00   2.70   2.00   0.34
 11 0    55.0  113.7    1.6    0.4    0.711.77  0.071   4.35   0.29   2.00   0.04
2.08   2.60   2.00   0.32
 12 0    60.0  108.7    1.6    0.4    0.712.32  0.074   4.55   0.27   2.00   0.04
2.16   2.52   2.00   0.31
 13 0    65.0  103.8    1.7    0.4    0.712.78  0.077   4.71   0.27   2.00   0.04
2.23   2.44   2.00   0.30
 14 0    70.0   98.8    1.7    0.4    0.713.14  0.079   4.84   0.26   2.00   0.04
2.29   2.38   2.00   0.29
 15 0    75.0   93.8    1.7    0.4    0.713.40  0.080   4.93   0.25   2.00   0.04
2.34   2.32   2.00   0.29
 16 0    80.0   88.8    1.8    0.4    0.713.56  0.081   4.99   0.25   2.00   0.04
2.38   2.27   2.00   0.28
 17 1    85.0   83.8    1.8    0.4    0.713.61  0.082   5.01   0.25   2.00   0.04
2.41   2.22   2.00   0.27
 18 1    90.0   78.8    1.8    0.4    0.713.57  0.081   5.00   0.25   2.00   0.04
2.43   2.18   2.00   0.27
 19 1    95.0   73.8    1.9    0.4    0.813.43  0.081   4.95   0.25   2.00   0.04
2.43   2.13   2.00   0.26
 20 1   100.0   68.8    1.9    0.4    0.813.18  0.079   4.86   0.26   2.00   0.04
2.43   2.10   2.00   0.26
 21 1   105.0   63.8    1.9    0.4    0.912.84  0.077   4.73   0.26   2.00   0.04
2.41   2.06   2.00   0.25
 22 1   110.0   58.8    2.0    0.4    0.912.40  0.074   4.58   0.27   2.00   0.04
2.38   2.02   2.00   0.25
 23 1   115.0   53.8    2.0    0.4    1.011.86  0.071   4.38   0.28   2.00   0.04
2.34   1.97   2.00   0.25
 24 1   120.0   48.8    2.1    0.5    1.111.24  0.067   4.16   0.30   2.00   0.05
2.29   1.92   2.00   0.24
 25 1   125.0   43.8    2.1    0.5    1.310.52  0.063   3.90   0.32   2.00   0.05
2.23   1.87   2.00   0.23
```

```
 26 0   130.0   38.8    2.2    0.6    1.5 9.72  0.058   3.61   0.34   2.00   0.05
2.16   1.79   2.00   0.23
 27 0   135.0   33.8    2.3    0.6    1.8 8.83  0.053   3.31   0.37   2.00   0.06
2.09   1.68   2.00   0.21
 28 0   140.0   28.8    2.4    0.7    2.3 7.87  0.050   2.98   0.41   2.00   0.06
2.02   1.53   2.00   0.20
 29 0   145.0   23.8    2.6    0.9    3.2 6.84  0.050   2.63   0.46   2.00   0.07
2.00   1.30   2.00   0.17
 30 0   150.0   18.8    2.8    1.1    5.3 5.74  0.050   2.25   0.53   2.00   0.08
2.00   0.90   2.00   0.12
 31 0   155.0   13.8    3.2    1.5   15.8 4.56  0.050   2.00   0.62   2.00   0.09
2.00   0.19   2.00   0.03
 32 0    13.4  155.4    1.0    0.8    1.2 4.02  0.050   2.00   0.78   2.00   0.12
2.00   4.95   2.00   0.66
 33 1    84.4   84.4    1.8    0.4    0.713.61  0.082   5.01   0.25   2.00   0.04
2.41   2.22   2.00   0.27
 34 1   129.2   39.6    2.2    0.6    1.5 9.86  0.059   3.66   0.34   2.00   0.05
2.17   1.80   2.00   0.23
 34
  1 0   5.000  0.050  0.026  0.049 -0.010  0.022  0.026  0.045 -0.014  0.017  0.023
0.048 -0.007  0.025
  2 0  10.000  0.050  0.016  0.030 -0.006  0.013  0.016  0.028 -0.008  0.010  0.014
0.029 -0.004  0.015
  3 0  15.000  0.050  0.012  0.022 -0.005  0.009  0.012  0.021 -0.006  0.007  0.010
0.022 -0.003  0.011
  4 0  20.000  0.050  0.009  0.018 -0.004  0.007  0.010  0.017 -0.005  0.006  0.008
0.018 -0.003  0.008
  5 0  25.000  0.050  0.008  0.015 -0.003  0.006  0.008  0.015 -0.004  0.005  0.007
0.015 -0.002  0.007
  6 0  30.000  0.050  0.007  0.014 -0.003  0.005  0.007  0.013 -0.004  0.004  0.006
0.013 -0.002  0.006
  7 0  35.000  0.053  0.006  0.012 -0.002  0.005  0.006  0.012 -0.003  0.004  0.005
0.012 -0.002  0.006
  8 0  40.000  0.058  0.006  0.011 -0.002  0.004  0.006  0.011 -0.003  0.003  0.005
0.011 -0.002  0.005
  9 0  45.000  0.062  0.005  0.010 -0.002  0.004  0.005  0.010 -0.003  0.003  0.004
0.010 -0.001  0.005
 10 0  50.000  0.067  0.005  0.010 -0.002  0.004  0.005  0.010 -0.003  0.003  0.004
0.009 -0.001  0.004
 11 0  55.000  0.071  0.005  0.009 -0.002  0.004  0.005  0.009 -0.003  0.003  0.004
0.009 -0.001  0.004
 12 0  60.000  0.074  0.004  0.009 -0.002  0.003  0.005  0.009 -0.002  0.003  0.004
0.008 -0.001  0.004
 13 0  65.000  0.077  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.003  0.004
0.008 -0.001  0.004
 14 0  70.000  0.079  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.004
0.008 -0.001  0.004
 15 0  75.000  0.080  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 16 0  80.000  0.081  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 17 1  85.000  0.082  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 18 1  90.000  0.081  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 19 1  95.000  0.081  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 20 1 100.000  0.079  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.003
0.008 -0.001  0.004
 21 1 105.000  0.077  0.004  0.008 -0.002  0.003  0.004  0.008 -0.002  0.002  0.004
0.008 -0.001  0.004
 22 1 110.000  0.074  0.004  0.008 -0.002  0.003  0.005  0.008 -0.002  0.002  0.004
0.008 -0.001  0.004
```

23	1	115.000	0.071	0.005	0.009	-0.002	0.003	0.005	0.008	-0.003	0.003	0.004	0.008	-0.001	0.004
24	1	120.000	0.067	0.005	0.009	-0.002	0.003	0.005	0.009	-0.003	0.003	0.004	0.009	-0.001	0.004
25	1	125.000	0.063	0.005	0.009	-0.002	0.004	0.005	0.009	-0.003	0.003	0.004	0.009	-0.001	0.004
26	0	130.000	0.058	0.005	0.010	-0.002	0.004	0.006	0.009	-0.003	0.003	0.005	0.010	-0.002	0.005
27	0	135.000	0.053	0.006	0.010	-0.002	0.004	0.006	0.009	-0.003	0.003	0.005	0.010	-0.002	0.005
28	0	140.000	0.050	0.007	0.011	-0.003	0.004	0.007	0.009	-0.004	0.003	0.006	0.011	-0.002	0.005
29	0	145.000	0.050	0.007	0.010	-0.003	0.004	0.008	0.009	-0.004	0.003	0.006	0.011	-0.002	0.005
30	0	150.000	0.050	0.008	0.009	-0.003	0.004	0.009	0.007	-0.005	0.002	0.007	0.010	-0.002	0.005
31	0	155.000	0.050	0.010	0.002	-0.004	0.001	0.010	0.001	-0.005	0.000	0.009	0.003	-0.003	0.002
32	0	13.395	0.050	0.013	0.024	-0.005	0.010	0.013	0.023	-0.007	0.008	0.011	0.024	-0.004	0.012
33	1	84.375	0.082	0.004	0.008	-0.002	0.003	0.004	0.008	-0.002	0.002	0.003	0.008	-0.001	0.004
34	1	129.157	0.059	0.005	0.010	-0.002	0.004	0.006	0.009	-0.003	0.003	0.005	0.009	-0.001	0.004

Appendix B

Modeling Files

NOTE: The contents of this Appendix were included on a CD and are not included herein.

NYSDEC Approval
of the Air Quality Modeling Report

Letter from: Julia Stuart/ Margaret Valis, New York State Department of Environmental Conservation

Division of Air Resources

To: Connie LaPort

December 8, 2014

New York State Department of Environmental Conservation
Division of Air Resources
Bureau of Stationary Sources
625 Broadway, Albany, New York 12233-3254
Phone: (518) 402-8403 FAX: (518) 402-9035
Website: www.dec.ny.gov

Joe Martens
Commissioner

MEMORANDUM

TO: Connie LaPort

FROM: Julia Stuart
Margaret Valis

SUBJECT: **Air Quality Modeling Report for the Carroll Construction and Demolition Debris Landfill**

DATE: December 8, 2014

We have completed our review of the Air Quality Modeling Report prepared by Conestoga-Rovers & Associates in support of the proposed Carroll Construction and Demolition Debris Landfill located in Carroll, NY. The analysis followed an approved protocol for the evaluation of PM2.5 and Hydrogen Sulfide (H_2S) impacts. As indicated in Section 3.2 of the modeling report, the H_2S emission rates were derived from a National Institute for Occupational Safety and Health time-weighted average of 10 ppm at breathing zone height, approximately 5-6 feet above ground level. This proposed 10 ppm upper limit of the H_2S emission rate is considered conservative since the monitoring instrument will be taking surface concentration measurements approximately 3-5 cm above the landfill surface. The modeling results demonstrate that the proposed landfill will not cause or contribute to a modeled violation of the applicable NAAQS or guideline values. Our acceptance of the modeling results assumes regional review of the emission rates listed in the report.

We have three minor comments, listed below. However, these comments do not alter the conclusions of the analysis.

1. In Section 2.5, the 2008-2012 Jamestown surface meteorological data with Buffalo upper air data was used in the analysis.
2. In Section 2.8, the years "2010-2012" were the most recent and available PM background data at the time of the analysis.

If you have any questions, please contact us at (518) 402-8403 or (518) 402-8402 or by email at julia.stuart@dec.ny.gov or margaret.valis@dec.ny.gov.

c: S. DeSantis
B. Szalda (Conestoga-Rovers & Assoc.)
T. Bathory (CRA)
B. Acquisto (Daigler Engineering)

SUPPLEMENTAL AIR EMMISSIONS INVENTORY, Rev 2

By: Daigler Engineering, P.C.

September 2015
Last Revised: March 2017

SUPPLEMENTAL AIR EMISSIONS INVENTORY

For the Draft Environmental Impact Statement

CARROLL LANDFILL EXPANSION APPLICATION

CARROLL, NEW YORK

SEALAND WASTE, LLC

Prepared on behalf of:

Sealand Waste, LLC
85 High Tech Drive
Rush, New York 14543

Prepared by:

DAIGLER ENGINEERING P.C.
2620 Grand Island Blvd.
Grand Island, New York 14072-2131

September 2015

Last Revised March 2017

SUPPLEMENTAL AIR EMISSIONS INVENTORY

For the Draft Environmental Impact Statement

CARROLL LANDFILL EXPANSION APPLICATION

CARROLL, NEW YORK

SEALAND WASTE, LLC

Prepared on behalf of:

Sealand Waste, LLC
85 High Tech Drive
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2620 Grand Island Blvd.
Grand Island, New York 14072-2131

September 2015

Last Revised March 2017

SUPPLEMENTAL AIR EMISSIONS INVENTORY
For the Draft Environmental Impact Statement

Sealand Waste, LLC

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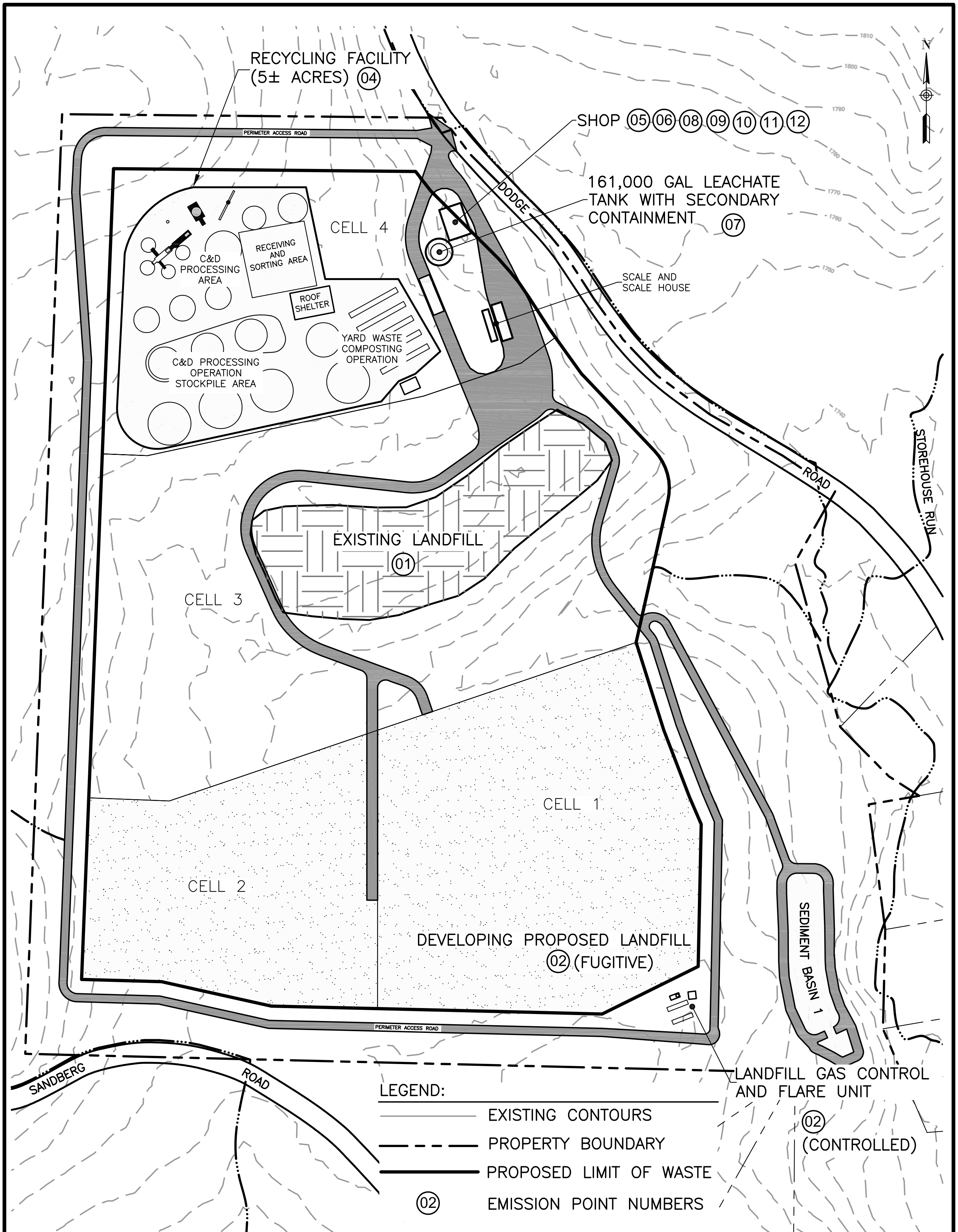
1 INTRODUCTION

The New York State Department of Environmental Conservation (the Department) issued comments on the Carroll Landfill Air Emissions Inventory (last revised December 2013) on February 3, 2015. In one of the comments, the Department recommended a landfill gas (LFG) flare be installed "behind" the SulfaTreat system to reduce greenhouse gases (GHGs) and other emissions. After meeting with the Department on March 10, 2015 to discuss their comments, the Department indicated the control of nuisance conditions from odors is an additional concern.

Despite the modeled results showing GHG emissions below levels requiring control and working experience at other working C&D landfills in the State that indicate nuisance odors from organic reduced sulfur compounds other than hydrogen sulfide are not of concern, the Department will require Sealand install a LFG flare. Rather than revise the full Air Emissions Inventory (AEI) prepared for the Carroll Landfill Expansion Application (Daigler Engineering, PC; Rev. 3, last revised March 2015), it was agreed that a focused supplemental AEI is appropriate. Therefore, the primary purpose of this supplemental AEI is to provide relevant emissions estimates with a LFG flare installed behind the SulfaTreat system.

A secondary purpose for this supplemental AEI is to evaluate the regulatory ramifications of the newly revised 6 NYCRR 212 Process Operations, which went into effect on June 14, 2015. The Air Facilities Site Plan in Figure 1-1 provides an overview of the inventoried emissions sources. Emission Point 02 (Controlled), the LFG control unit is the primary subject of this submission.



Q:\Sealand\02–0104 Carroll Landfill\Air Quality Impacts\ACAD\Air Facilities Site Plan.dwg 9/29/2015 2:31 PM

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

INITIAL CONDITIONS AIR FACILITIES SITE PLAN

CARROLL LANDFILL EXPANSION APPLICATION

SEALAND WASTE, LLC

TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	FIGURE 1-1
September 2015	SCALE: 1 : 250	REVISION # 3	

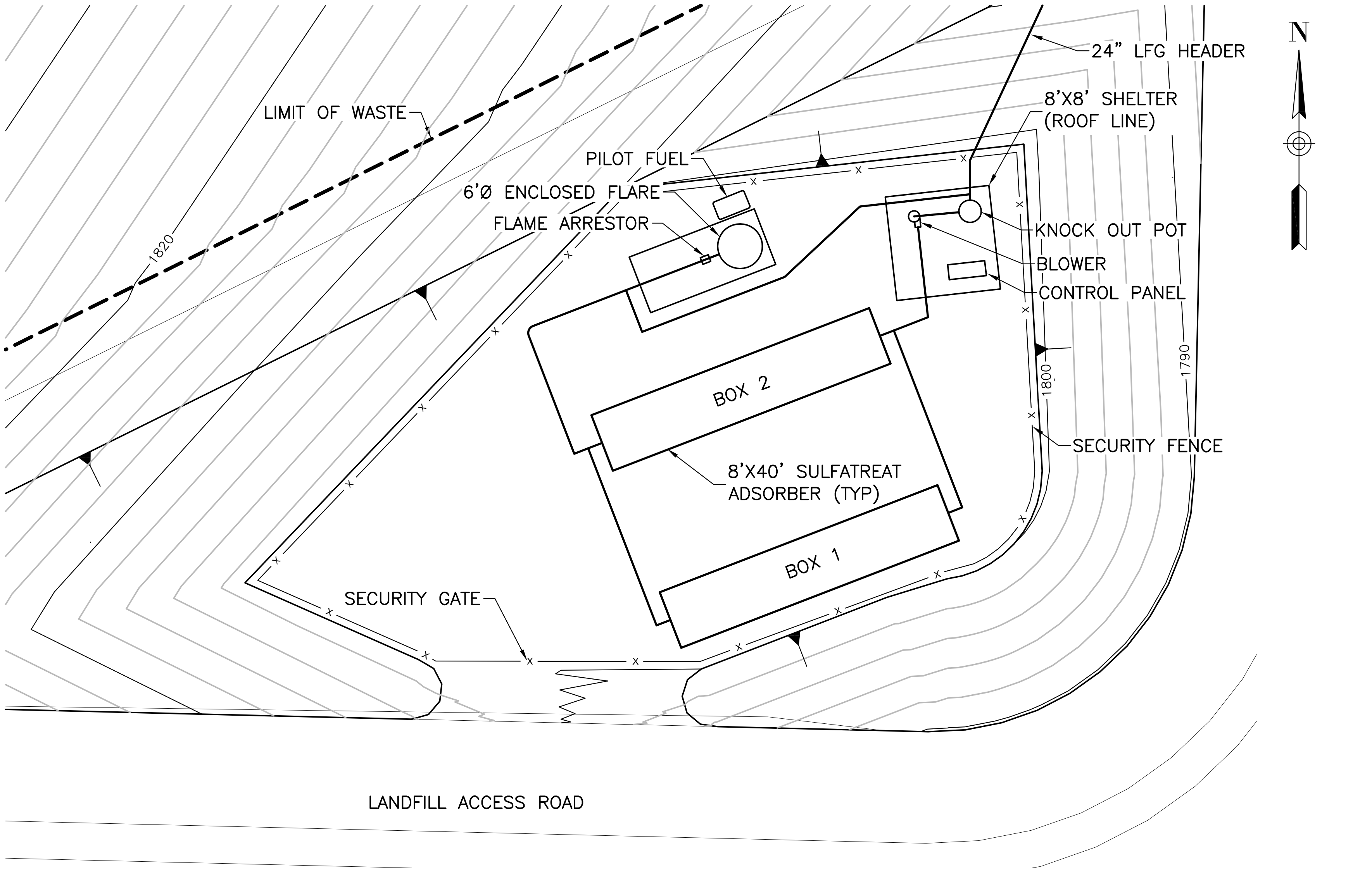
2 PROPOSED LFG CONTROL SYSTEM

A plan of the proposed LFG control system and a process schematic are shown in Figures 2-1 and 2-2, respectively. The landfill gas control system will contain a condensate knockout, one or more blowers, two SulfaTreat adsorber vessels in a lead-lag arrangement, a flame arrestor, an enclosed flare with pilot fuel, and process control and monitoring systems. The proposed enclosed flare is manufactured by LFG Specialties, LLC (Model No. EF-630I6).

The SulfaTreat adsorber vessels are a fixed bed system for treatment of gaseous waste streams that are high in hydrogen sulfide (H_2S). Hydrogen sulfide chemically adsorbs onto the SulfaTreat media. Removal efficiencies for the SulfaTreat System are generally well over 99% for H_2S. According to the media's manufacturer, SulfaTreat is compound specific, targeting only H_2S. There is some anecdotal evidence that SulfaTreat can control light mercaptans; however, the manufacturer will not guarantee removal efficiency for any compound other than H_2S. According to a study by Lee *et al*. (2006)[1], the presence of organic reduced sulfur compounds, such as mercaptans, in C&D landfill gas is less frequent than H_2S and typically several orders of magnitude lower in concentration..

An enclosed flare can control all sulfur containing compounds found in LFG by reducing them to sulfur dioxide. Sulfur dioxide is a regulated air pollutant. While the enclosed flare can control H_2S, as well as any other organic reduced sulfur compounds with the potential to emit nuisance odors, sulfur dioxide emissions from the flare may exceed the major facility threshold if the landfill gas is not pretreated to remove H_2S. Use of the enclosed flare with and without the SulfaTreat System was evaluated and the results of the evaluation are presented in Section 3 of this document.

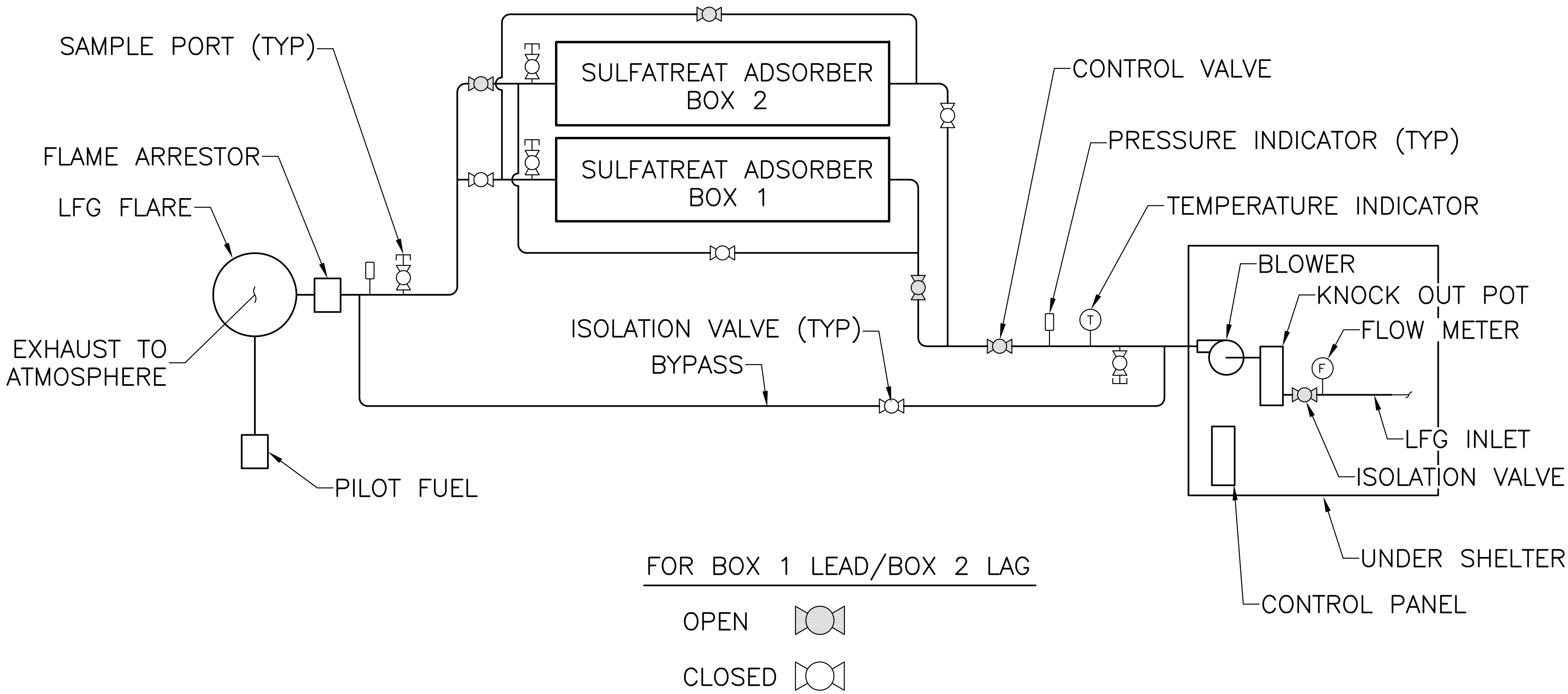
[1] Lee, S., Qiyong, X., Booth, M., Townsend, T., Chadik, P., and Bitton, G. (2006). Reduced sulfur compounds in Gas from Construction and Demolition Debris Landfills. Waste Management, 26(5), 526-533.



DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072
(716) 773-6872 (716) 773-6873 FAX

SEALAND WASTE, LLC		LFG CONTROL SYSTEM PLAN CARROLL LANDFILL EXPANSION APPLICATION			FIGURE 2-1
SCALE: 1" = 20'	REVISION # 0				
September 2015		TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	

Q:\Sealand\02-0104 Carroll Landfill\Permit Drawings\2015 REVISIONS\LFG FLARE PLACEMENT AREA MAP WITH PROFILES.dwg 9/29/2015 3:04 PM



DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072
(716) 773-6872 (716) 773-6873 FAX

SEALAND WASTE, LLC		LFG CONTROL PIPING SCHEMATIC			FIGURE 2-2
SCALE: Not To Scale	REVISION # 0	CARROLL LANDFILL EXPANSION APPLICATION			
September 2015		TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	

3 CONTROLLED LANDFILL GAS EMISSIONS USING AN ENCLOSED FLARE

3.1 GENERAL

All emissions estimates discussed are for the modeled year of maximum emissions, 2029. During the year of maximum emissions, the landfill will have reached capacity. Uncontrolled LFG emissions were estimated using LandGEM (US EPA, ver. 3.02) as described in the Carroll AEI (rev. 3, last revised March 2015). Uncontrolled emissions are the same as presented in Appendix A of the Carroll AEI and were not recalculated.

Controlled emissions were calculated based on the approach set forth in AP-42, Section 2.4 Municipal Solid Waste Landfills (ver. 11/98; henceforth referred to as AP-42 1998) for emissions from a flare. A more recent draft of AP-42, Section 2.4 (ver. 10/08; henceforth referred to as AP-42 2008) is also available. According to the US EPA, all issues raised during the public comment period have not been resolved in draft versions and users are to use draft versions at their discretion. Therefore, emission factors associated with enclosed flares from the draft version were only used when the reliability rating of the factor had significantly improved. Details on the calculation of controlled emissions of landfill gas using an enclosed flare, both with and without SulfaTreat pretreatment are provided in Appendix A-S.

In addition to changes in the emissions factors associated with control units, AP-42 2008 also updated the AP-42 1998 list of default concentrations for LFG constituents which is the basis for the LandGEM Model (ver. 3.02). AP-42 2008 now includes two LFG constituent lists, one for landfills with waste in place on or after 1992 (Table 2.4-1) and one with waste in place prior to 1992 (Table 2.4-2). The constituent list for waste in place prior to 1992 is the same as the original list published in AP-42 1998. The 1992 cutoff is related to the year the RCRA Subtitle D regulations were proposed.

The existing Jones-Carroll Landfill began placing waste in 1990. Approximately 16% of its reported waste acceptance falls under the "prior to 1992" category. Overall, when considering both the existing landfill and proposed expansion, the waste accepted in 1990 and 1991 accounts for only 0.41% of the final waste mass. Therefore, for the year 2029 it is reasonable to assume that the "on or after 1992" category would adequately describe the entire waste mass. A newer version of LandGEM is not available, therefore uncontrolled emissions using the newer default concentrations was not modeled. However, when appropriate, the significance of the changes in default concentration is discussed.

3.2 Controlled Emissions of Speciated Parameters

There are 48 speciated parameters and one group (non-methane organic compounds) listed in AP-42 1998 for which emissions are estimated by LandGEM. Controlled emission rates for speciated parameters were calculated as the sum of fugitive emissions and stack emissions from the flare. Fugitive emissions take into account the 86.35% estimated average collection efficiency for the year of maximum emissions and a 25% methane oxidation factor. The calculations and support for these numbers was presented in the Carroll AEI (Rev. 3, last revised March 2015).

Emissions from the stack of the flare take into account the collection efficiency of the system and the control efficiency of the flare. The control efficiency of methane for the proposed enclosed flare is 99% minimum per the manufacturer's technical data. For all other speciated parameters, emissions factors from AP-42 2008 were used for the control efficiency, with the exception of carbon dioxide. "Controlled" carbon dioxide emissions are greater than uncontrolled carbon dioxide emissions, because the methane converts to carbon dioxide with the manufacturer's guaranteed 99% combustion efficiency. For non-methane organic carbons and volatile compounds the control efficiency of the enclosed flare per AP-42 2008 is 97.7%. Also, per AP-42 2008, the control efficiency for mercury is assumed to be 0%.

All calculations and inventory tables of controlled emission rates for speciated parameters are included in Appendix A-S.

3.3 Secondary Compounds Emitted by the Flare

Emissions of secondary compounds emitted by the flare were calculated based on the approach laid out in AP-42 1998, as presented in Appendix A-S. Secondary compounds include nitrogen oxides, carbon dioxide, particulate matter (assumed to be all less than 2.5 microns), hydrogen chloride emissions, and sulfur dioxide. Emissions estimates of nitrogen oxides, carbon dioxide, and particulate matter are calculated based on collected emissions of methane and an emission factor. Hydrogen chloride or gaseous hydrochloric acid emissions and sulfur dioxide emissions are calculated using a mass balance method as described in AP-42 1998.

Sulfur dioxide is a regulated air pollutant with a major facility threshold of 100 tons per year (TPY). All sulfur-containing compounds, including hydrogen sulfide and mercaptans, are reduced to sulfur dioxide within the flare. Emissions of sulfur dioxide were calculated without pretreatment of the collected landfill gas with SulfaTreat, as presented in Appendix A-S. Controlled emissions of sulfur dioxide for the year of maximum emissions (2029) were calculated at 99.13 TPY. Since the estimated emissions were right at the threshold, the computation was evaluated for the effective difference between AP-42 1998 and AP-42 2008. A site-specific estimate of hydrogen sulfide concentration as described in the Carroll AEI (Rev 3, last revised March 2015) was used in calculation of sulfur dioxide emission rate under both versions of AP-42. Other than hydrogen sulfide, AP-42 1998 lists five other sulfur containing compounds that were used in the calculation of sulfur dioxide emissions. AP-42 2008 lists 15 additional sulfur-containing compounds. Table 3-1 is a comparison of the sulfur-containing compounds between the two versions of AP-42.

As seen in Table 3-1, the default concentrations of all sulfur-containing compounds listed in AP-42 1998 decreased and improved in reliability in AP-42 2008. However, due to the increased number of speciated sulfur-containing compounds and the overwhelming dominance of the site-specific hydrogen sulfide concentration, the calculated controlled emission rate of sulfur dioxide from the enclosed flare using AP-42 2008 constituents and default concentrations was essentially the same (99.01 TPY; calculation not shown).

TABLE 3-1: DEFAULT CONCENTRATIONS OF SULFUR-CONTAINING COMPOUNDS IN MUNICIPAL SOLID WASTE LANDFILL GAS

Sulfur-Containing Compounds in Landfill Gas	Molecular Formula	AP-42 1998 Default Concentration		AP-42 2008 Default Concentration	
		(ppmv)	Rating	(ppmv)	Rating
1-Propanethiol	C_3H_8S			0.125	A
2,5-Dimethylthiophene	C_3H_8S			0.0644	E
2-Ethylthiophene	C_6H_8S			0.0629	E
2-Methyl-1-propanethiol	$C_4H_{10}S$			0.17	E
2-Methyl-2-propanethiol	$C_4H_{10}S$			0.325	E
3-Methylthiophene	C_5H_6S			0.0925	E
Carbon disulfide	CS_2	0.58	C	0.147	A
Carbonyl sulfide	COS	0.49	D	0.122	A
Diethyl sulfide	$C_4H_{10}S$			0.0862	E
Dimethyl disulfide	$C_2H_6S_2$	7.82	C	0.137	A
Dimethyl sulfide (methyl sulfide)	C_2H_6S			5.66	A
Ethyl mercaptan (ethanethiol)	C_2H_6S	2.28	D	0.198	A
Ethly methyl sulfide	C_3H_8S			0.0367	E
Hydrogen sulfide (AP-42)	H_2S	35.5	B	32.0	A
Hydrogen sulfide (Site Specific)	H_2S	4,310	--	4,310	--
Isopropyl mercaptan	C_3H_8S			0.175	A
Methyl mercaptan (methanethiol)	CH_4S	2.49	C	1.37	A

Facility-wide, one other regulated air emission source, the proposed waste oil space heaters, has the potential to emit sulfur dioxide at a rate of 1.12 TPY. The two sources combined are estimated to emit 100.25 TPY. Thus, facility totals are estimated to narrowly exceed the 100 TPY threshold for sulfur dioxide. Further, sulfur dioxide is subject to National Ambient Air Quality Standards (NAAQSs). The primary NAAQS for sulfur dioxide is 75 ppb for the average of the 99th percentile of the daily maximum 1-hour average value for a period of three years. The secondary NAAQS for sulfur dioxide is a 3-hour average concentration of 0.5 ppm which is not to be exceeded more than once in any given year. The US EPA (2010)[2] provides guidance concerning the implementation of the 1-hour sulfur dioxide NAAQS in which they uphold the use of a significant emissions rate (SER) of 40 TPY. When a proposed project falls below the SER, the

[2] U.S. Environmental Protection Agency (US EPA). (2010). Memorandum: Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program. Stephen D. Page, Office of Air Quality Planning and Standards, August 23, 2010.

source is not required to undergo any additional analysis and it is assumed to meet the primary NAAQS for sulfur dioxide. Therefore, the LFG will be pretreated to achieve a sulfur dioxide emission rate less than 40 TPY.

Pretreatment with the proposed SulfaTreat system will significantly reduce hydrogen sulfide concentrations from the site specific uncontrolled concentration of 4,310 ppm to 3 ppm. The maximum SulfaTreat outlet concentration of 3 ppm will be maintained by replacing the spent media in the lead unit and reversing the lead-lag arrangement once measureable concentrations of hydrogen sulfide are detected at the outlet of the lead unit. Pretreating the collected LFG with SulfaTreat provides for estimated sulfur dioxide emissions of 0.40 TPY; exactly two orders of magnitude below the SER.

Note that this calculation was performed using the year of maximum emissions (2029). For the grand majority of time, emissions of all sulfur-containing compounds, including hydrogen sulfide will be significantly lower. Thus, sulfur dioxide emissions will also be lower. Without SulfaTreat, sulfur dioxide emissions are not expected to approach the SER until Phase 6 of the landfill phasing plan shown in PD-10 of the Carroll Landfill Expansion Part 360 Permit Application (currently in revision; expected submission date October 2015), or around 5 years into the development of the landfill. For reference, the facility snapshot shown in Figure 1-1 herein, is the end of Phase 5. Despite this, delayed installation of the SulfaTreat system is not currently proposed.

3.4 Summary of Emissions Estimates from an Enclosed Flare

The table below is a summary of the calculated emissions of landfill gas for the Carroll Landfill Expansion Application. Controlled emissions are first routed through the SulfaTreat system to knock down hydrogen sulfide concentrations before being combusted in an enclosed flare. Table 3-2 includes both primary compounds and secondary compounds from the flare.

TABLE 3-2: ESTIMATED CONTROLLED EMISSIONS FROM THE ANTICIPATED YEAR OF MAXIMUM LANDFILL GAS EMISSIONS (2029)

Compound	Existing Jones-Carroll Landfill		Proposed Carroll Landfill		TOTAL	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
Carbon Monoxide	0.00566	0.0248	0.62	2.72	0.63	2.74
Non-Methane Organic Compounds (NMOCs)	0.01	0.02	0.60	2.63	0.61	2.66
Oxides of Nitrogen	0.005	0.020	0.49	2.17	0.50	2.19
Hydrogen Sulfide	0.00434	0.0190	0.48	2.09	0.48	2.11
Particular Matter	0.002	0.008	0.19	0.83	0.19	0.84
VOCs	0.00164	0.00719	0.18	0.79	0.18	0.80
HAPs	0.00112	0.00491	0.12	0.54	0.12	0.54
Sulfur Dioxide*	0.001	0.004	0.089	0.392	0.09	0.40
Ozone-Depleting Compounds	0.0003	0.0012	0.03	0.13	0.03	0.13
Greenhouse Gases:						
Methane	0.62	2.70	67.70	296.53	68.32	299
Carbon Dioxide	35.17	154.05	3,858	16,898	3,893	17,052

* Assumes 100% of collected LFG is pretreated with SulfaTreat adsorber vessels.

Uncontrolled emissions of GHGs from landfill emissions for the year of maximum emissions, as presented in the Carroll AEI (Rev. 3, last revised March 2015), are estimated to be 13,790 TPY in total GHGs (sum of methane and carbon dioxide) or 67,700 TPY in CO_2-e. These estimates exceed the 50 TPY/50,000 TPY in CO_2-e minor facility maximum emission rates. Controlled GHG landfill emissions are estimated to be 17,350 TPY in total GHGs (sum of methane and carbon dioxide) or 23,330 TPY in CO_2-e. Thus, use of an enclosed flare actually increases GHG emissions in terms of total TPY due to the conversion of organic carbon compounds in the LFG to carbon dioxide during combustion, but significant reductions in methane reduce the overall GHG emissions in CO_2-e.

4 REGULATORY ANALYSIS

4.1 6 NYCRR 201 Permits and Registrations

Based on the Carroll AEI (Rev. 3, last revised March 2015), the uncontrolled, potential-to-emit emissions for the regulated air pollutant H_2S will exceed the 50 TPY minor facility maximum, but fall well under the major facility threshold. The uncontrolled GHG emissions also exceed the minor facility maximum for both parts of the GHG standard. Thus, an Air State Facility Permit will be required for the proposed Carroll Landfill Expansion based on emission estimates of H_2S and GHG. The amended controlled emissions for enclosed flare as presented herein, do not change this analysis as the comparison is based on uncontrolled, potential-to-emit emissions. However, a revised Carroll Landfill Air State Facility Permit application which was originally submitted on March 18, 2015 is included in Appendix B-S. The application form was revised to add the proposed enclosed flare as a control unit to emission point 02.

4.2 6 NYCRR 212 Process Operations

Part 212 was modified in June 2015 to establish consistent terminology between Part 212 and the permitting program (Parts 200 and 201), as well as the federal National Emission Standards for Hazardous Air Pollutants program. The updated regulations are applicable for any process emission sources and/or emission points from manufacturing, industrial, commercial, or other activity or operation. Some exceptions are listed, however, none apply to the Carroll Landfill.

Section 212-2.2 introduces a High Toxicity Air Contaminants (HTACs) list. Several of the listed HTACs coincide with LFG constituents identified by AP-42 for municipal solid waste landfills but are not necessarily representative of C&D landfills. A summary of these pollutants is provided in Table 4-1.

As described earlier in Section 3, the modeled concentrations of compounds in LFG using LandGEM are based on constituents and concentrations listed in AP-42 1998; but, a more recent draft, AP-42 2008, is also available. AP-42 2008 includes more parameters than AP-42 1998. Also, in most cases the rating on the emission factor increases in reliability[3] in AP-42 2008 as compared to AP-42 1998. As established in Section 3.1, the constituents and concentrations in the

[3] The rating scale is from A to E with decreasing reliability, i.e. A is the most reliable.

"on or after 1992" Table in AP-42 2008 (Table 2.4-1) is more representative of the waste being modeled. Therefore, LandGEM was modified for those parameters that are on the Section 212 HTAC list. For HTAC parameters that are already included in LandGEM, a user-specified parameter concentration was entered to override the AP-42 1998 default concentration with the AP-42 2008 concentration from Table 2.4-1. HTAC parameters that were new to the LFG constituent list in AP-42 2008, were manually added to the model in the space provided for new compounds. Modeling results using both AP-42 1998 emission factors (see Total Controlled Emissions spreadsheet in Appendix A-S) and AP-42 2008 emission factors (see Appendix C-S) are both reported in Table 4-1.

TABLE 4-1: HIGH TOXICITY AIR CONTAMINANTS IN LANDFILL GAS

Pollutant	Part 212 Mass Emission Limit (lbs/yr)	AP-42 1998 Concentrations			AP-42 2008 Concentrations		
		Uncontrolled Mass Emissions (lbs/yr)	Controlled Mass Emissions (lbs/yr)	Rating	Uncontrolled Mass Emissions (lbs/yr)	Controlled Mass Emissions (lbs/yr)	Rating
1,1,2,2-tetrachloroethane	1000	155	19.0	C	75.5	9.2	E
1,2-dichloroethane	100	34.1	4.2	B	13.2	1.6	A
1,2-dichloropropane (propylene dichloride)	1000	17.1	2.1	D	4.9	0.6	D
Acrylonitrile	25	**281**	**34.3**	D	0.9	0.1	C*
Benzene	100	**125**	15.2	B	**158**	19.3	A
Carbon tetrachloride	100	0.5	0.1	B	1.0	0.1	A
Chloroform	100	3.0	0.4	B	7.1	0.9	A
Ethlyene dibromide (1,2-dibromoethane)	5	0.2	1.9E-02	E	**25.1**	3.1	A
Mercury	5	4.9E-02	4.7E-02	E	2.1E-02	2.0E-02	B
Perchloroethylene	1000	516	63.0	B	283	34.6	A
Trichloroethylene	500	309	37.8	B	91.4	11.2	A
Vinyl chloride	100	**383**	46.9	B	74.6	9.1	A
1,1,2-trichloroethane	100				17.7	2.2	D
1,3-butadiene	25				7.5	0.9	C
1,3-dichloropropene (cis + trans)	500				1.2	0.1	D
Acetaldehyde	1000				2.9	0.4	D
Benzyl chloride	25				1.9	0.2	A
Formaldehyde	100				0.3	0.0	D

*Recommended Emission Factor Rating from *Background Information Document for Updating AP-42 Section 2.4 for Estimating Emissions from Solid Waste Landfills* (EPA/600/R-08-116, Sept. 2008). In the Draft AP-42, (ver. 10/08) Table 2.4-1, this column was left blank and the following footnote was applied: "All tests were below detection limit.

Method detection limits are available for three tests, and are as follows: MDL = 2.00E-04, 4.00E-03, and 2.00E-02." The most conservative detection limit of 2.00E-02 was used in this analysis.

The predicted mass emission rates for the Proposed Carroll Landfill for nearly all constituents are well below the HTAC mass emissions limit published in section 212-2.2 even without controls with four exceptions. In both versions, the estimated emissions for benzene are greater than the HTAC mass emission limit when uncontrolled, but fall well below the limit under the proposed LFG control system as described in Section 2. Ethylene dibromide mass emission rates predicted under AP-42 2008 and vinyl chloride mass emission rates predicted under AP-42 1998 also will be above HTAC limits when uncontrolled, but fall below their respective limits under the proposed LFG control system.

The emission rate for acrylonitrile exceeds the limit set forth in section 212-2.2 for both uncontrolled and controlled emissions estimates when using the emission factors in the AP-42 1998. AP-42 1998 lists a default LFG concentration in municipal solid waste of 6.33 ppm for acrylonitrile with an emission rating factor of D, or low reliability. The more recent AP-42 2008 lists a default concentration of 'BDL' meaning below detection limit. The predicted acrylonitrile mass emission rate using the most conservative method detection limit as the concentration in LFG is well below the limit. While AP-42 2008 is still draft and, therefore, its concentrations have not be officially substituted, the AP-42 2008 concentration is more applicable to the post-1992 (i.e., post-RCRA Subtitle D regulations) waste that will be disposed within the Proposed Carroll Landfill. Hence, HTAC mass emission limits for acrylonitrile are highly unlikely to be exceeded.

5 SUMMARY AND CONCLUSIONS

Due to the Department's concerns over greenhouse gas emissions, it is our understanding that installation and operation of LFG flare will be a permit requirement in the facility's Air State Facility Permit. For this reason, an enclosed flare has been added to the proposed LFG control system and the LFG emissions estimates have been updated. The following bullets summarize the main conclusions of this Supplemental AEI:

- The enclosed flare will reduce LFG emissions of nearly all speciated constituents, including H_2S and the other sulfur-containing compounds, such as mercaptans;
- Methane, the primary cause for elevated GHG emissions from the facility in CO2-e, will be significantly reduced by including an enclosed flare;
- Estimated emissions of carbon dioxide and carbon monoxide will increase by the addition of the LFG flare;
- Four new secondary compounds will be created in the flare, namely, oxides of nitrogen, particulate matter (assumed to be PM-2.5), hydrogen chloride, and sulfur dioxide;
- SulfaTreat adsorber vessels will be used to pretreat the LFG entering the flare to reduce the concentration of H_2S, thereby lowering the sulfur dioxide emissions to levels below the SER, ensuring emissions from the facility do not cause and exceedance of the NAAQS for sulfur dioxide; and,
- Several HTACs are constituents of municipal solid waste LFG, however, none of these HTACs are expected to be above the mass emission limits set forth in Part 212 for the proposed C&D facility.

APPENDIX A-S

Calculation of Controlled Landfill Gas Emissions Using an Enclosed Flare (Emission Point 02)

Calculation of Controlled Landfill Gas Emissions Using an Enclosed Flare (Emission Point 02):

The US EPA's LandGEM (ver. 3.02) was used to estimate the uncontrolled emissions found within these calculations. Emissions are controlled by both a SulfaTreat adsorber vessel, which is specific to hydrogen sulfide (H_2S), and an enclosed landfill gas flare. Controlled emissions from the SulfaTreat adsorber vessel are fed into the flare. Installation and operation of both the SulfaTreat unit and the enclosed flare is intended to occur as soon as the generation rate of landfill gas will support it.

Controlled emissions for H_2S from the SulfaTreat unit are based on operational practices that will limit the H_2S concentration to 3 ppm or less. The remaining controlled emissions calculations follow the procedures and equations outlined in AP-42 Section 2.4 Municipal Solid Waste Landfills (ver. 11/98) for emissions from a flare. A more recent draft AP-42 Section 2.4 (ver. 10/08) is also available. According to the US EPA, all issues raised during the public comment period have not been resolved in draft versions and users are to use draft versions at their discretion. Therefore, emission factors from the draft version were only used when the reliability rating of the factor had significantly improved. Emission factors from the draft Section 2.4 will be clearly identified where used; otherwise all references to AP-42 can be assumed to be from the final (11/98) version of Section 2.4. The controlled landfill gas emissions are estimated both for the proposed landfill and the existing waste for the year of maximum emissions, 2029.

A. CONTROLLED EMISSIONS OF SPECIATED PARAMETERS

A.1 Controlled Emissions of Speciated Parameters

Controlled emissions of all parameters speciated in the inventory produced by LandGEM, except those otherwise specified in this Appendix, can be calculated using the following equation (AP-42, Section 2.4.4.2, Equation (5), modified to include a methane oxidation factor for fugitive emissions as per 40 CFR 98.348).

$$M_{c,P} = \left[M_{u,P} \times \left(1 - \frac{\eta_{col}}{100}\right) \times \left(1 - \frac{M_{OX}}{100}\right)\right] + \left[M_{u,P} \times \frac{\eta_{col}}{100} \times \left(1 - \frac{\eta_{cnt}}{100}\right)\right]$$

where, $M_{c,P}$ = Controlled mass emissions of parameter P (Mg/yr, lbs/hr, or ton/yr)

$M_{u,P}$ = Uncontrolled mass emissions of parameter P (Mg/yr, lbs/hr, or ton/yr), from LandGEM, 3.02 model

η_{col} = Collection efficiency of the landfill gas collection system (%)

= 86.35%, estimated average collection efficiency for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

M_{OX} = Methane oxidation factor (%)

= 25%, for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

η_{cnt} = Control efficiency of the landfill gas control device (%)

= 99% for methane, per flare manufacturer's technical data

= 97.7% for NMOC and VOCs, per draft AP-42 (ver. 10/08)*

*The control efficiency for a flare (enclosed or open) from the draft 10/08 version was given an A rating, meaning excellent reliability. This factor applies to all speciated parameters, except for mercury. Control efficiency for mercury from any control device should be assumed to be zero, according to the draft 10/08 version of AP-42, Section 2.4. The final 11/98 version of AP-42, Section 2.4 presents three separate control efficiencies for NMOC, halogenated species, and non-halogenated species with reliability ratings of B, C, and C, respectively. The B rating is above average reliability and the C rating is average reliability. Since the draft 10/08 version had a better rating, it was used herein.

A.2 Controlled Emissions of Carbon Dioxide (CO_2)

Controlled emissions of carbon dioxide can be calculated using the following equation (AP-42, Section 2.4.4.2, Equation (6), modified to include a methane oxidation factor for fugitive emissions as per 40 CFR 98.348). Also, AP-42 Equation (6) assumes 100% combustion efficiency for methane. The technical data per the flare's manufacturer guarantees 99% destruction of methane. Therefore, this equation was modified to include control efficiency of methane as well.

$$M_{c,CO_2} = \left[M_{u,CO_2} \times \left(1 - \frac{\eta_{col}}{100}\right) \times \left(1 - \frac{M_{OX}}{100}\right) \right] + \left[M_{u,CO_2} \times \frac{\eta_{col}}{100} \right] + \left[M_{u,CH_4} \times \frac{\eta_{col}}{100} \times \frac{\eta_{cnt}}{100} \times 2.75 \right]$$

where, M_{c,CO_2} = Controlled mass emissions of CO_2 (Mg/yr, lbs/hr, or ton/yr)

M_{u,CH_4} = Uncontrolled mass emissions of methane (Mg/yr, lbs/hr, or ton/yr), from LandGEM, 3.02 model

M_{u,CO_2} = Uncontrolled mass emissions of carbon dioxide (Mg/yr, lbs/hr, or ton/yr), from LandGEM, 3.02 model

η_{cnt} = Control efficiency of the landfill gas control device (%)

= 99% for methane, per flare manufacturer's technical data

2.75 = Ratio of the molecular weight of CO_2 to the molecular weight of CH_4

Controlled emission rates of CO_2 and all other speciated (primary) parameters are summarized in the following tables.

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill — **Existing Controlled Emissions Summary**
Emission Point: Existing Waste's Contribution to 002
Carroll Landfill Expansion Application — Inventory for Year 2029

Parameter	Emission Rate								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY
* Methane							2.46	0.62	2.70
Carbon dioxide							140.04	35.17	154.05
Non-Methane Organic Compounds (NMOC)							0.02	0.01	0.02
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				2.70E-05	6.78E-06	2.97E-05	2.70E-05	6.78E-06	2.97E-05
1,1,2,2-Tetrachloroethane - HAP/VOC	7.79E-05	1.96E-05	8.57E-05	7.79E-05	1.96E-05	8.57E-05			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	1.00E-04	2.52E-05	1.10E-04	1.00E-04	2.52E-05	1.10E-04			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	8.18E-06	2.05E-06	8.99E-06	8.18E-06	2.05E-06	8.99E-06			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	1.71E-05	4.30E-06	1.88E-05	1.71E-05	4.30E-06	1.88E-05			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	8.58E-06	2.15E-06	9.44E-06	8.58E-06	2.15E-06	9.44E-06			
2-Propanol (isopropyl alcohol) - VOC	1.27E-03	3.18E-04	1.39E-03						
* Acetone							1.71E-04	4.31E-05	1.89E-04
Acrylonitrile - HAP/VOC	1.41E-04	3.54E-05	1.55E-04	1.41E-04	3.54E-05	1.55E-04			
Benzene - No or Unknown Co-disposal - HAP/VOC	6.26E-05	1.57E-05	6.89E-05	6.26E-05	1.57E-05	6.89E-05			
Bromodichloromethane - VOC	2.14E-04	5.38E-05	2.36E-04						
Butane - VOC	1.23E-04	3.08E-05	1.35E-04						
Carbon disulfide - HAP/VOC	1.86E-05	4.68E-06	2.05E-05	1.86E-05	4.68E-06	2.05E-05			
Carbon monoxide[2]							*NC*[2]	5.66E-03	2.48E-02
Carbon tetrachloride - HAP/VOC/ODC	2.60E-07	6.52E-08	2.85E-07	2.60E-07	6.52E-08	2.85E-07	2.60E-07	6.52E-08	2.85E-07
Carbonyl sulfide - HAP/VOC	1.24E-05	3.12E-06	1.37E-05	1.24E-05	3.12E-06	1.37E-05			
Chlorobenzene - HAP/VOC	1.19E-05	2.98E-06	1.31E-05	1.19E-05	2.98E-06	1.31E-05			
* Chlorodifluoromethane - HCFC-22							4.74E-05	1.19E-05	5.22E-05
Chloroethane (ethyl chloride) - HAP/VOC	3.54E-05	8.88E-06	3.89E-05	3.54E-05	8.88E-06	3.89E-05			
Chloroform - HAP/VOC	1.51E-06	3.79E-07	1.66E-06	1.51E-06	3.79E-07	1.66E-06			
Chloromethane (methyl chloride) - HAP/VOC	2.56E-05	6.42E-06	2.81E-05	2.56E-05	6.42E-06	2.81E-05			
Dichlorobenzene (1,4 isomer) - HAP/VOC	1.30E-05	3.27E-06	1.43E-05	1.30E-05	3.27E-06	1.43E-05			
* Dichlorodifluoromethane - CFC-12							8.16E-04	2.05E-04	8.97E-04
Dichlorofluoromethane - VOC/HCFC-21	1.13E-04	2.83E-05	1.24E-04				1.13E-04	2.83E-05	1.24E-04
* Dichloromethane (methylene chloride) - HAP				5.02E-04	1.26E-04	5.52E-04			
Dimethyl sulfide (methyl sulfide) - VOC	2.04E-04	5.13E-05	2.25E-04						
* Ethane	0.00E+00	0.00E+00	0.00E+00				1.13E-02	2.83E-03	1.24E-02
Ethanol - VOC	5.25E-04	1.32E-04	5.77E-04						
Ethyl mercaptan (ethanethiol) - VOC	6.03E-05	1.51E-05	6.63E-05						
Ethylbenzene - HAP/VOC	2.06E-04	5.17E-05	2.27E-04	2.06E-04	5.17E-05	2.27E-04			
Ethylene dibromide - HAP/VOC	7.92E-08	1.99E-08	8.72E-08	7.92E-08	1.99E-08	8.72E-08			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							4.40E-05	1.11E-05	4.84E-05
Hexane - HAP/VOC	2.40E-04	6.02E-05	2.64E-04	2.40E-04	6.02E-05	2.64E-04			
Hydrogen sulfide[3]							1.73E-02	4.34E-03	1.90E-02
Mercury (total)[4] - HAP				1.94E-07	4.87E-08	2.13E-07			
Methyl ethyl ketone - HAP/VOC	2.16E-04	5.42E-05	2.38E-04	2.16E-04	5.42E-05	2.38E-04			
Methyl isobutyl ketone - HAP/VOC	8.03E-05	2.02E-05	8.83E-05	8.03E-05	2.02E-05	8.83E-05			
Methyl mercaptan - VOC	5.07E-05	1.27E-05	5.58E-05						
Pentane - VOC	1.00E-04	2.52E-05	1.10E-04						
* Perchloroethylene (tetrachloroethylene) - HAP				2.59E-04	6.50E-05	2.85E-04			
Propane - VOC	2.05E-04	5.14E-05	2.25E-04						
* t-1,2-Dichloroethene							1.14E-04	2.87E-05	1.26E-04
Toluene - No or Unknown Co-disposal - HAP/VOC	1.52E-03	3.81E-04	1.67E-03	1.52E-03	3.81E-04	1.67E-03			
Trichloroethylene (trichloroethene) - HAP/VOC	1.55E-04	3.90E-05	1.71E-04	1.55E-04	3.90E-05	1.71E-04			
Vinyl chloride - HAP/VOC	1.92E-04	4.83E-05	2.12E-04	1.92E-04	4.83E-05	2.12E-04			
Xylenes - HAP/VOC	5.37E-04	1.35E-04	5.91E-04	5.37E-04	1.35E-04	5.91E-04			
TOTALS	6.54E-03	1.64E-03	7.19E-03	4.46E-03	1.12E-03	4.91E-03	142.55	35.81	156.83

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate in lbs/hr is based on 8,760 hours per year
[2] Secondary compound, see separate calculation; *NC* = not calculated
[3] H_2S controlled = fugitive emissions only [=Uncontrolled landfill emissions*(1-86.35%)*(1-75% Diffusive reduction factor)] as the flare will convert all H_2S to SO_2
[4] The control efficiency for mercury from an enclosed flare is assumed to be 0% per AP-42, Section 2.4 (10/2008)
ODC = Classified ozone depleting chemical (SUM = 0.0010 Mg/yr, 0.0003 lbs/hr, 0.0012 TPY)

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill **Proposed Controlled Emissions Summary**
Emission Point: Proposed New Waste's Contribution to 002
Carroll Landfill Expansion Application Inventory for Year 2029

Parameter	Emission Rate								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY
* Methane							269.57	67.70	296.53
Carbon dioxide							15361.90	3858.01	16898.09
Non-Methane Organic Compounds (NMOC)							2.39	0.60	2.63
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0030	0.0007	0.0033	0.0030	0.0007	0.0033
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0085	0.0021	0.0094	0.0085	0.0021	0.0094			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0110	0.0028	0.0121	0.0110	0.0028	0.0121			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.0009	0.0002	0.0010	0.0009	0.0002	0.0010			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.0019	0.0005	0.0021	0.0019	0.0005	0.0021			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.0009	0.0002	0.0010	0.0009	0.0002	0.0010			
2-Propanol (isopropyl alcohol) - VOC	0.1390	0.0349	0.1530						
* Acetone							0.0188	0.0047	0.0207
Acrylonitrile - HAP/VOC	0.0155	0.0039	0.0170	0.0155	0.0039	0.0170			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0069	0.0017	0.0076	0.0069	0.0017	0.0076			
Bromodichloromethane - VOC	0.0235	0.0059	0.0258						
Butane - VOC	0.0134	0.0034	0.0148						
Carbon disulfide - HAP/VOC	0.0020	0.0005	0.0022	0.0020	0.0005	0.0022			
Carbon monoxide[2]							*NC*[2]	0.6208	2.7192
Carbon tetrachloride - HAP/VOC/ODC	0.000028	0.000007	0.000031	0.000028	0.000007	0.000031	0.000028	0.000007	0.000031
Carbonyl sulfide - HAP/VOC	0.0014	0.0003	0.0015	0.0014	0.0003	0.0015			
Chlorobenzene - HAP/VOC	0.0013	0.0003	0.0014	0.0013	0.0003	0.0014			
* Chlorodifluoromethane - HCFC-22							0.0052	0.0013	0.0057
Chloroethane (ethyl chloride) - HAP/VOC	0.0039	0.0010	0.0043	0.0039	0.0010	0.0043			
Chloroform - HAP/VOC	0.000166	0.000042	0.000182	0.000166	0.000042	0.000182			
Chloromethane (methyl chloride) - HAP/VOC	0.0028	0.0007	0.0031	0.0028	0.0007	0.0031			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.0014	0.0004	0.0016	0.0014	0.0004	0.0016			
* Dichlorodifluoromethane - CFC-12							0.0895	0.0225	0.0985
Dichlorofluoromethane - VOC/HCFC-21	0.0124	0.0031	0.0136				0.0124	0.0031	0.0136
* Dichloromethane (methylene chloride) - HAP				0.0550	0.0138	0.0605			
Dimethyl sulfide (methyl sulfide) - VOC	0.0224	0.0056	0.0247						
* Ethane							1.2381	0.3109	1.3619
Ethanol - VOC	0.0576	0.0145	0.0633						
Ethyl mercaptan (ethanethiol) - VOC	0.0066	0.0017	0.0073						
Ethylbenzene - HAP/VOC	0.0226	0.0057	0.0249	0.0226	0.0057	0.0249			
Ethylene dibromide - HAP/VOC	0.000009	0.000002	0.000010	0.000009	0.000002	0.000010			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.0048	0.0012	0.0053
Hexane - HAP/VOC	0.0263	0.0066	0.0289	0.0263	0.0066	0.0289			
Hydrogen sulfide[3]							1.8971	0.4764	2.0868
Mercury (total)[4] - HAP				0.000021	0.000005	0.000023			
Methyl ethyl ketone - HAP/VOC	0.0237	0.0059	0.0261	0.0237	0.0059	0.0261			
Methyl isobutyl ketone - HAP/VOC	0.0088	0.0022	0.0097	0.0088	0.0022	0.0097			
Methyl mercaptan - VOC	0.0056	0.0014	0.0061						
Pentane - VOC	0.0110	0.0028	0.0121						
* Perchloroethylene (tetrachloroethylene) - HAP				0.0284	0.0071	0.0312			
Propane - VOC	0.0224	0.0056	0.0247						
* t-1,2-Dichloroethene							0.0126	0.0032	0.0138
Toluene - No or Unknown Co-disposal - HAP/VOC	0.1662	0.0417	0.1829	0.1662	0.0417	0.1829			
Trichloroethylene (trichloroethene) - HAP/VOC	0.0170	0.0043	0.0187	0.0170	0.0043	0.0187			
Vinyl chloride - HAP/VOC	0.0211	0.0053	0.0232	0.0211	0.0053	0.0232			
Xylenes - HAP/VOC	0.0589	0.0148	0.0648	0.0589	0.0148	0.0648			
TOTALS	0.72	0.18	0.79	0.49	0.12	0.54	15637.15	3927.76	17203.58

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate in lbs/hr is based on 8,760 hours per year
[2] Secondary compound, see separate calculation; *NC* = not calculated
[3] H_2S controlled = fugitive emissions only [=Uncontrolled landfill emissions*(1-86.35%)*(1-75% Diffusive reduction factor)] as the flare will convert all H_2S to SO_2
[4] The control efficiency for mercury from an enclosed flare is assumed to be 0% per AP-42, Section 2.4 (10/2008)
ODC = Classified ozone depleting chemical (SUM = 0.1149 Mg/yr, 0.0289 lbs/hr, 0.1264 TPY)

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll & Proposed Carroll C&D Debris Landfills **Total Controlled Emissions Summary**
Emission Point: 002 (TOTAL)
Carroll Landfill Expansion Application — Inventory for Year 2029

Parameter	Emission Rate[1]								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[2]	TPY	Mg/yr	lbs/hr[2]	TPY	Mg/yr	lbs/hr[2]	TPY
* Methane							272.03	68.32	299.23
Carbon dioxide							15501.94	3893.18	17052.14
Non-Methane Organic Compounds (NMOC)							2.41	0.61	2.66
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				2.99E-03	7.51E-04	3.29E-03	2.99E-03	7.51E-04	3.29E-03
1,1,2,2-Tetrachloroethane - HAP/VOC	8.62E-03	2.16E-03	9.48E-03	8.62E-03	2.16E-03	9.48E-03			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	1.11E-02	2.78E-03	1.22E-02	1.11E-02	2.78E-03	1.22E-02			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	9.05E-04	2.27E-04	9.96E-04	9.05E-04	2.27E-04	9.96E-04			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	1.89E-03	4.76E-04	2.08E-03	1.89E-03	4.76E-04	2.08E-03			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	9.50E-04	2.38E-04	1.04E-03	9.50E-04	2.38E-04	1.04E-03			
2-Propanol (isopropyl alcohol) - VOC	1.40E-01	3.52E-02	1.54E-01						
* Acetone							1.90E-02	4.77E-03	2.09E-02
Acrylonitrile - HAP/VOC	1.56E-02	3.92E-03	1.72E-02	1.56E-02	3.92E-03	1.72E-02			
Benzene - No or Unknown Co-disposal - HAP/VOC	6.93E-03	1.74E-03	7.62E-03	6.93E-03	1.74E-03	7.62E-03			
Bromodichloromethane - VOC	2.37E-02	5.95E-03	2.61E-02						
Butane - VOC	1.36E-02	3.41E-03	1.49E-02						
Carbon disulfide - HAP/VOC	2.06E-03	5.18E-04	2.27E-03	2.06E-03	5.18E-04	2.27E-03			
Carbon monoxide							*NC*[4]	6.26E-01	2.74E+00
Carbon tetrachloride - HAP/VOC/ODC	2.87E-05	7.21E-06	3.16E-05	2.87E-05	7.21E-06	3.16E-05	2.87E-05	7.21E-06	3.16E-05
Carbonyl sulfide - HAP/VOC	1.37E-03	3.45E-04	1.51E-03	1.37E-03	3.45E-04	1.51E-03			
Chlorobenzene - HAP/VOC	1.31E-03	3.30E-04	1.45E-03	1.31E-03	3.30E-04	1.45E-03			
* Chlorodifluoromethane - HCFC-22							5.25E-03	1.32E-03	5.77E-03
Chloroethane (ethyl chloride) - HAP/VOC	3.92E-03	9.83E-04	4.31E-03	3.92E-03	9.83E-04	4.31E-03			
Chloroform - HAP/VOC	1.67E-04	4.20E-05	1.84E-04	1.67E-04	4.20E-05	1.84E-04			
Chloromethane (methyl chloride) - HAP/VOC	2.83E-03	7.10E-04	3.11E-03	2.83E-03	7.10E-04	3.11E-03			
Dichlorobenzene (1,4 isomer) - HAP/VOC	1.44E-03	3.62E-04	1.59E-03	1.44E-03	3.62E-04	1.59E-03			
* Dichlorodifluoromethane - CFC-12							9.03E-02	2.27E-02	9.93E-02
Dichlorofluoromethane - VOC/HCFC-21	1.25E-02	3.14E-03	1.37E-02				1.25E-02	3.14E-03	1.37E-02
* Dichloromethane (methylene chloride) - HAP				5.55E-02	1.39E-02	6.11E-02			
Dimethyl sulfide (methyl sulfide) - VOC	2.26E-02	5.68E-03	2.49E-02						
* Ethane							1.25E+00	3.14E-01	1.37E+00
Ethanol - VOC	5.81E-02	1.46E-02	6.39E-02						
Ethyl mercaptan (ethanethiol) - VOC	6.67E-03	1.68E-03	7.34E-03						
Ethylbenzene - HAP/VOC	2.28E-02	5.73E-03	2.51E-02	2.28E-02	5.73E-03	2.51E-02			
Ethylene dibromide - HAP/VOC	8.77E-06	2.20E-06	9.65E-06	8.77E-06	2.20E-06	9.65E-06			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							4.87E-03	1.22E-03	5.36E-03
Hexane - HAP/VOC	2.66E-02	6.67E-03	2.92E-02	2.66E-02	6.67E-03	2.92E-02			
Hydrogen sulfide							1.91E+00	4.81E-01	2.11E+00
Mercury (total) - HAP				2.15E-05	5.39E-06	2.36E-05			
Methyl ethyl ketone - HAP/VOC	2.39E-02	6.00E-03	2.63E-02	2.39E-02	6.00E-03	2.63E-02			
Methyl isobutyl ketone - HAP/VOC	8.88E-03	2.23E-03	9.77E-03	8.88E-03	2.23E-03	9.77E-03			
Methyl mercaptan - VOC	5.62E-03	1.41E-03	6.18E-03						
Pentane - VOC	1.11E-02	2.79E-03	1.22E-02						
* Perchloroethylene (tetrachloroethylene) - HAP				2.86E-02	7.19E-03	3.15E-02			
Propane - VOC	2.26E-02	5.69E-03	2.49E-02						
* t-1,2-Dichloroethene							1.27E-02	3.18E-03	1.39E-02
Toluene - No or Unknown Co-disposal - HAP/VOC	1.68E-01	4.21E-02	1.85E-01	1.68E-01	4.21E-02	1.85E-01			
Trichloroethylene (trichloroethene) - HAP/VOC	1.72E-02	4.31E-03	1.89E-02	1.72E-02	4.31E-03	1.89E-02			
Vinyl chloride - HAP/VOC	2.13E-02	5.35E-03	2.34E-02	2.13E-02	5.35E-03	2.34E-02			
Xylenes - HAP/VOC	5.95E-02	1.49E-02	6.54E-02	5.95E-02	1.49E-02	6.54E-02			
TOTALS	0.72	0.18	0.80	0.49	0.12	0.54	15779.70	3963.56	17360.41

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate = Jones-Carroll Controlled + Proposed Carroll Controlled
[2] Emission Rate in lbs/hr is based on 8,760 hours per year
[3] *NC* = not calculated
ODC = Classified ozone depleting chemical (SUM = 0.1159 Mg/yr, 0.0291 lbs/hr, 0.1275 TPY)

B. <u>SECONDARY COMPOUNDS EMITTED BY CONTROL DEVICE</u>

B.1 <u>Collected Emissions of Methane</u>

$$Q_{col,CH_4} = Q_{u,CH_4} \times \frac{\eta_{col}}{100}$$

where, Q_{col,CH_4} = Collected flow rate of methane (ft^3/yr)

Q_{u,CH_4} = Uncontrolled flow rate of methane (ft^3/yr), from LandGEM, 3.02 model

= 1.172E+06 ft^3/yr, existing Jones-Carroll Landfill

= 1.285E+08 ft^3/yr, proposed Carroll Landfill

η_{col} = Collection efficiency of the landfill gas collection system (%)

= 86.35%, estimated average collection efficiency for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

- **Collected Emissions of Methane originating from the Jones-Carroll Landfill in 2029**

$$Q_{col,CH_4} = 1.172\text{E} + 06 \times \frac{86.35}{100}$$

$= 1.012\text{E+06 ft}^3\text{/yr}$

- **Collected Emissions of Methane originating from the Proposed Landfill in 2029**

$$Q_{col,CH_4} = 1.285\text{E} + 08 \times \frac{86.35}{100}$$

$= 1.110\text{E+08 ft}^3\text{/yr}$

B.2 <u>NOx, CO, and PM emissions</u>

The NOx, CO, and PM emissions are estimated based on the volumetric rate of methane entering the control device as is calculated in B.1. The following emissions estimates are based on the emission factors for flares listed in Table 2.4-4. in draft AP-42, Section 2.4 (ver. 10/08). Emission factors for these three secondary compounds are rated A in ver. 10/08, while the ratings in final AP-42, Section 2.4 (ver. 11/98) are C for NOx and CO, and D for PM. A and C ratings are as previously defined. A reliability rating of D is below average.

- **Calculation of Annual Emission Rates**

$M_{c,P} = Q_{col,CH_4} \times EF_P \div 2{,}000$ lbs/ton

where, $M_{c,P}$ = Controlled mass emissions of parameter P (tons/yr)
EF_P = Emission factor for parameter P (lbs/10^6 ft^3 of CH_4)

- **Calculation of Hourly Emission Rates, (assumes 24-7, year-round operation)**

$M_{c,P}$ (lbs/hr) = $M_{c,P}$ (ton/yr) × 2,000 lbs/ton ÷ 8,760 hr/yr

- **Controlled Estimated Emission Rates for 2029**

Parameter	Emission Factors (lbs/10^6 ft^3 CH_4)	Existing Jones-Carroll		Proposed Carroll Landfill		TOTAL	
		lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
NOx	39	0.005	0.020	0.494	2.165	0.499	2.185
CO^+	46	0.005	0.023	0.583	2.553	0.588	2.576
PM*	15	0.002	0.008	0.190	0.833	0.192	0.841

$^+$CO is also a primary compound from LandGEM. Total emission rates listed in the inventories = secondary emission rates in the table above + fugitive emissions of CO (uncontrolled emissions × (1-collection efficiency) × (1 – methane oxidation factor)).

*All PM is assumed less than 2.5 microns, therefore PM = PM-10 = PM-2.5.

B.3 Hydrogen Chloride or Gaseous Hydrochloric Acid Emissions, HCl

Hydrogen chloride or gaseous hydrochloric acid, HCl emissions are estimated using a mass balance method. The calculations below are based on a series of steps laid out in AP-42, Section 2.4.4.2, Controlled Emissions. The chloride containing parameters in landfill gas and their relative volumetric concentrations are listed in AP-42 Table 2.4-1., which is the basis for LandGEM, ver. 3.02.

- **Calculate the Relative Volumetric Concentration of Chloride in Landfill Gas (Equation 9)**

$$C_{Cl} = \sum_{i=1}^{n} C_{Pi} \times Cl_{Pi}$$

where, C_{Cl} = Relative volumetric concentration of chloride containing parameter in landfill gas (ppmv as Cl^-)

C_{Pi} = Relative volumetric concentration of chloride containing parameter i, ppmv
Cl_{Pi} = Number of moles of chloride produced from the combustion of chloride containing parameter i
n = Total number of chloride containing parameters in landfill gas = 22, as listed below

Chloride Containing Parameters in Landfill Gas	Molecular Formula	# of moles of Cl, Cl_{Pi}	Concentration of Cl^- containing parameter, C_{Pi} (ppmv)	Concentration of Cl^- containing parameter, C_{Cl} (ppmv as Cl^-)
1,1,1-Trichloroethane (methyl chloroform)	$C_2H_3Cl_3$	3	0.48	1.44
1,1,2,2-Tetrachloroethane	$C_2H_2Cl_4$	4	1.11	4.44
1,1-Dichloroethane (ethylidene dichloride)	$C_2H_4Cl_2$	2	2.35	4.7
1,1-Dichloroethene (vinylidene chloride)	$C_2H_4Cl_2$	2	0.20	0.4
1,2-Dichloroethane (ethylene dichloride)	$C_2H_4Cl_2$	2	0.41	0.82
1,2-Dichloropropane (propylene dichloride)	$C_3H_6Cl_2$	2	0.18	0.36
Bromodichloromethane	$CHBrCl_2$	2	3.13	6.26
Carbon tetrachloride	CCl_4	4	0.004	0.016
Chlorobenzene	C_6H_5Cl	1	0.25	0.25
Chlorodifluoromethane	$CHClF_2$	1	1.30	1.30
Chloroethane (ethyl chloride)	C_2H_5Cl	1	1.25	1.25
Chloroform	$CHCl_3$	3	0.03	0.09
Chloromethane	CH_3Cl	1	1.21	1.21
Dichlorobenzene	$C_6H_4Cl_2$	2	0.21	0.42
Dichlorodifluoromethane	CCl_2F_2	2	15.7	31.4
Dichlorofluoromethane	$CHCl_2F$	2	2.62	5.24
Dichloromethane (methylene chloride)	CH_2Cl_2	2	14.3	28.6
Fluorotrichloromethane	$CFCl_3$	3	0.76	2.28
Perchloroethylene (tetrachloroethylene)	C_2Cl_4	4	3.73	14.92
t-1,2-Dichloroethene	$C_2H_2Cl_2$	2	2.84	5.68
Trichloroethylene (trichloroethene)	C_2HCl_3	3	2.82	8.46
Vinyl chloride	C_2H_3Cl	1	7.34	7.34
TOTAL, C_{Cl}				**126.88**

- **Calculate the Uncontrolled Flow Rate of Chloride (Equation 3 from draft AP-24, Section 2.4 ver. 10/08)**

  Equation 3 in the final version of AP-42, Section 2.4 (11/98), uses a multiplication factor based on an assumed uncontrolled methane concentration of 55%. Equation (3) in the draft version of AP-42, Section 2.4 (10/08), includes the concentration of methane as a variable to be user specified. Since the concentration of methane used in LandGEM was 40%, the draft version of Equation (3) is more appropriate.

$$Q_{u,Cl} = \frac{Q_{u,CH_4} \times C_{Cl}}{C_{CH_4} \times 1 \times 10^6}$$

where,
$Q_{u,Cl}$ = Uncontrolled flow rate of chloride (m^3/yr)
Q_{u,CH_4} = Uncontrolled flow rate of methane (m^3/yr), from LandGEM, 3.02 model,
C_{CH_4} = Concentration of CH_4 in the landfill gas in decimal format
= 40% or 0.4

Uncontrolled Flow Rate of Chloride for 2029		
	Uncontrolled flow rate of methane, Q_{u,CH_4} (m^3/yr)	Uncontrolled flow rate of chloride, $Q_{u,Cl}$ (m^3/yr)
Existing	3.32E+04	10.52
Proposed	3.64E+06	1,154.54
TOTAL	3.67E+06	1,165.06

- **Calculate the Uncontrolled Mass Emissions of Chloride (Equation 4)**

$$M_{u,Cl} = Q_{u,Cl}\left(\frac{MW_{Cl} \times 1atm}{R \times 1{,}000 g/kg \times (273+T)}\right)$$

where,
$M_{u,Cl}$ = Uncontrolled mass emissions of chloride, kg/yr
MW_{Cl} = Molecular weight of chloride, g/gmol
= 35.5 g/gmol
R = Ideal gas constant
= 8.205×10^{-5} $m^3\cdot$atm/gmol·°K
T = Temperature of landfill gas (°C)
= 25°C, assumed as per AP-42 recommendation

Uncontrolled Mass Emissions of Chloride (Cl^-) for 2029	
Existing	15.28
Proposed	1,676.26
TOTAL	1,691.54

- **Annual Controlled Mass Emissions of HCl (Equation 10)**

$$M_{c,HCl} = 1.03 \times M_{u,Cl} \times \left(\frac{\eta_{col}}{100}\right) \times \left(\frac{\eta_{cnt}}{100}\right) \times \left(\frac{2.205 lbs}{kg}\right) \times \left(\frac{1 ton}{2{,}000 lbs}\right)$$

where, $M_{c,HCl}$ = Controlled mass emissions of HCl (tons/year)
1.03 = Ratio of the molecular weight of HCl to the molecular weight of Cl^-
η_{cnt} = control device efficiency (%)
= 97.7% (per draft AP-42, Section 2.4 (ver. 10/08))

- **Hourly Controlled Mass Emissions of HCl (assumes 24-7, year-round operation)**

$M_{c,HCl}$ (lbs/hour) = $M_{c,HCl}$ (ton/yr) × 2,000 (lbs/ton) ÷ 8,760 (hours/year)

Controlled Gaseous Hydrochloric Acid (HCl) Emissions for Year 2029		
	lbs/hr	**TPY**
Existing	0.003	0.015
Proposed	0.367	1.606
TOTAL	0.37	1.62

B.4 Sulfur Dioxide Emissions, SO_2

Reduced sulfur emissions are estimated using a mass balance method. The calculations below are based on a series of steps laid out in AP-42, Section 2.4.4.2, Controlled Emissions. The sulfur containing parameters in landfill gas and their relative volumetric concentrations are listed in AP-42 Table 2.4-1., which is the basis for LandGEM, ver. 3.02. The concentration of hydrogen sulfide is the one exception. A user-specified concentration of 4,310 ppmv was used as justified in the AEI, Rev 3 (last modified March 2015)

B.4.1 Without SulfaTreat

- **Calculate the Relative Volumetric Concentration of Sulfur in Landfill Gas (Equation 8)**

$$C_s = \sum_{i=1}^{n} C_{Pi} \times S_{Pi}$$

where,
C_S = Relative volumetric concentration of sulfur containing parameter in landfill gas (ppmv as S)
C_{Pi} = Relative volumetric concentration of sulfur containing parameter i (ppmv)
S_{Pi} = Number of moles of sulfur produced from the combustion of sulfur containing parameter i
n = Total number of sulfur containing parameters in landfill gas
= 6, as listed below

Sulfur Containing Parameters in Landfill Gas	Molecular Formula	Number of moles of S, S_{Pi}	Concentration of sulfur containing parameter, C_{Pi} (ppmv)	Concentration of sulfur containing parameter, C_S (ppmv as S)
Carbon disulfide	CS_2	2	0.58	1.16
Carbonyl sulfide	COS	1	0.49	0.49
Dimethyl sulfide (methyl sulfide)	C_2H_6S	1	7.82	7.8
Ethyl mercaptan (ethanethiol)	C_2H_6S	1	2.28	2.3
Hydrogen sulfide	H_2S	1	4,310	4,310
Methyl mercaptan (methanethiol)	CH_4S	1	2.49	2.5
TOTAL, C_S				**4,324.25**

- **Calculate the Uncontrolled Flow Rate of Sulfur (Equation 3 from draft AP-24, Section 2.4 ver. 10/08; see above for justification)**

$$Q_{u,S} = \frac{Q_{u,CH_4} \times C_S}{C_{CH_4} \times 1 \times 10^6}$$

where, $Q_{u,S}$ = Uncontrolled flow rate of sulfur (m^3/yr)
Q_{u,CH_4} = Uncontrolled flow rate of methane (m^3/yr), from LandGEM, 3.02 model
C_{CH_4} = Concentration of CH_4 in the landfill gas in decimal format = 40% or 0.4

Uncontrolled Flow Rate of Sulfur (S) for 2029		
	Uncontrolled flow rate of methane, Q_{u,CH_4}(m^3/yr)	Uncontrolled flow rate of sulfur, $Q_{u,S}$ (m^3/yr)
Existing	3.32E+04	359
Proposed	3.64E+06	39,949
TOTAL	3.67E+06	39,708

- **Calculate the Uncontrolled Mass Emissions of Sulfur (Equation 4)**

$$M_{u,S} = Q_{u,S}\left(\frac{MW_S \times 1 \text{ atm}}{R \times 1{,}000\text{g/kg} \times (273 + T)}\right)$$

where, $M_{u,S}$ = Uncontrolled mass emissions of sulfur (kg/yr)
MW_S = Molecular weight of sulfur (g/gmol) = 32.06 g/gmol
R = Ideal gas constant = 8.205×10^{-5} m^3·atm/gmol·°K
T = Temperature of landfill gas (°C) = 25°C, assumed as per AP-42 recommendation

Uncontrolled Mass Emissions of Sulfur (S) for 2029	
Existing	470
Proposed	51,595
TOTAL	52,065

- **Annual Controlled Mass Emissions of SO_2 (Equation 7)**

$$M_{c,SO_2} = 2.0 \times M_{u,S} \times \left(\frac{\eta_{col}}{100}\right) \times \left(\frac{2.205 lbs}{kg}\right) \times \left(\frac{1 ton}{2{,}000 lbs}\right)$$

where, M_{c,SO_2} = Controlled mass emissions of SO_2 (tons/year)
2.0 = Ratio of the molecular weight of SO_2 to the molecular weight of S

- **Hourly Controlled Mass Emissions of SO_2 (assumes 24-7, year-round operation)**

M_{c,SO_2}(lbs/hour) = M_{c,SO_2} (ton/yr) × 2,000 (lbs/ton) ÷ 8,760 (hours/year)

Controlled Reduced Sulfur (SO_2) Emissions without SulfaTreat for Year 2029		
	lbs/hr	**TPY**
Existing	0.204	0.896
Proposed	22.429	98.238
TOTAL	22.63	99.13

One other regulated emission source, the proposed waste oil space heaters has the potential to emit sulfur dioxide 1.12 TPY of sulfur dioxide. This will result in a facility wide total of 100.25 TPY. Since the facility-wide total estimated sulfur dioxide emissions are above the 100 TPY major facility threshold and the 40 TPY Significant Emission Rate for sulfur dioxide without pretreatment of the LFG for hydrogen sulfide, the SulfaTreat unit is.

B.4.2 With SulfaTreat

SulfaTreat will be used as a pretreatment to lower the concentration of hydrogen sulfide in the feed gas to the flare. With all gas going through the SulfaTreat system the concentration of H_2S in Equation 8 will reduce from 4,130 ppm to 3 ppm. The remainder of the calculations in Section B.4.1 are the same.

- **Controlled Reduced Sulfur (SO_2) Emissions with SulfaTreat:**
  Using the reduced concentration of H_2S in the calculations performed in B.4.1 yields the following:

Controlled Reduced Sulfur (SO_2) Emissions with SulfaTreat for Year 2029

	lbs/hr	**TPY**
Existing	0.001	0.004
Proposed	0.089	0.392
TOTAL	0.09	0.40

APPENDIX B-S

Revised Air State Facility Permit Application

New York State Department of Environmental Conservation
Air Permit Application

DEC ID	APPLICATION ID	OFFICE USE ONLY
- -	- - /	/ /

Section I - Certification

Title V Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information [required pursuant to 6 NYCRR 201-6.3(d)] I believe the information is, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Responsible Official	Title
Signature	Date / /

State Facility Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official Daniel Bree	Title President
Signature [signature]	Date 9 / 30 / 2015

Section II - Identification Information

Title V Facility Permit
- • New • Significant Modification • Administrative Amendment
- • Renewal • Minor Modification General Permit Title:________

State Facility Permit
- ☒ New • Modification
- General Permit Title:________

• Application involves construction of new facility ☒ Application involves construction of new emission unit(s)

Owner/Firm

Name Sealand Waste, LLC			
Street Address 85 High Tech Drive			
City Rush	State New York	Country	Zip 14543
Owner Classification • Federal ☒ Corporation/Partnership	• State • Individual	• Municipal	Taxpayer ID 2 0 5 4 7 6 7 7 6

Facility • Confidential

Name Carroll Landfill	
Location Address 309 Dodge Road	
• City / ☒ Town / • Village Carroll, New York	Zip 14738

Project Description • Continuation Sheet(s)

See Carroll Air Emissions Inventory, Rev 3 (submitted March 18,2015) and Supplemental Air Emissions Inventory (Attached)

Owner/Firm Contact Mailing Address

Name (Last, First, Middle Initial) Acquisto, Bethany AM			Phone No. (716) 773-6872x201
Affiliation Daigler Engineering, PC	Title Senior Scientist		Fax No. (716) 773-6873
Street Address 2620 Grand Island Blvd.			
City Grand Island	State NY	Country USA	Zip 14072

Facility Contact Mailing Address

Name (Last, First, Middle Initial) Facility currently not in operation			Phone No. ( )
Affiliation	Title		Fax No. ( )
Street Address			
City	State	Country	Zip

New York State Department of Environmental Conservation
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Section III - Facility Information

Classification					
“ Hospital	“ Residential	“ Educational/Institutional	“ Commercial	X Industrial	“ Utility

Affected States (Title V Only)				
“ Vermont	“ Massachusetts	“ Rhode Island	“ Pennsylvania	Tribal Land:__________
“ New Hampshire	“ Connecticut	“ New Jersey	“ Ohio	Tribal Land:__________

SIC Codes												
4953												

Facility Description “ Continuation Sheet(s)
See Carroll Air Emissions Inventory, Rev 3 (submitted March 18,2015) and
Supplemental Air Emissions Inventory (Attached)

Compliance Statements (Title V Only)

I certify that as of the date of this application the facility is in compliance with all applicable requirements: “ YES “ NO

If one or more emission units at the facility are not in compliance with all applicable requirements at the time of signing this application (the ‘NO’ box must be checked), the noncomplying units must be identified in the “Compliance Plan” block on page 8 of this form along with the compliance plan information required. For all emission units at this facility that are operating in compliance with all applicable requirements complete the following:

- “ This facility will continue to be operated and maintained in such a manner as to assure compliance for the duration of the permit, except those units referenced in the compliance plan portion of Section IV of this application.
- “ For all emission units, subject to any applicable requirements that will become effective during the term of the permit, this facility will meet all such requirements on a timely basis.
- “ Compliance certification reports will be submitted at least once a year. Each report will certify compliance status with respect to each requirement, and the method used to determine the status.

Facility Applicable Federal Requirements (X Continuation Sheet(s))

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
40	CFR	50							
40	CFR	60	IIII						
40	CFR	63	ZZZZ						
6	NYCRR	200		6&7					

Facility State Only Requirements (X Continuation Sheet(s))

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
4	ECL	19	0301						
6	NYCRR	201	1	4					
6	NYCRR	201	5						
6	NYCRR	211		1&2					

DEC ID
- -

Section III - Facility Information

Classification					
“ Hospital	“ Residential	“ Educational/Institutional	“ Commercial	X Industrial	“ Utility

Affected States (Title V Only)				
“ Vermont	“ Massachusetts	“ Rhode Island	“ Pennsylvania	Tribal Land:__________
“ New Hampshire	“ Connecticut	“ New Jersey	“ Ohio	Tribal Land:__________

SIC Codes												
4953												

Facility Description “ Continuation Sheet(s)

See Carroll Air Emissions Inventory, Rev 3 (submitted March 18,2015) and
Supplemental Air Emissions Inventory (Attached)

Compliance Statements (Title V Only)

I certify that as of the date of this application the facility is in compliance with all applicable requirements: “ YES “ NO

If one or more emission units at the facility are not in compliance with all applicable requirements at the time of signing this application (the ‘NO’ box must be checked), the noncomplying units must be identified in the “Compliance Plan” block on page 8 of this form along with the compliance plan information required. For all emission units at this facility that are operating in compliance with all applicable requirements complete the following:

“ This facility will continue to be operated and maintained in such a manner as to assure compliance for the duration of the permit, except those units referenced in the compliance plan portion of Section IV of this application.

“ For all emission units, subject to any applicable requirements that will become effective during the term of the permit, this facility will meet all such requirements on a timely basis.

“ Compliance certification reports will be submitted at least once a year. Each report will certify compliance status with respect to each requirement, and the method used to determine the status.

Facility Applicable Federal Requirements “ Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	201	1	2,7&8					
6	NYCRR	201	7	1					
6	NYCRR	257	2						

Facility State Only Requirements “ Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	212	2	2					
6	NYCRR	215							
6	NYCRR	225	2						
6	NYCRR	257	10						

New York State Department of Environmental Conservation
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Section III - Facility Information (continued)

Facility Compliance Certification									“ Continuation Sheet(s)
Rule Citation									
Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	257	10	3					

“ Applicable Federal Requirement / X State Only Requirement	“ Capping	CAS No.	Contaminant Name
		7783 - 06 - 4	Hydrogen sulfide

Monitoring Information

“ Ambient Air Monitoring   “ Work Practice Involving Specific Operations   X Record Keeping/Maintenance Procedures

Description

Monitor surface emissions of the landfill and ambient air at the property boundary according to a department approved Air Quality Monitoring Plan, Rev 1 (See Attached).

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.
23	concentration	Arizona Instrument LLC/Jerome J605

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description
10 ppm	--	273	parts per million

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description
--	Appropriate measure of central tendency in space (not time)	07	quarterly	09	annually

Facility Emissions Summary				“ Continuation Sheet(s)
CAS No.	Contaminant Name	PTE (lbs/yr)	PTE Range Code	Actual (lbs/yr)
NY075 - 00 - 5	PM-10		D	
NY075 - 00 - 0	PARTICULATES		G	
7446 - 09 - 5	SULFUR DIOXIDE		F	
NY210 - 00 - 0	OXIDES OF NITROGEN		B	
630 - 08 - 0	CARBON MONOXIDE		B	
7439 - 92 - 1	LEAD		Y	
NY998 - 00 - 0	VOC		B	
NY100 - 00 - 0	HAP		B	
7783 - 06 - 4	Hydrogen sulfide		F	
NA - -	Greenhouse Gases in CO2-e		H	
- -	PM-2.5		B	
- -				
- -				

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information

Emission Unit Description

“ Continuation Sheet(s)

EMISSION UNIT	1 - L F G A S
Emission of gases generated by the biodegradation of landfilled C&D debris under anaerobic conditions.	

Building

“ Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation

Emission Point

“ Continuation Sheet(s)

EMISSION PT.	FLARE	Enclosed LFG Flare				
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
1800	30	NA	72	1,500		
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal
63.4 max	50,000	1206.731	4553.919		138	

EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control

X Continuation Sheet(s)

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
EXLF	I	1990					

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
142,350	334	Cubic yards of C&D Debris				

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
EPLD	I						

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
5,448,710	334	Cubic yards of C&D Debris				

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information

Emission Unit Description

" Continuation Sheet(s)

EMISSION UNIT 1 - L F G A S

Emission of gases generated by the biodegradation of landfilled C&D debris under anaerobic conditions.

Building

" Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation

Emission Point

" Continuation Sheet(s)

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**

Emission Source/Control

X Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
FLARE	K				104	Combustion	LFG Specialties,LLC/EF-630I6

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
1,000	39	standard cubic feet per minute				

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

DEC ID
- -

Section IV - Emission Unit Information

Emission Unit Description

" Continuation Sheet(s)

EMISSION UNIT 1 - L F G A S

Emission of gases generated by the biodegradation of landfilled C&D debris under anaerobic conditions.

Building

" Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation

Emission Point

" Continuation Sheet(s)

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)

Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)

Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control

" Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
STR01	K				013	Gas Scrubber	MiSWACO/SulfaTreat 410XHP

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
250	39	standard cubic feet per minute				

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
STR02	K				013	Gas Scrubber	MiSWACO/SulfaTreat 410XHP

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
250	39	standard cubic feet per minute				

DEC ID
- -

Section IV - Emission Unit Information (continued)

Process Information

“ Continuation Sheet(s)

EMISSION UNIT	1-LFGAS	PROCESS	GAS

Description

GAS includes all landfill gas collected with the active landfill gas collection system and the enclosed flare and two SulfaTreat control units. The collection efficiency of the active system during the year of maximum landfill gas generation is estimated to be 86.35%. SulfaTreat will be used to pretreat the landfill gas collected. The SulfaTreat reactor is designed to remove 99.925% of hydrogen sulfide. All other components of the landfill gas will pass through the reactors unaffected. Following pretreatment, all collected landfill gas will pass through the enclosed flare.

Source Classification Code (SCC)	Total Thruput Quantity/Hr	Total Thruput Quantity/Yr	Thruput Quantity Units Code	Thruput Quantity Units Description
50100406				

“ Confidential
“ Operating at Maximum Capacity
“ Activity with Insignificant Emissions

Operating Schedule Hrs/Day	Operating Schedule Days/Yr	Building	Floor/Location
24	365		

Emission Source/Control Identifier(s)

EXLF	EPLF	FLARE	STR01	STR02			

EMISSION UNIT	1-LFGAS	PROCESS	FUG

Description

FUG is fugitive landfill gas emissions not collected by the active landfill gas collection system (i.e. 100 - 86.35% = 13.65%). Further, clayey cover soils reduces the fugitive emissions of hydrogen sulfide by an additional 75% as they diffuse out into the atmosphere. All other components of landfill gas will experience a 25% oxidation in cover materials.

Source Classification Code (SCC)	Total Thruput Quantity/Hr	Total Thruput Quantity/Yr	Thruput Quantity Units Code	Thruput Quantity Units Description
50100402				

“ Confidential
“ Operating at Maximum Capacity
“ Activity with Insignificant Emissions

Operating Schedule Hrs/Day	Operating Schedule Days/Yr	Building	Floor/Location
24	365		

Emission Source/Control Identifier(s)

EXLF	EPLF						

DEC ID
- -

Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements " Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements " Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
1 -LFGAS				6	NYCRR	201	5						
-													
-													
-													

Emission Unit Compliance Certification
" Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	207	1						

X Applicable Federal Requirement " State Only Requirement X Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
1 - LFGAS	FLARE	GAS	FLARE	7446 - 09 - 5	Sulfur dioxide

Monitoring Information

" Continuous Emission Monitoring
" Intermittent Emission Testing
" Ambient Air Monitoring
X Monitoring of Process or Control Device Parameters as Surrogate
" Work Practice Involving Specific Operations
" Record Keeping/Maintenance Procedures

Description

The SulfaTreat control system will be used to reduce LFG H2S concentrations and, therefore, reduce LGF combustion SO2 emissions. SO2 emissions will be estimated by annually updating of LandGEM using actual waste acceptance & site-specific H2S concentration measured at outlet of lag SulfaTreat unit.

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method
03	183	Waste Material "Throughput"	

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description
				09	Annually

DEC ID
- -

Section IV - Emission Unit Information

Emission Unit Description	" Continuation Sheet(s)
EMISSION UNIT	2 - C D P O
Emissions from stationary internal combustion engines.	

Building	Building Name	Length (ft)	Width (ft)	Orientation

" Continuation Sheet(s)

Emission Point

" Continuation Sheet(s)

EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal
EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control

X Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Crush	C						Screen Machine Industries, Inc./ 4043T Impact Crusher
Design Capacity	**Design Capacity Units Code**	**Design Capacity Units Description**			**Waste Feed Code**	**Waste Feed Description**	**Waste Type Code / Description**
350	9	tons per hour					
Emission Source ID	**Type**	**Date of Construction**	**Date of Operation**	**Date of Removal**	**Control Type Code**	**Control Type Description**	**Manufacturer's Name/Model No.**
Grind	C						Diamond Z Manufacturing/ 1460BTK Tub Grinder
Design Capacity	**Design Capacity Units Code**	**Design Capacity Units Description**			**Waste Feed Code**	**Waste Feed Description**	**Waste Type Code / Description**
95	9	tons per hour					

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Section IV - Emission Unit Information

Emission Unit Description

" Continuation Sheet(s)

EMISSION UNIT 2 - C D P 0

Emissions from stationary internal combustion engines.

Building

" Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation

Emission Point

" Continuation Sheet(s)

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**

Emission Source/Control

" Continuation Sheet(s)

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Screen	C						Screen Machine Industries, Inc./ Spyder 512T Shaker Screen

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
400	9	tons per hour				

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Convey	C						Screen Machine Industries, Inc./ Radial Stacking Conveyor TH60-36

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
480	324	feet per minute				

DEC ID
- -

Section IV - Emission Unit Information (continued)

Process Information

“ Continuation Sheet(s)

EMISSION UNIT	2 - CDPO	PROCESS	PRS

Description

The Construction and Demolition debris processing operation (CDPO) will process C&D debris for resale or use within the facility, such as alternative daily cover or road base material. PRS is the CDPO process. Approximately 430 cubic yards of material per day will be processed in the CDPO. Emission from the CDPO process include exhaust emissions from the stationary internal combustion engines (sources) and fugitive dust.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		
	10	307		

Emission Source/Control Identifier(s)

Crush	Grind	Screen	Convey				

EMISSION UNIT	-	PROCESS	

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)

DEC ID
- -

Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements									" Continuation Sheet(s)
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
2-CDPO		PRS	Crush	40	CFR	60	IIII						
2-CDPO		PRS	Grind	40	CFR	60	IIII						
2-CDPO		PRS	Screen	40	CFR	60	IIII						
2-CDPO		PRS	Convey	40	CFR	60	IIII						

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements									" Continuation Sheet(s)
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
2-CDPO		PRS	Crush	6	NYCRR	201	3	3	c	41			
2-CDPO		PRS	Grind	6	NYCRR	201	3	3	c	41			
2-CDPO		PRS	Screen	6	NYCRR	201	3	3	c	41			
2-CDPO		PRS	Convey	6	NYCRR	201	3	3	c	41			

Emission Unit Compliance Certification

" Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

" Applicable Federal Requirement " State Only Requirement " Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
-				- -	

Monitoring Information

" Continuous Emission Monitoring
" Intermittent Emission Testing
" Ambient Air Monitoring
" Monitoring of Process or Control Device Parameters as Surrogate
" Work Practice Involving Specific Operations
" Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

DEC ID
- -

Section IV - Emission Unit Information

Emission Unit Description	" Continuation Sheet(s)
EMISSION UNIT	3 - C M P S T
Emissions from the yard waste composting facility. The composting facility will share use of the grinder, screen, and conveyor with the CDPO. Emissions from these sources are already accounted for in 2-CDPO.	

Building				" Continuation Sheet(s)
Building	Building Name	Length (ft)	Width (ft)	Orientation

Emission Point						" Continuation Sheet(s)
EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal
EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control							" Continuation Sheet(s)
Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Piles	I						
Design Capacity	Design Capacity Units Code	Design Capacity Units Description		Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
735	0028	cubic yards of pile					
Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Design Capacity	Design Capacity Units Code	Design Capacity Units Description		Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

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Section IV - Emission Unit Information (continued)

Process Information “ Continuation Sheet(s)

EMISSION UNIT	3 - C M P S T	PROCESS	A E R

Description

AER is the aeration process in the yard waste composting facility. The yard waste composting facility will process up to 2,100 cubic yards of yard waste per year, half of which is assumed to be composted in aerated windrows. The compost product is anticipated to be produced at a rate of 525-735 cubic yards per year. Emissions from the aeration process are primarily greenhouse gases.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		
	24	365		

Emission Source/Control Identifier(s)

Piles							

EMISSION UNIT	-	PROCESS	

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)

DEC ID
- -

Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements									“ Continuation Sheet(s)
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements									“ Continuation Sheet(s)
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
3-CMPST		AER	Piles	6	NYCRR	201	3	3	c	41			
-													
-													
-													

Emission Unit Compliance Certification

“ Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

“ Applicable Federal Requirement “ State Only Requirement “ Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
-				- -	

Monitoring Information

“ Continuous Emission Monitoring
“ Intermittent Emission Testing
“ Ambient Air Monitoring
“ Monitoring of Process or Control Device Parameters as Surrogate
“ Work Practice Involving Specific Operations
“ Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

DEC ID
- -

Section IV - Emission Unit Information

Emission Unit Description	“ Continuation Sheet(s)
EMISSION UNIT	4 - W O H T R
Emissions from two waste oil space heaters to be installed in the maintenance shop.	

Building	Building Name	Length (ft)	Width (ft)	Orientation
SHOP	Maintenance Shop	60	42	60

Building — “ Continuation Sheet(s)

Emission Point — “ Continuation Sheet(s)

EMISSION PT. 0 0 0 4 a

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
1786	25	4	8	200		
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**
		1206.574	4554.348	SHOP	102	

EMISSION PT. 0 0 0 4 b

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section Length (in)	Cross Section Width (in)
1786	25	4	8	200		
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**
		1206.574	4554.348	SHOP	102	

Emission Source/Control — “ Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer’s Name/Model No.
HTRa	C						Econoheat/OW-H-350

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
0.3		million BTU per hour				

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer’s Name/Model No.
HTRb	C						Econoheat/OW-H-350

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
0.3		million BTU per hour				

DEC ID
- -

Section IV - Emission Unit Information (continued)

Process Information

“ Continuation Sheet(s)

EMISSION UNIT	4-WOHTR	PROCESS	HTR

Description

HTR is the process of heating the maintenance shop during the winter months (assumed to be October thru April). Heating will be provided by two waste oil space heaters. Emission from this process consists of exhaust from the waste oil heaters which will be vented through the roof of the maintenance shop.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		
	24	212	SHOP	

Emission Source/Control Identifier(s)

HTRa	HTRb						

EMISSION UNIT	-	PROCESS	

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

	Operating Schedule		Building	Floor/Location
“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)

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Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements								" Continuation Sheet(s)	
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements								" Continuation Sheet(s)	
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
4 -WOHTR	0004a	HTR	HTRa	6	NYCRR	225	2						
4 -WOHTR	0004b	HTR	HTRb	6	NYCRR	225	2						
-													
-													

Emission Unit Compliance Certification

" Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

" Applicable Federal Requirement " State Only Requirement " Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
-				- -	

Monitoring Information

" Continuous Emission Monitoring
" Intermittent Emission Testing
" Ambient Air Monitoring
" Monitoring of Process or Control Device Parameters as Surrogate
" Work Practice Involving Specific Operations
" Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

DEC ID
- -

Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only)									“ Continuation Sheet(s)
Rule Citation									
Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	“ Applicable Federal Requirement “ State Only Requirement
-				

Description

Rule Citation									
Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	“ Applicable Federal Requirement “ State Only Requirement
-				

Description

Process Emissions Summary							“ Continuation Sheet(s)
EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)
EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)
EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)

DEC ID
- -

Section IV - Emission Unit Information (continued)

EMISSION UNIT	Emission Unit Emissions Summary			“ Continuation Sheet(s)
-				
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)

Compliance Plan

“ Continuation Sheet(s)

For any emission units which are <u>not in compliance</u> at the time of permit application, the applicant shall complete the following

Consent Order | Certified progress reports are to be submitted every 6 months beginning ____/____/____

Emission Unit	Process	Emission Source	Applicable Federal Requirement									
			Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-												

Remedial Measure / Intermediate Milestones	R/I	Date Scheduled

DEC ID
- -

Section IV - Emission Unit Information (continued)

Request for Emission Reduction Credits				“ Continuation Sheet(s)
EMISSION UNIT	-			
Emission Reduction Description				
Contaminant Emission Reduction Data				
Baseline Period ___/___/___ to ___/___/___			Reduction	
			Date	Method
			/ /	
CAS No.	Contaminant Name		ERC (lbs/yr)	
			Netting	Offset
- -				
- -				
- -				
Facility to Use Future Reduction				
Name			APPLICATION ID	
			- - /	
Location Address				
“ City / “ Town / “ Village			State	Zip

Use of Emission Reduction Credits				“ Continuation Sheet(s)
EMISSION UNIT	-			
Proposed Project Description				
Contaminant Emissions Increase Data				
CAS No.	Contaminant Name		PEP (lbs/yr)	
- -				
Statement of Compliance				
“ All facilities under the ownership of this “ownership/firm” are operating in compliance with all applicable requirements and state regulations including any compliance certification requirements under Section 114(a)(3) of the Clean Air Act Amendments of 1990, or are meeting the schedule of a consent order.				
Source of Emission Reduction Credit - Facility				
Name			PERMIT ID	
			- - /	
Location Address				
“ City / “ Town / “ Village			State	Zip
Emission Unit	CAS No.	Contaminant Name	ERC (lbs/yr)	
			Netting	Offset
-	- -			
-	- -			
-	- -			

DEC ID
- -

Supporting Documentation

- “ P.E. Certification (form attached)
- “ List of Exempt Activities (form attached)
- X Plot Plan
- “ Methods Used to Determine Compliance (form attached)
- X Calculations
- X Air Quality Model (10 / _____ / 2014) Air Quality Modeling Report submitted by CRA
- “ Confidentiality Justification
- X Ambient Air Monitoring Plan (9 / 30 / 2015) Air Quality Monitoring Plan, Rev.1 - Attached
- “ Stack Test Protocols/Reports (_____ / _____ / _____)
- “ Continuous Emissions Monitoring Plans/QA/QC (_____ / _____ / _____)
- “ MACT Demonstration (_____ / _____ / _____)
- “ Operational Flexibility: Description of Alternative Operating Scenarios and Protocols
- “ Title IV: Application/Registration
- “ ERC Quantification (form attached)
- “ Use of ERC(s) (form attached)
- “ Baseline Period Demonstration
- “ Analysis of Contemporaneous Emission Increase/Decrease
- “ LAER Demonstration (_____ / _____ / _____)
- “ BACT Demonstration (_____ / _____ / _____)
- X Other Document(s):

Document	Date
Air Emissions Inventory - Rev.3	(3 / 18 / 2015)
(includes facility plot plan and	(/ /)
calculations as checked above)	(/ /)
	(/ /)
	(/ /)
Supplemental Air Emissions Inventory	(9 / 30 / 2015)
(includes additional calculations)	(/ /)
- Attached	(/ /)
	(/ /)
	(/ /)
	(/ /)
	(/ /)
	(/ /)

APPENDIX C-S

Uncontrolled and Controlled Emission Estimates of HTAC Parameters using AP-42 2008 Table 2.4-1

Summary Report

Landfill Name or Identifier: Existing Jones-Carroll Landfill - HTAC AP-42 2008

Date: Friday, September 04, 2015

Description/Comments:
Waste acceptance values were calculated from Jones-Carroll Annual Reports as waste received - waste recovered. Most reported numbers were in units of cubic yards. A density of 0.75 ton/cy was assumed for the C&D waste.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*year^{-1}*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1990**	
Landfill Closure Year (with 80-year limit)	**2006**	
Actual Closure Year (without limit)	***2006***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**32**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**40**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Hydrogen sulfide**
Gas / Pollutant #3:	**Methane**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1990	4,126	4,539	0	0
1991	11,412	12,553	4,126	4,539
1992	11,938	13,132	15,538	17,092
1993	11,111	12,222	27,476	30,224
1994	10,778	11,856	38,587	42,446
1995	9,112	10,023	49,365	54,302
1996	7,460	8,207	58,477	64,325
1997	11,001	12,101	65,938	72,531
1998	6,740	7,414	76,939	84,632
1999	2,333	2,566	83,679	92,047
2000	1,656	1,821	86,012	94,613
2001	1,868	2,054	87,668	96,434
2002	1,949	2,144	89,535	98,489
2003	1,257	1,383	91,484	100,632
2004	1,684	1,852	92,741	102,015
2005	2,420	2,662	94,424	103,867
2006	210	231	96,844	106,529
2007	0	0	97,054	106,760
2008	0	0	97,054	106,760
2009	0	0	97,054	106,760
2010	0	0	97,054	106,760
2011	0	0	97,054	106,760
2012	0	0	97,054	106,760
2013	0	0	97,054	106,760
2014	0	0	97,054	106,760
2015	0	0	97,054	106,760
2016	0	0	97,054	106,760
2017	0	0	97,054	106,760
2018	0	0	97,054	106,760
2019	0	0	97,054	106,760
2020	0	0	97,054	106,760
2021	0	0	97,054	106,760
2022	0	0	97,054	106,760
2023	0	0	97,054	106,760
2024	0	0	97,054	106,760
2025	0	0	97,054	106,760
2026	0	0	97,054	106,760
2027	0	0	97,054	106,760
2028	0	0	97,054	106,760
2029	0	0	97,054	106,760

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2030	0	0	97,054	106,760
2031	0	0	97,054	106,760
2032	0	0	97,054	106,760
2033	0	0	97,054	106,760
2034	0	0	97,054	106,760
2035	0	0	97,054	106,760
2036	0	0	97,054	106,760
2037	0	0	97,054	106,760
2038	0	0	97,054	106,760
2039	0	0	97,054	106,760
2040	0	0	97,054	106,760
2041	0	0	97,054	106,760
2042	0	0	97,054	106,760
2043	0	0	97,054	106,760
2044	0	0	97,054	106,760
2045	0	0	97,054	106,760
2046	0	0	97,054	106,760
2047	0	0	97,054	106,760
2048	0	0	97,054	106,760
2049	0	0	97,054	106,760
2050	0	0	97,054	106,760
2051	0	0	97,054	106,760
2052	0	0	97,054	106,760
2053	0	0	97,054	106,760
2054	0	0	97,054	106,760
2055	0	0	97,054	106,760
2056	0	0	97,054	106,760
2057	0	0	97,054	106,760
2058	0	0	97,054	106,760
2059	0	0	97,054	106,760
2060	0	0	97,054	106,760
2061	0	0	97,054	106,760
2062	0	0	97,054	106,760
2063	0	0	97,054	106,760
2064	0	0	97,054	106,760
2065	0	0	97,054	106,760
2066	0	0	97,054	106,760
2067	0	0	97,054	106,760
2068	0	0	97,054	106,760
2069	0	0	97,054	106,760

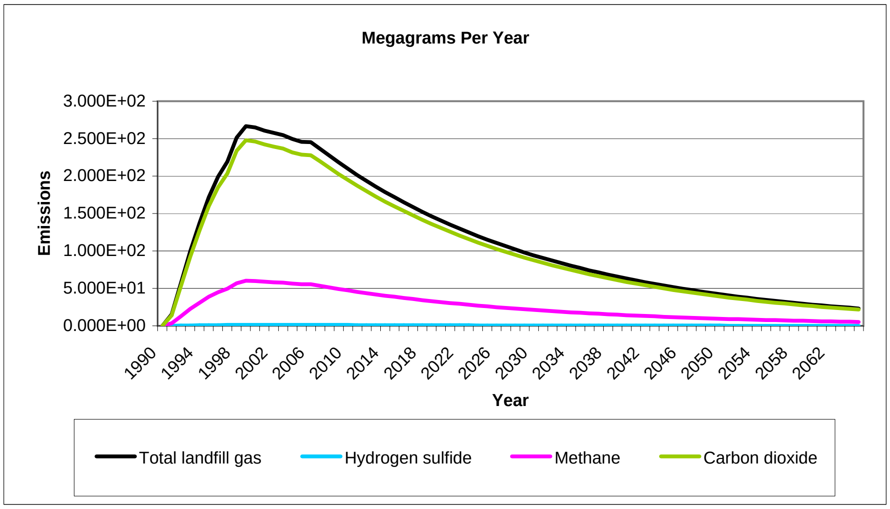
Pollutant Parameters

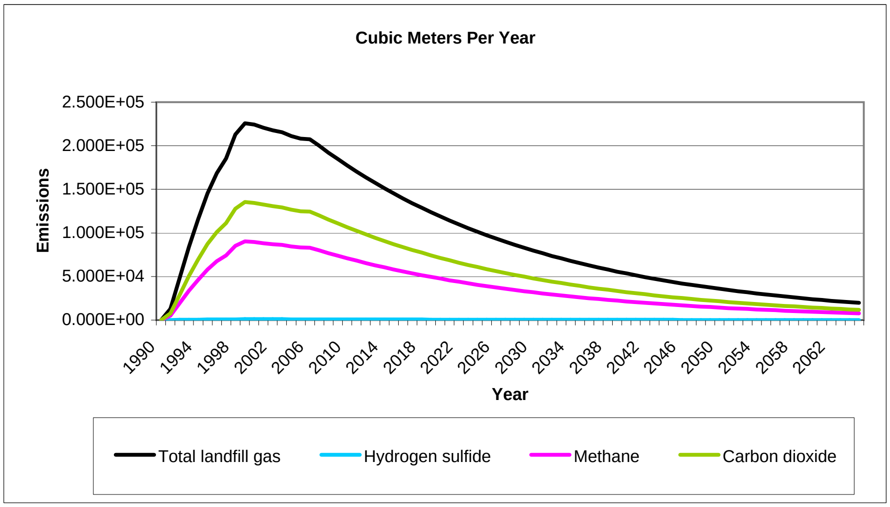
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85	0.54	
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96	0.16	
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99	0.05	
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06	0.02	
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11	2.40	
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84	0.01	
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39	0.07	
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

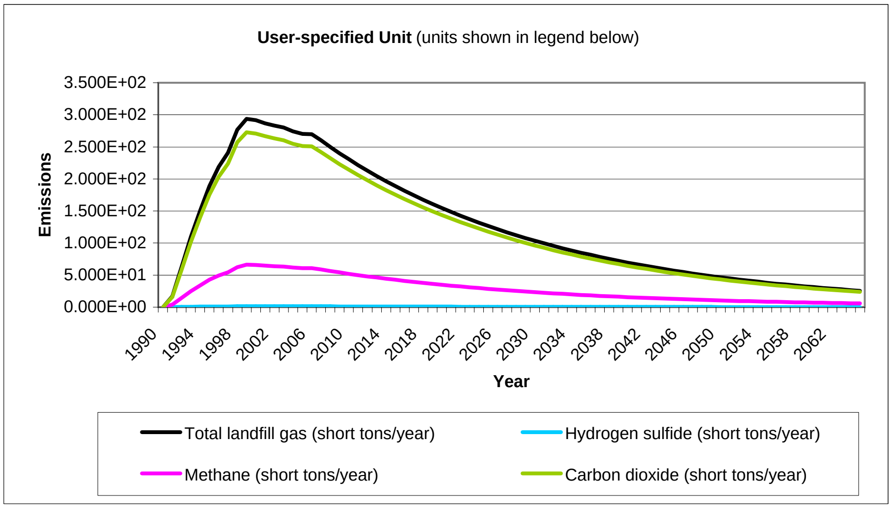
Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88	0.16	
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08	4310.00	
	Mercury (total) - HAP	2.9E-04	200.61	0.00	
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83	2.03	
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40	0.83	
	Vinyl chloride - HAP/VOC	7.3	62.50	1.42	
	Xylenes - HAP/VOC	12	106.16		
	Formaldehyde			0.01	30.03
	Acetaldehyde			0.08	44.05
	1,1,2-trichloroethane			0.16	133.40
	Benzyl chloride			0.02	126.58
	1,3-butadiene			0.17	54.09
	cis-1,3-dichloropropene			0.00	110.97
	trans-1,3-dichloropropene			0.01	110.97

Graphs


Megagrams Per Year
Emissions
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
Year
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Total landfill gas
Hydrogen sulfide
Methane
Carbon dioxide


Cubic Meters Per Year
Emissions
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
Year
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Total landfill gas
Hydrogen sulfide
Methane
Carbon dioxide


User-specified Unit (units shown in legend below)
Emissions
3.500E+02
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
Year
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062
Total landfill gas (short tons/year)
Hydrogen sulfide (short tons/year)
Methane (short tons/year)
Carbon dioxide (short tons/year)

Results

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
1990	0	0	0	0	0	0
1991	1.538E+01	1.301E+04	1.692E+01	7.948E-02	5.607E+01	8.743E-02
1992	5.731E+01	4.848E+04	6.304E+01	2.962E-01	2.089E+02	3.258E-01
1993	9.956E+01	8.422E+04	1.095E+02	5.145E-01	3.630E+02	5.660E-01
1994	1.371E+02	1.160E+05	1.508E+02	7.084E-01	4.997E+02	7.792E-01
1995	1.719E+02	1.454E+05	1.890E+02	8.882E-01	6.266E+02	9.770E-01
1996	1.991E+02	1.684E+05	2.190E+02	1.029E+00	7.259E+02	1.132E+00
1997	2.191E+02	1.853E+05	2.410E+02	1.132E+00	7.988E+02	1.245E+00
1998	2.515E+02	2.128E+05	2.766E+02	1.300E+00	9.170E+02	1.430E+00
1999	2.668E+02	2.257E+05	2.934E+02	1.379E+00	9.726E+02	1.517E+00
2000	2.650E+02	2.242E+05	2.915E+02	1.370E+00	9.662E+02	1.506E+00
2001	2.608E+02	2.206E+05	2.869E+02	1.348E+00	9.508E+02	1.482E+00
2002	2.575E+02	2.178E+05	2.833E+02	1.331E+00	9.389E+02	1.464E+00
2003	2.547E+02	2.154E+05	2.801E+02	1.316E+00	9.285E+02	1.448E+00
2004	2.494E+02	2.110E+05	2.743E+02	1.289E+00	9.092E+02	1.418E+00
2005	2.459E+02	2.080E+05	2.705E+02	1.271E+00	8.964E+02	1.398E+00
2006	2.452E+02	2.075E+05	2.698E+02	1.267E+00	8.942E+02	1.394E+00
2007	2.364E+02	2.000E+05	2.601E+02	1.222E+00	8.620E+02	1.344E+00
2008	2.271E+02	1.922E+05	2.499E+02	1.174E+00	8.282E+02	1.291E+00
2009	2.182E+02	1.846E+05	2.401E+02	1.128E+00	7.957E+02	1.241E+00
2010	2.097E+02	1.774E+05	2.306E+02	1.084E+00	7.645E+02	1.192E+00
2011	2.015E+02	1.704E+05	2.216E+02	1.041E+00	7.345E+02	1.145E+00
2012	1.936E+02	1.637E+05	2.129E+02	1.000E+00	7.057E+02	1.100E+00
2013	1.860E+02	1.573E+05	2.046E+02	9.611E-01	6.781E+02	1.057E+00
2014	1.787E+02	1.512E+05	1.965E+02	9.234E-01	6.515E+02	1.016E+00
2015	1.717E+02	1.452E+05	1.888E+02	8.872E-01	6.259E+02	9.760E-01
2016	1.649E+02	1.395E+05	1.814E+02	8.524E-01	6.014E+02	9.377E-01
2017	1.585E+02	1.341E+05	1.743E+02	8.190E-01	5.778E+02	9.009E-01
2018	1.523E+02	1.288E+05	1.675E+02	7.869E-01	5.551E+02	8.656E-01
2019	1.463E+02	1.238E+05	1.609E+02	7.561E-01	5.334E+02	8.317E-01
2020	1.406E+02	1.189E+05	1.546E+02	7.264E-01	5.125E+02	7.990E-01
2021	1.350E+02	1.142E+05	1.485E+02	6.979E-01	4.924E+02	7.677E-01
2022	1.297E+02	1.098E+05	1.427E+02	6.706E-01	4.731E+02	7.376E-01
2023	1.247E+02	1.055E+05	1.371E+02	6.443E-01	4.545E+02	7.087E-01
2024	1.198E+02	1.013E+05	1.317E+02	6.190E-01	4.367E+02	6.809E-01
2025	1.151E+02	9.735E+04	1.266E+02	5.947E-01	4.196E+02	6.542E-01
2026	1.106E+02	9.353E+04	1.216E+02	5.714E-01	4.031E+02	6.286E-01
2027	1.062E+02	8.986E+04	1.169E+02	5.490E-01	3.873E+02	6.039E-01
2028	1.021E+02	8.634E+04	1.123E+02	5.275E-01	3.721E+02	5.802E-01
2029	9.806E+01	8.295E+04	1.079E+02	5.068E-01	3.575E+02	5.575E-01
2030	9.422E+01	7.970E+04	1.036E+02	4.869E-01	3.435E+02	5.356E-01
2031	9.052E+01	7.658E+04	9.957E+01	4.678E-01	3.300E+02	5.146E-01
2032	8.697E+01	7.357E+04	9.567E+01	4.495E-01	3.171E+02	4.944E-01
2033	8.356E+01	7.069E+04	9.192E+01	4.319E-01	3.047E+02	4.750E-01
2034	8.029E+01	6.792E+04	8.831E+01	4.149E-01	2.927E+02	4.564E-01
2035	7.714E+01	6.525E+04	8.485E+01	3.987E-01	2.812E+02	4.385E-01
2036	7.411E+01	6.270E+04	8.152E+01	3.830E-01	2.702E+02	4.213E-01
2037	7.121E+01	6.024E+04	7.833E+01	3.680E-01	2.596E+02	4.048E-01
2038	6.841E+01	5.788E+04	7.526E+01	3.536E-01	2.494E+02	3.889E-01
2039	6.573E+01	5.561E+04	7.231E+01	3.397E-01	2.397E+02	3.737E-01

Results (Continued)

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
2040	6.315E+01	5.343E+04	6.947E+01	3.264E-01	2.303E+02	3.590E-01
2041	6.068E+01	5.133E+04	6.675E+01	3.136E-01	2.212E+02	3.450E-01
2042	5.830E+01	4.932E+04	6.413E+01	3.013E-01	2.126E+02	3.314E-01
2043	5.601E+01	4.738E+04	6.161E+01	2.895E-01	2.042E+02	3.184E-01
2044	5.382E+01	4.553E+04	5.920E+01	2.781E-01	1.962E+02	3.059E-01
2045	5.171E+01	4.374E+04	5.688E+01	2.672E-01	1.885E+02	2.940E-01
2046	4.968E+01	4.203E+04	5.465E+01	2.568E-01	1.811E+02	2.824E-01
2047	4.773E+01	4.038E+04	5.250E+01	2.467E-01	1.740E+02	2.714E-01
2048	4.586E+01	3.879E+04	5.045E+01	2.370E-01	1.672E+02	2.607E-01
2049	4.406E+01	3.727E+04	4.847E+01	2.277E-01	1.606E+02	2.505E-01
2050	4.233E+01	3.581E+04	4.657E+01	2.188E-01	1.544E+02	2.407E-01
2051	4.067E+01	3.441E+04	4.474E+01	2.102E-01	1.483E+02	2.312E-01
2052	3.908E+01	3.306E+04	4.299E+01	2.020E-01	1.425E+02	2.222E-01
2053	3.755E+01	3.176E+04	4.130E+01	1.940E-01	1.369E+02	2.135E-01
2054	3.607E+01	3.052E+04	3.968E+01	1.864E-01	1.315E+02	2.051E-01
2055	3.466E+01	2.932E+04	3.813E+01	1.791E-01	1.264E+02	1.970E-01
2056	3.330E+01	2.817E+04	3.663E+01	1.721E-01	1.214E+02	1.893E-01
2057	3.200E+01	2.707E+04	3.519E+01	1.654E-01	1.167E+02	1.819E-01
2058	3.074E+01	2.601E+04	3.381E+01	1.589E-01	1.121E+02	1.748E-01
2059	2.954E+01	2.499E+04	3.249E+01	1.526E-01	1.077E+02	1.679E-01
2060	2.838E+01	2.401E+04	3.122E+01	1.467E-01	1.035E+02	1.613E-01
2061	2.726E+01	2.306E+04	2.999E+01	1.409E-01	9.941E+01	1.550E-01
2062	2.620E+01	2.216E+04	2.882E+01	1.354E-01	9.551E+01	1.489E-01
2063	2.517E+01	2.129E+04	2.769E+01	1.301E-01	9.176E+01	1.431E-01
2064	2.418E+01	2.046E+04	2.660E+01	1.250E-01	8.817E+01	1.375E-01
2065	2.323E+01	1.965E+04	2.556E+01	1.201E-01	8.471E+01	1.321E-01
2066	2.232E+01	1.888E+04	2.455E+01	1.154E-01	8.139E+01	1.269E-01
2067	2.145E+01	1.814E+04	2.359E+01	1.108E-01	7.820E+01	1.219E-01
2068	2.061E+01	1.743E+04	2.267E+01	1.065E-01	7.513E+01	1.171E-01
2069	1.980E+01	1.675E+04	2.178E+01	1.023E-01	7.218E+01	1.126E-01
2070	1.902E+01	1.609E+04	2.092E+01	9.831E-02	6.935E+01	1.081E-01
2071	1.828E+01	1.546E+04	2.010E+01	9.445E-02	6.663E+01	1.039E-01
2072	1.756E+01	1.485E+04	1.932E+01	9.075E-02	6.402E+01	9.983E-02
2073	1.687E+01	1.427E+04	1.856E+01	8.719E-02	6.151E+01	9.591E-02
2074	1.621E+01	1.371E+04	1.783E+01	8.377E-02	5.910E+01	9.215E-02
2075	1.557E+01	1.317E+04	1.713E+01	8.049E-02	5.678E+01	8.854E-02
2076	1.496E+01	1.266E+04	1.646E+01	7.733E-02	5.456E+01	8.507E-02
2077	1.438E+01	1.216E+04	1.581E+01	7.430E-02	5.242E+01	8.173E-02
2078	1.381E+01	1.168E+04	1.519E+01	7.139E-02	5.036E+01	7.853E-02
2079	1.327E+01	1.123E+04	1.460E+01	6.859E-02	4.839E+01	7.545E-02
2080	1.275E+01	1.079E+04	1.403E+01	6.590E-02	4.649E+01	7.249E-02
2081	1.225E+01	1.036E+04	1.348E+01	6.331E-02	4.467E+01	6.965E-02
2082	1.177E+01	9.957E+03	1.295E+01	6.083E-02	4.292E+01	6.691E-02
2083	1.131E+01	9.567E+03	1.244E+01	5.845E-02	4.123E+01	6.429E-02
2084	1.087E+01	9.192E+03	1.195E+01	5.615E-02	3.962E+01	6.177E-02
2085	1.044E+01	8.831E+03	1.148E+01	5.395E-02	3.806E+01	5.935E-02
2086	1.003E+01	8.485E+03	1.103E+01	5.184E-02	3.657E+01	5.702E-02
2087	9.637E+00	8.152E+03	1.060E+01	4.980E-02	3.514E+01	5.479E-02
2088	9.259E+00	7.833E+03	1.018E+01	4.785E-02	3.376E+01	5.264E-02
2089	8.896E+00	7.525E+03	9.785E+00	4.598E-02	3.243E+01	5.057E-02
2090	8.547E+00	7.230E+03	9.402E+00	4.417E-02	3.116E+01	4.859E-02

Results (Continued)

Year	Total landfill gas			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(short tons/year)	(Mg/year)	(m^3/year)	(short tons/year)
2091	8.212E+00	6.947E+03	9.033E+00	4.244E-02	2.994E+01	4.668E-02
2092	7.890E+00	6.674E+03	8.679E+00	4.078E-02	2.877E+01	4.485E-02
2093	7.581E+00	6.413E+03	8.339E+00	3.918E-02	2.764E+01	4.310E-02
2094	7.283E+00	6.161E+03	8.012E+00	3.764E-02	2.656E+01	4.141E-02
2095	6.998E+00	5.920E+03	7.698E+00	3.617E-02	2.551E+01	3.978E-02
2096	6.723E+00	5.688E+03	7.396E+00	3.475E-02	2.451E+01	3.822E-02
2097	6.460E+00	5.465E+03	7.106E+00	3.339E-02	2.355E+01	3.672E-02
2098	6.206E+00	5.250E+03	6.827E+00	3.208E-02	2.263E+01	3.528E-02
2099	5.963E+00	5.044E+03	6.559E+00	3.082E-02	2.174E+01	3.390E-02
2100	5.729E+00	4.847E+03	6.302E+00	2.961E-02	2.089E+01	3.257E-02
2101	5.505E+00	4.657E+03	6.055E+00	2.845E-02	2.007E+01	3.129E-02
2102	5.289E+00	4.474E+03	5.818E+00	2.733E-02	1.928E+01	3.007E-02
2103	5.081E+00	4.299E+03	5.590E+00	2.626E-02	1.853E+01	2.889E-02
2104	4.882E+00	4.130E+03	5.370E+00	2.523E-02	1.780E+01	2.776E-02
2105	4.691E+00	3.968E+03	5.160E+00	2.424E-02	1.710E+01	2.667E-02
2106	4.507E+00	3.813E+03	4.957E+00	2.329E-02	1.643E+01	2.562E-02
2107	4.330E+00	3.663E+03	4.763E+00	2.238E-02	1.579E+01	2.462E-02
2108	4.160E+00	3.519E+03	4.576E+00	2.150E-02	1.517E+01	2.365E-02
2109	3.997E+00	3.381E+03	4.397E+00	2.066E-02	1.457E+01	2.272E-02
2110	3.840E+00	3.249E+03	4.224E+00	1.985E-02	1.400E+01	2.183E-02
2111	3.690E+00	3.121E+03	4.059E+00	1.907E-02	1.345E+01	2.098E-02
2112	3.545E+00	2.999E+03	3.900E+00	1.832E-02	1.293E+01	2.015E-02
2113	3.406E+00	2.881E+03	3.747E+00	1.760E-02	1.242E+01	1.936E-02
2114	3.273E+00	2.768E+03	3.600E+00	1.691E-02	1.193E+01	1.860E-02
2115	3.144E+00	2.660E+03	3.459E+00	1.625E-02	1.146E+01	1.788E-02
2116	3.021E+00	2.556E+03	3.323E+00	1.561E-02	1.101E+01	1.717E-02
2117	2.903E+00	2.455E+03	3.193E+00	1.500E-02	1.058E+01	1.650E-02
2118	2.789E+00	2.359E+03	3.068E+00	1.441E-02	1.017E+01	1.585E-02
2119	2.679E+00	2.267E+03	2.947E+00	1.385E-02	9.769E+00	1.523E-02
2120	2.574E+00	2.178E+03	2.832E+00	1.330E-02	9.386E+00	1.464E-02
2121	2.473E+00	2.092E+03	2.721E+00	1.278E-02	9.018E+00	1.406E-02
2122	2.376E+00	2.010E+03	2.614E+00	1.228E-02	8.664E+00	1.351E-02
2123	2.283E+00	1.931E+03	2.512E+00	1.180E-02	8.325E+00	1.298E-02
2124	2.194E+00	1.856E+03	2.413E+00	1.134E-02	7.998E+00	1.247E-02
2125	2.108E+00	1.783E+03	2.318E+00	1.089E-02	7.685E+00	1.198E-02
2126	2.025E+00	1.713E+03	2.228E+00	1.047E-02	7.383E+00	1.151E-02
2127	1.946E+00	1.646E+03	2.140E+00	1.006E-02	7.094E+00	1.106E-02
2128	1.869E+00	1.581E+03	2.056E+00	9.661E-03	6.816E+00	1.063E-02
2129	1.796E+00	1.519E+03	1.976E+00	9.282E-03	6.548E+00	1.021E-02
2130	1.726E+00	1.460E+03	1.898E+00	8.918E-03	6.292E+00	9.810E-03

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
1990	0	0	0	0	0	0
1991	3.472E+00	5.204E+03	3.819E+00	1.429E+01	7.806E+03	1.572E+01
1992	1.294E+01	1.939E+04	1.423E+01	5.325E+01	2.909E+04	5.857E+01
1993	2.248E+01	3.369E+04	2.472E+01	9.250E+01	5.053E+04	1.017E+02
1994	3.094E+01	4.638E+04	3.404E+01	1.273E+02	6.957E+04	1.401E+02
1995	3.880E+01	5.815E+04	4.268E+01	1.597E+02	8.723E+04	1.756E+02
1996	4.494E+01	6.737E+04	4.944E+01	1.850E+02	1.010E+05	2.035E+02
1997	4.946E+01	7.413E+04	5.440E+01	2.036E+02	1.112E+05	2.239E+02
1998	5.677E+01	8.510E+04	6.245E+01	2.337E+02	1.277E+05	2.570E+02
1999	6.022E+01	9.026E+04	6.624E+01	2.478E+02	1.354E+05	2.726E+02
2000	5.982E+01	8.967E+04	6.580E+01	2.462E+02	1.345E+05	2.708E+02
2001	5.887E+01	8.824E+04	6.476E+01	2.423E+02	1.324E+05	2.665E+02
2002	5.813E+01	8.714E+04	6.395E+01	2.393E+02	1.307E+05	2.632E+02
2003	5.749E+01	8.618E+04	6.324E+01	2.366E+02	1.293E+05	2.603E+02
2004	5.630E+01	8.438E+04	6.193E+01	2.317E+02	1.266E+05	2.549E+02
2005	5.550E+01	8.320E+04	6.106E+01	2.284E+02	1.248E+05	2.513E+02
2006	5.536E+01	8.299E+04	6.090E+01	2.279E+02	1.245E+05	2.506E+02
2007	5.337E+01	8.000E+04	5.871E+01	2.197E+02	1.200E+05	2.416E+02
2008	5.128E+01	7.686E+04	5.641E+01	2.110E+02	1.153E+05	2.321E+02
2009	4.927E+01	7.385E+04	5.419E+01	2.028E+02	1.108E+05	2.230E+02
2010	4.734E+01	7.095E+04	5.207E+01	1.948E+02	1.064E+05	2.143E+02
2011	4.548E+01	6.817E+04	5.003E+01	1.872E+02	1.023E+05	2.059E+02
2012	4.370E+01	6.550E+04	4.807E+01	1.798E+02	9.824E+04	1.978E+02
2013	4.198E+01	6.293E+04	4.618E+01	1.728E+02	9.439E+04	1.901E+02
2014	4.034E+01	6.046E+04	4.437E+01	1.660E+02	9.069E+04	1.826E+02
2015	3.875E+01	5.809E+04	4.263E+01	1.595E+02	8.714E+04	1.755E+02
2016	3.724E+01	5.581E+04	4.096E+01	1.532E+02	8.372E+04	1.686E+02
2017	3.578E+01	5.362E+04	3.935E+01	1.472E+02	8.044E+04	1.620E+02
2018	3.437E+01	5.152E+04	3.781E+01	1.415E+02	7.728E+04	1.556E+02
2019	3.302E+01	4.950E+04	3.633E+01	1.359E+02	7.425E+04	1.495E+02
2020	3.173E+01	4.756E+04	3.490E+01	1.306E+02	7.134E+04	1.436E+02
2021	3.049E+01	4.570E+04	3.353E+01	1.255E+02	6.854E+04	1.380E+02
2022	2.929E+01	4.390E+04	3.222E+01	1.205E+02	6.586E+04	1.326E+02
2023	2.814E+01	4.218E+04	3.096E+01	1.158E+02	6.327E+04	1.274E+02
2024	2.704E+01	4.053E+04	2.974E+01	1.113E+02	6.079E+04	1.224E+02
2025	2.598E+01	3.894E+04	2.858E+01	1.069E+02	5.841E+04	1.176E+02
2026	2.496E+01	3.741E+04	2.746E+01	1.027E+02	5.612E+04	1.130E+02
2027	2.398E+01	3.595E+04	2.638E+01	9.870E+01	5.392E+04	1.086E+02
2028	2.304E+01	3.454E+04	2.534E+01	9.483E+01	5.180E+04	1.043E+02
2029	2.214E+01	3.318E+04	2.435E+01	9.111E+01	4.977E+04	1.002E+02
2030	2.127E+01	3.188E+04	2.340E+01	8.754E+01	4.782E+04	9.629E+01
2031	2.044E+01	3.063E+04	2.248E+01	8.410E+01	4.595E+04	9.251E+01
2032	1.963E+01	2.943E+04	2.160E+01	8.081E+01	4.414E+04	8.889E+01
2033	1.886E+01	2.828E+04	2.075E+01	7.764E+01	4.241E+04	8.540E+01
2034	1.812E+01	2.717E+04	1.994E+01	7.459E+01	4.075E+04	8.205E+01
2035	1.741E+01	2.610E+04	1.916E+01	7.167E+01	3.915E+04	7.884E+01
2036	1.673E+01	2.508E+04	1.840E+01	6.886E+01	3.762E+04	7.574E+01
2037	1.607E+01	2.409E+04	1.768E+01	6.616E+01	3.614E+04	7.277E+01
2038	1.544E+01	2.315E+04	1.699E+01	6.356E+01	3.473E+04	6.992E+01
2039	1.484E+01	2.224E+04	1.632E+01	6.107E+01	3.336E+04	6.718E+01

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
2040	1.426E+01	2.137E+04	1.568E+01	5.868E+01	3.206E+04	6.454E+01
2041	1.370E+01	2.053E+04	1.507E+01	5.638E+01	3.080E+04	6.201E+01
2042	1.316E+01	1.973E+04	1.448E+01	5.417E+01	2.959E+04	5.958E+01
2043	1.264E+01	1.895E+04	1.391E+01	5.204E+01	2.843E+04	5.725E+01
2044	1.215E+01	1.821E+04	1.336E+01	5.000E+01	2.732E+04	5.500E+01
2045	1.167E+01	1.750E+04	1.284E+01	4.804E+01	2.624E+04	5.284E+01
2046	1.122E+01	1.681E+04	1.234E+01	4.616E+01	2.522E+04	5.077E+01
2047	1.078E+01	1.615E+04	1.185E+01	4.435E+01	2.423E+04	4.878E+01
2048	1.035E+01	1.552E+04	1.139E+01	4.261E+01	2.328E+04	4.687E+01
2049	9.947E+00	1.491E+04	1.094E+01	4.094E+01	2.236E+04	4.503E+01
2050	9.557E+00	1.432E+04	1.051E+01	3.933E+01	2.149E+04	4.327E+01
2051	9.182E+00	1.376E+04	1.010E+01	3.779E+01	2.064E+04	4.157E+01
2052	8.822E+00	1.322E+04	9.704E+00	3.631E+01	1.984E+04	3.994E+01
2053	8.476E+00	1.271E+04	9.324E+00	3.488E+01	1.906E+04	3.837E+01
2054	8.144E+00	1.221E+04	8.958E+00	3.352E+01	1.831E+04	3.687E+01
2055	7.824E+00	1.173E+04	8.607E+00	3.220E+01	1.759E+04	3.542E+01
2056	7.518E+00	1.127E+04	8.269E+00	3.094E+01	1.690E+04	3.403E+01
2057	7.223E+00	1.083E+04	7.945E+00	2.973E+01	1.624E+04	3.270E+01
2058	6.940E+00	1.040E+04	7.634E+00	2.856E+01	1.560E+04	3.142E+01
2059	6.668E+00	9.994E+03	7.334E+00	2.744E+01	1.499E+04	3.019E+01
2060	6.406E+00	9.602E+03	7.047E+00	2.637E+01	1.440E+04	2.900E+01
2061	6.155E+00	9.226E+03	6.770E+00	2.533E+01	1.384E+04	2.786E+01
2062	5.914E+00	8.864E+03	6.505E+00	2.434E+01	1.330E+04	2.677E+01
2063	5.682E+00	8.516E+03	6.250E+00	2.338E+01	1.277E+04	2.572E+01
2064	5.459E+00	8.183E+03	6.005E+00	2.247E+01	1.227E+04	2.471E+01
2065	5.245E+00	7.862E+03	5.769E+00	2.159E+01	1.179E+04	2.374E+01
2066	5.039E+00	7.553E+03	5.543E+00	2.074E+01	1.133E+04	2.281E+01
2067	4.842E+00	7.257E+03	5.326E+00	1.993E+01	1.089E+04	2.192E+01
2068	4.652E+00	6.973E+03	5.117E+00	1.915E+01	1.046E+04	2.106E+01
2069	4.469E+00	6.699E+03	4.916E+00	1.839E+01	1.005E+04	2.023E+01
2070	4.294E+00	6.437E+03	4.724E+00	1.767E+01	9.655E+03	1.944E+01
2071	4.126E+00	6.184E+03	4.538E+00	1.698E+01	9.276E+03	1.868E+01
2072	3.964E+00	5.942E+03	4.360E+00	1.631E+01	8.913E+03	1.795E+01
2073	3.809E+00	5.709E+03	4.189E+00	1.567E+01	8.563E+03	1.724E+01
2074	3.659E+00	5.485E+03	4.025E+00	1.506E+01	8.227E+03	1.657E+01
2075	3.516E+00	5.270E+03	3.867E+00	1.447E+01	7.905E+03	1.592E+01
2076	3.378E+00	5.063E+03	3.716E+00	1.390E+01	7.595E+03	1.529E+01
2077	3.245E+00	4.865E+03	3.570E+00	1.336E+01	7.297E+03	1.469E+01
2078	3.118E+00	4.674E+03	3.430E+00	1.283E+01	7.011E+03	1.412E+01
2079	2.996E+00	4.491E+03	3.296E+00	1.233E+01	6.736E+03	1.356E+01
2080	2.878E+00	4.315E+03	3.166E+00	1.185E+01	6.472E+03	1.303E+01
2081	2.766E+00	4.145E+03	3.042E+00	1.138E+01	6.218E+03	1.252E+01
2082	2.657E+00	3.983E+03	2.923E+00	1.094E+01	5.974E+03	1.203E+01
2083	2.553E+00	3.827E+03	2.808E+00	1.051E+01	5.740E+03	1.156E+01
2084	2.453E+00	3.677E+03	2.698E+00	1.010E+01	5.515E+03	1.110E+01
2085	2.357E+00	3.532E+03	2.592E+00	9.699E+00	5.299E+03	1.067E+01
2086	2.264E+00	3.394E+03	2.491E+00	9.319E+00	5.091E+03	1.025E+01
2087	2.175E+00	3.261E+03	2.393E+00	8.954E+00	4.891E+03	9.849E+00
2088	2.090E+00	3.133E+03	2.299E+00	8.602E+00	4.700E+03	9.463E+00
2089	2.008E+00	3.010E+03	2.209E+00	8.265E+00	4.515E+03	9.092E+00
2090	1.929E+00	2.892E+03	2.122E+00	7.941E+00	4.338E+03	8.735E+00

Results (Continued)

Year	Methane			Carbon dioxide		
	(Mg/year)	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
2091	1.854E+00	2.779E+03	2.039E+00	7.630E+00	4.168E+03	8.393E+00
2092	1.781E+00	2.670E+03	1.959E+00	7.331E+00	4.005E+03	8.064E+00
2093	1.711E+00	2.565E+03	1.882E+00	7.043E+00	3.848E+03	7.747E+00
2094	1.644E+00	2.465E+03	1.809E+00	6.767E+00	3.697E+03	7.444E+00
2095	1.580E+00	2.368E+03	1.738E+00	6.502E+00	3.552E+03	7.152E+00
2096	1.518E+00	2.275E+03	1.670E+00	6.247E+00	3.413E+03	6.871E+00
2097	1.458E+00	2.186E+03	1.604E+00	6.002E+00	3.279E+03	6.602E+00
2098	1.401E+00	2.100E+03	1.541E+00	5.766E+00	3.150E+03	6.343E+00
2099	1.346E+00	2.018E+03	1.481E+00	5.540E+00	3.027E+03	6.094E+00
2100	1.293E+00	1.939E+03	1.423E+00	5.323E+00	2.908E+03	5.855E+00
2101	1.243E+00	1.863E+03	1.367E+00	5.114E+00	2.794E+03	5.626E+00
2102	1.194E+00	1.790E+03	1.313E+00	4.914E+00	2.684E+03	5.405E+00
2103	1.147E+00	1.719E+03	1.262E+00	4.721E+00	2.579E+03	5.193E+00
2104	1.102E+00	1.652E+03	1.212E+00	4.536E+00	2.478E+03	4.990E+00
2105	1.059E+00	1.587E+03	1.165E+00	4.358E+00	2.381E+03	4.794E+00
2106	1.017E+00	1.525E+03	1.119E+00	4.187E+00	2.288E+03	4.606E+00
2107	9.775E-01	1.465E+03	1.075E+00	4.023E+00	2.198E+03	4.425E+00
2108	9.392E-01	1.408E+03	1.033E+00	3.865E+00	2.112E+03	4.252E+00
2109	9.024E-01	1.353E+03	9.926E-01	3.714E+00	2.029E+03	4.085E+00
2110	8.670E-01	1.300E+03	9.537E-01	3.568E+00	1.949E+03	3.925E+00
2111	8.330E-01	1.249E+03	9.163E-01	3.428E+00	1.873E+03	3.771E+00
2112	8.003E-01	1.200E+03	8.804E-01	3.294E+00	1.799E+03	3.623E+00
2113	7.689E-01	1.153E+03	8.458E-01	3.165E+00	1.729E+03	3.481E+00
2114	7.388E-01	1.107E+03	8.127E-01	3.041E+00	1.661E+03	3.345E+00
2115	7.098E-01	1.064E+03	7.808E-01	2.921E+00	1.596E+03	3.214E+00
2116	6.820E-01	1.022E+03	7.502E-01	2.807E+00	1.533E+03	3.088E+00
2117	6.552E-01	9.822E+02	7.208E-01	2.697E+00	1.473E+03	2.966E+00
2118	6.296E-01	9.436E+02	6.925E-01	2.591E+00	1.415E+03	2.850E+00
2119	6.049E-01	9.066E+02	6.654E-01	2.489E+00	1.360E+03	2.738E+00
2120	5.812E-01	8.711E+02	6.393E-01	2.392E+00	1.307E+03	2.631E+00
2121	5.584E-01	8.369E+02	6.142E-01	2.298E+00	1.255E+03	2.528E+00
2122	5.365E-01	8.041E+02	5.901E-01	2.208E+00	1.206E+03	2.429E+00
2123	5.154E-01	7.726E+02	5.670E-01	2.121E+00	1.159E+03	2.333E+00
2124	4.952E-01	7.423E+02	5.447E-01	2.038E+00	1.113E+03	2.242E+00
2125	4.758E-01	7.132E+02	5.234E-01	1.958E+00	1.070E+03	2.154E+00
2126	4.571E-01	6.852E+02	5.029E-01	1.881E+00	1.028E+03	2.070E+00
2127	4.392E-01	6.584E+02	4.831E-01	1.808E+00	9.875E+02	1.988E+00
2128	4.220E-01	6.325E+02	4.642E-01	1.737E+00	9.488E+02	1.910E+00
2129	4.055E-01	6.077E+02	4.460E-01	1.669E+00	9.116E+02	1.836E+00
2130	3.896E-01	5.839E+02	4.285E-01	1.603E+00	8.759E+02	1.764E+00

Appendix C-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill

Reference Number: 001
Carroll Landfill Expansion Application

Existing Uncontrolled Emissions Summary

LandGEM 3.02 Results modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
1,1,2,2-Tetrachloroethane - HAP/VOC	3.10E-04	7.78E-05	3.41E-04	3.10E-04	7.78E-05	3.41E-04			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	5.43E-05	1.36E-05	5.97E-05	5.43E-05	1.36E-05	5.97E-05			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.03E-05	5.09E-06	2.23E-05	2.03E-05	5.09E-06	2.23E-05			
Acrylonitrile - HAP/VOC	3.66E-06	9.20E-07	4.03E-06	3.66E-06	9.20E-07	4.03E-06			
Benzene - No or Unknown Co-disposal - HAP/VOC	6.47E-04	1.62E-04	7.11E-04	6.47E-04	1.62E-04	7.11E-04			
Carbon tetrachloride - HAP/VOC/ODC	4.24E-06	1.06E-06	4.66E-06	4.24E-06	1.06E-06	4.66E-06	4.24E-06	1.06E-06	4.66E-06
Chloroform - HAP/VOC	2.92E-05	7.32E-06	3.21E-05	2.92E-05	7.32E-06	3.21E-05			
Ethylene dibromide - HAP/VOC	1.03E-04	2.59E-05	1.13E-04	1.03E-04	2.59E-05	1.13E-04			
Mercury (total) - HAP				8.44E-08	2.12E-08	9.29E-08			
* Perchloroethylene (tetrachloroethylene) - HAP				1.16E-03	2.92E-04	1.28E-03			
Trichloroethylene (trichloroethene) - HAP/VOC	3.75E-04	9.43E-05	4.13E-04	3.75E-04	9.43E-05	4.13E-04			
Vinyl chloride - HAP/VOC	3.06E-04	7.69E-05	3.37E-04	3.06E-04	7.69E-05	3.37E-04			
1,1,2-trichloroethane - HAP/VOC	7.27E-05	1.83E-05	8.00E-05	7.27E-05	1.83E-05	8.00E-05			
1,3-butadiene - HAP/VOC	3.10E-05	7.78E-06	3.41E-05	3.10E-05	7.78E-06	3.41E-05			
Acetaldehyde - HAP/VOC	1.18E-05	2.95E-06	1.29E-05	1.18E-05	2.95E-06	1.29E-05			
Benzyl chloride - HAP/VOC	7.90E-06	1.99E-06	8.70E-06	7.90E-06	1.99E-06	8.70E-06			
cis-1,3-dichloropropene - HAP/VOC	1.16E-06	2.91E-07	1.28E-06	1.16E-06	2.91E-07	1.28E-06			
Formaldehyde - HAP/VOC	1.21E-06	3.04E-07	1.33E-06	1.21E-06	3.04E-07	1.33E-06			
trans-1,3-dichloropropene - HAP/VOC	3.61E-06	9.07E-07	3.97E-06	3.61E-06	9.07E-07	3.97E-06			
TOTALS	1.98E-03	4.98E-04	2.18E-03	3.14E-03	7.90E-04	3.46E-03	4.24E-06	1.06E-06	4.66E-06

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 2008 Table 2.4-1 default concentrations
[2] Emission Rate in lbs/hr is based on 8,760 hours per year

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Appendix C-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill

Emission Point: Existing Waste's Contribution to 002
Carroll Landfill Expansion Application

Existing Controlled Emissions Summary

Modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
1,1,2,2-Tetrachloroethane - HAP/VOC	3.79E-05	9.51E-06	4.17E-05	3.79E-05	9.51E-06	4.17E-05			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	6.64E-06	1.67E-06	7.30E-06	6.64E-06	1.67E-06	7.30E-06			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.48E-06	6.22E-07	2.73E-06	2.48E-06	6.22E-07	2.73E-06			
Acrylonitrile - HAP/VOC	4.48E-07	1.12E-07	4.92E-07	4.48E-07	1.12E-07	4.92E-07			
Benzene - No or Unknown Co-disposal - HAP/VOC	7.91E-05	1.99E-05	8.70E-05	7.91E-05	1.99E-05	8.70E-05			
Carbon tetrachloride - HAP/VOC/ODC	5.18E-07	1.30E-07	5.70E-07	5.18E-07	1.30E-07	5.70E-07	5.18E-07	1.30E-07	5.70E-07
Chloroform - HAP/VOC	3.56E-06	8.95E-07	3.92E-06	3.56E-06	8.95E-07	3.92E-06			
Ethylene dibromide - HAP/VOC	1.26E-05	3.16E-06	1.39E-05	1.26E-05	3.16E-06	1.39E-05			
Mercury (total) - HAP				8.16E-08	2.05E-08	8.97E-08			
* Perchloroethylene (tetrachloroethylene) - HAP				1.42E-04	3.57E-05	1.56E-04			
Trichloroethylene (trichloroethene) - HAP/VOC	4.59E-05	1.15E-05	5.05E-05	4.59E-05	1.15E-05	5.05E-05			
Vinyl chloride - HAP/VOC	3.74E-05	9.40E-06	4.12E-05	3.74E-05	9.40E-06	4.12E-05			
1,1,2-trichloroethane - HAP/VOC	8.89E-06	2.23E-06	9.78E-06	8.89E-06	2.23E-06	9.78E-06			
1,3-butadiene - HAP/VOC	3.79E-06	9.51E-07	4.17E-06	3.79E-06	9.51E-07	4.17E-06			
Acetaldehyde - HAP/VOC	1.44E-06	3.61E-07	1.58E-06	1.44E-06	3.61E-07	1.58E-06			
Benzyl chloride - HAP/VOC	9.66E-07	2.43E-07	1.06E-06	9.66E-07	2.43E-07	1.06E-06			
cis-1,3-dichloropropene - HAP/VOC	1.42E-07	3.56E-08	1.56E-07	1.42E-07	3.56E-08	1.56E-07			
Formaldehyde - HAP/VOC	1.48E-07	3.72E-08	1.63E-07	1.48E-07	3.72E-08	1.63E-07			
trans-1,3-dichloropropene - HAP/VOC	4.41E-07	1.11E-07	4.85E-07	4.41E-07	1.11E-07	4.85E-07			
TOTALS	2.26E-04	5.69E-05	2.49E-04	3.69E-04	9.26E-05	4.05E-04	5.18E-07	1.30E-07	5.70E-07

Notes: [1] Emission Rates were calculated using the formula, collection efficiency, methane oxidation factor, and flare control efficiencies for speciated parameters as presented in Section A.1 of Appendix A-S

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Summary Report

Landfill Name or Identifier: Proposed Carroll Expansion - HTAC AP-42 2008

Date: Friday, September 04, 2015

Description/Comments:

Using parameters for Lo and k derived from the Greenhouse Gas Reporting Rule Subpart H-H and not discounting for non-biodegradable waste mass. This version of the LandGEM model has been modified to include updated concentrations for AP-42 2008's HTAC parameters only.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*$year^{-1}$*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2016**	
Landfill Closure Year (with 80-year limit)	**2029**	
Actual Closure Year (without limit)	***2029***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**4,030,909**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**32**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**40**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Hydrogen sulfide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2016	279,091	307,000	0	0
2017	279,091	307,000	279,091	307,000
2018	279,091	307,000	558,182	614,000
2019	279,091	307,000	837,273	921,000
2020	279,091	307,000	1,116,364	1,228,000
2021	279,091	307,000	1,395,455	1,535,000
2022	279,091	307,000	1,674,545	1,842,000
2023	279,091	307,000	1,953,636	2,149,000
2024	279,091	307,000	2,232,727	2,456,000
2025	279,091	307,000	2,511,818	2,763,000
2026	279,091	307,000	2,790,909	3,070,000
2027	279,091	307,000	3,070,000	3,377,000
2028	279,091	307,000	3,349,091	3,684,000
2029	36,281	39,909	3,628,182	3,991,000
2030	0	0	3,664,463	4,030,909
2031	0	0	3,664,463	4,030,909
2032	0	0	3,664,463	4,030,909
2033	0	0	3,664,463	4,030,909
2034	0	0	3,664,463	4,030,909
2035	0	0	3,664,463	4,030,909
2036	0	0	3,664,463	4,030,909
2037	0	0	3,664,463	4,030,909
2038	0	0	3,664,463	4,030,909
2039	0	0	3,664,463	4,030,909
2040	0	0	3,664,463	4,030,909
2041	0	0	3,664,463	4,030,909
2042	0	0	3,664,463	4,030,909
2043	0	0	3,664,463	4,030,909
2044	0	0	3,664,463	4,030,909
2045	0	0	3,664,463	4,030,909
2046	0	0	3,664,463	4,030,909
2047	0	0	3,664,463	4,030,909
2048	0	0	3,664,463	4,030,909
2049	0	0	3,664,463	4,030,909
2050	0	0	3,664,463	4,030,909
2051	0	0	3,664,463	4,030,909
2052	0	0	3,664,463	4,030,909
2053	0	0	3,664,463	4,030,909
2054	0	0	3,664,463	4,030,909
2055	0	0	3,664,463	4,030,909

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2056	0	0	3,664,463	4,030,909
2057	0	0	3,664,463	4,030,909
2058	0	0	3,664,463	4,030,909
2059	0	0	3,664,463	4,030,909
2060	0	0	3,664,463	4,030,909
2061	0	0	3,664,463	4,030,909
2062	0	0	3,664,463	4,030,909
2063	0	0	3,664,463	4,030,909
2064	0	0	3,664,463	4,030,909
2065	0	0	3,664,463	4,030,909
2066	0	0	3,664,463	4,030,909
2067	0	0	3,664,463	4,030,909
2068	0	0	3,664,463	4,030,909
2069	0	0	3,664,463	4,030,909
2070	0	0	3,664,463	4,030,909
2071	0	0	3,664,463	4,030,909
2072	0	0	3,664,463	4,030,909
2073	0	0	3,664,463	4,030,909
2074	0	0	3,664,463	4,030,909
2075	0	0	3,664,463	4,030,909
2076	0	0	3,664,463	4,030,909
2077	0	0	3,664,463	4,030,909
2078	0	0	3,664,463	4,030,909
2079	0	0	3,664,463	4,030,909
2080	0	0	3,664,463	4,030,909
2081	0	0	3,664,463	4,030,909
2082	0	0	3,664,463	4,030,909
2083	0	0	3,664,463	4,030,909
2084	0	0	3,664,463	4,030,909
2085	0	0	3,664,463	4,030,909
2086	0	0	3,664,463	4,030,909
2087	0	0	3,664,463	4,030,909
2088	0	0	3,664,463	4,030,909
2089	0	0	3,664,463	4,030,909
2090	0	0	3,664,463	4,030,909
2091	0	0	3,664,463	4,030,909
2092	0	0	3,664,463	4,030,909
2093	0	0	3,664,463	4,030,909
2094	0	0	3,664,463	4,030,909
2095	0	0	3,664,463	4,030,909

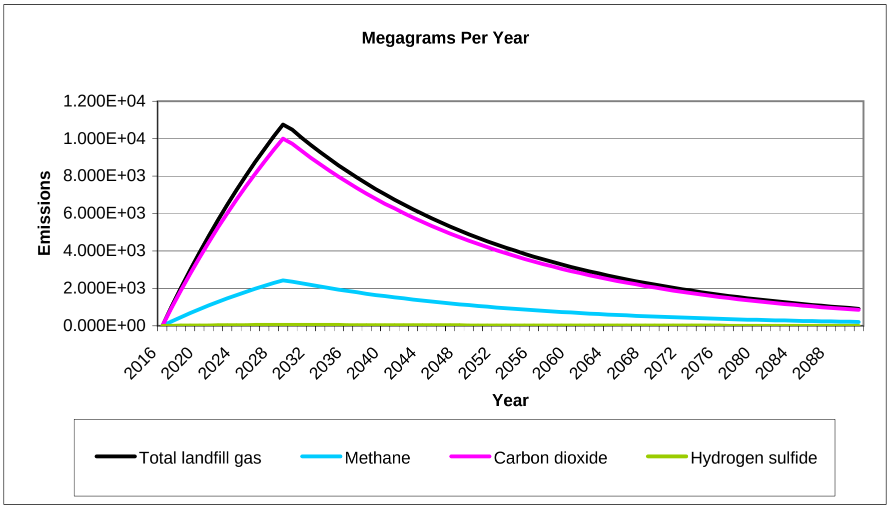
Pollutant Parameters

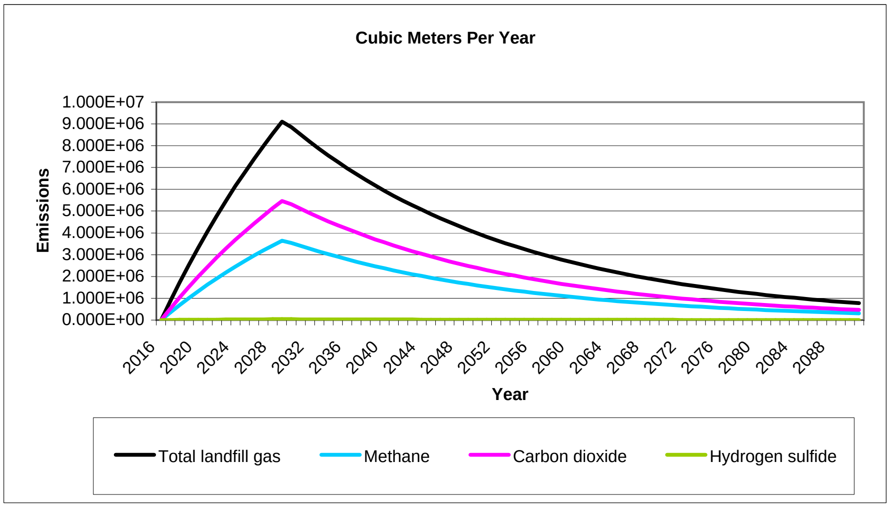
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85	0.54	
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96	0.16	
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99	0.05	
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06	0.02	
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11	2.40	
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84	0.01	
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39	0.07	
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

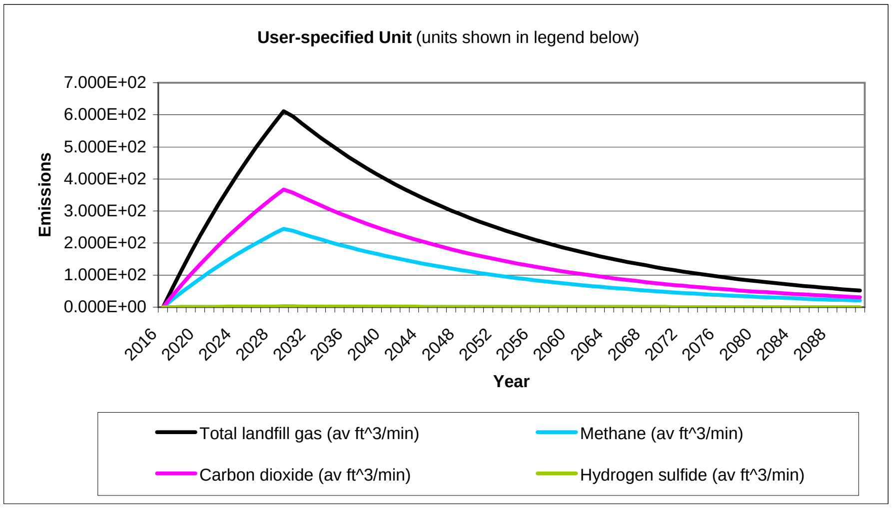
Pollutant Parameters (Continued)

	Compound	Gas / Pollutant Default Parameters: Concentration (*ppmv*)	Molecular Weight	User-specified Pollutant Parameters: Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88	0.16	
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08	4310.00	
	Mercury (total) - HAP	2.9E-04	200.61	0.00	
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83	2.03	
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40	0.83	
	Vinyl chloride - HAP/VOC	7.3	62.50	1.42	
	Xylenes - HAP/VOC	12	106.16		
	Formaldehyde			0.01	30.03
	Acetaldehyde			0.08	44.05
	1,1,2-trichloroethane			0.16	133.40
	Benzyl chloride			0.02	126.58
	1,3-butadiene			0.17	54.09
	cis-1,3-dichloropropene			0.00	110.97
	trans-1,3-dichloropropene			0.01	110.97

Graphs


Megagrams Per Year
1.200E+04
1.000E+04
8.000E+03
6.000E+03
4.000E+03
2.000E+03
0.000E+00
Emissions
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
2060
2064
2068
2072
2076
2080
2084
2088
Year
Total landfill gas
Methane
Carbon dioxide
Hydrogen sulfide


Cubic Meters Per Year
1.000E+07
9.000E+06
8.000E+06
7.000E+06
6.000E+06
5.000E+06
4.000E+06
3.000E+06
2.000E+06
1.000E+06
0.000E+00
Emissions
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
2060
2064
2068
2072
2076
2080
2084
2088
Year
Total landfill gas
Methane
Carbon dioxide
Hydrogen sulfide


User-specified Unit (units shown in legend below)
7.000E+02
6.000E+02
5.000E+02
4.000E+02
3.000E+02
2.000E+02
1.000E+02
0.000E+00
Emissions
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
2060
2064
2068
2072
2076
2080
2084
2088
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
Hydrogen sulfide (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2016	0	0	0	0	0	0
2017	1.040E+03	8.800E+05	5.912E+01	2.348E+02	3.520E+05	2.365E+01
2018	2.040E+03	1.725E+06	1.159E+02	4.604E+02	6.902E+05	4.637E+01
2019	3.000E+03	2.538E+06	1.705E+02	6.772E+02	1.015E+06	6.820E+01
2020	3.922E+03	3.318E+06	2.229E+02	8.855E+02	1.327E+06	8.918E+01
2021	4.809E+03	4.068E+06	2.733E+02	1.086E+03	1.627E+06	1.093E+02
2022	5.660E+03	4.788E+06	3.217E+02	1.278E+03	1.915E+06	1.287E+02
2023	6.479E+03	5.481E+06	3.682E+02	1.463E+03	2.192E+06	1.473E+02
2024	7.265E+03	6.146E+06	4.129E+02	1.640E+03	2.458E+06	1.652E+02
2025	8.020E+03	6.785E+06	4.559E+02	1.811E+03	2.714E+06	1.823E+02
2026	8.746E+03	7.399E+06	4.971E+02	1.974E+03	2.959E+06	1.988E+02
2027	9.443E+03	7.988E+06	5.367E+02	2.132E+03	3.195E+06	2.147E+02
2028	1.011E+04	8.555E+06	5.748E+02	2.283E+03	3.422E+06	2.299E+02
2029	1.076E+04	9.100E+06	6.114E+02	2.428E+03	3.640E+06	2.446E+02
2030	1.047E+04	8.857E+06	5.951E+02	2.364E+03	3.543E+06	2.380E+02
2031	1.006E+04	8.510E+06	5.718E+02	2.271E+03	3.404E+06	2.287E+02
2032	9.665E+03	8.176E+06	5.494E+02	2.182E+03	3.271E+06	2.197E+02
2033	9.286E+03	7.856E+06	5.278E+02	2.096E+03	3.142E+06	2.111E+02
2034	8.922E+03	7.548E+06	5.071E+02	2.014E+03	3.019E+06	2.029E+02
2035	8.572E+03	7.252E+06	4.872E+02	1.935E+03	2.901E+06	1.949E+02
2036	8.236E+03	6.967E+06	4.681E+02	1.859E+03	2.787E+06	1.873E+02
2037	7.913E+03	6.694E+06	4.498E+02	1.786E+03	2.678E+06	1.799E+02
2038	7.603E+03	6.432E+06	4.321E+02	1.716E+03	2.573E+06	1.729E+02
2039	7.305E+03	6.180E+06	4.152E+02	1.649E+03	2.472E+06	1.661E+02
2040	7.018E+03	5.937E+06	3.989E+02	1.584E+03	2.375E+06	1.596E+02
2041	6.743E+03	5.704E+06	3.833E+02	1.522E+03	2.282E+06	1.533E+02
2042	6.479E+03	5.481E+06	3.683E+02	1.463E+03	2.192E+06	1.473E+02
2043	6.225E+03	5.266E+06	3.538E+02	1.405E+03	2.106E+06	1.415E+02
2044	5.981E+03	5.059E+06	3.399E+02	1.350E+03	2.024E+06	1.360E+02
2045	5.746E+03	4.861E+06	3.266E+02	1.297E+03	1.944E+06	1.306E+02
2046	5.521E+03	4.670E+06	3.138E+02	1.246E+03	1.868E+06	1.255E+02
2047	5.304E+03	4.487E+06	3.015E+02	1.197E+03	1.795E+06	1.206E+02
2048	5.096E+03	4.311E+06	2.897E+02	1.151E+03	1.725E+06	1.159E+02
2049	4.897E+03	4.142E+06	2.783E+02	1.105E+03	1.657E+06	1.113E+02
2050	4.705E+03	3.980E+06	2.674E+02	1.062E+03	1.592E+06	1.070E+02
2051	4.520E+03	3.824E+06	2.569E+02	1.020E+03	1.530E+06	1.028E+02
2052	4.343E+03	3.674E+06	2.468E+02	9.804E+02	1.470E+06	9.874E+01
2053	4.173E+03	3.530E+06	2.372E+02	9.420E+02	1.412E+06	9.487E+01
2054	4.009E+03	3.391E+06	2.279E+02	9.050E+02	1.357E+06	9.115E+01
2055	3.852E+03	3.258E+06	2.189E+02	8.695E+02	1.303E+06	8.757E+01
2056	3.701E+03	3.131E+06	2.103E+02	8.354E+02	1.252E+06	8.414E+01
2057	3.556E+03	3.008E+06	2.021E+02	8.027E+02	1.203E+06	8.084E+01
2058	3.416E+03	2.890E+06	1.942E+02	7.712E+02	1.156E+06	7.767E+01
2059	3.282E+03	2.777E+06	1.866E+02	7.410E+02	1.111E+06	7.462E+01
2060	3.154E+03	2.668E+06	1.792E+02	7.119E+02	1.067E+06	7.170E+01
2061	3.030E+03	2.563E+06	1.722E+02	6.840E+02	1.025E+06	6.889E+01
2062	2.911E+03	2.463E+06	1.655E+02	6.572E+02	9.851E+05	6.619E+01
2063	2.797E+03	2.366E+06	1.590E+02	6.314E+02	9.464E+05	6.359E+01
2064	2.687E+03	2.273E+06	1.527E+02	6.067E+02	9.093E+05	6.110E+01
2065	2.582E+03	2.184E+06	1.468E+02	5.829E+02	8.737E+05	5.870E+01

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2066	2.481E+03	2.099E+06	1.410E+02	5.600E+02	8.394E+05	5.640E+01
2067	2.383E+03	2.016E+06	1.355E+02	5.381E+02	8.065E+05	5.419E+01
2068	2.290E+03	1.937E+06	1.302E+02	5.170E+02	7.749E+05	5.206E+01
2069	2.200E+03	1.861E+06	1.251E+02	4.967E+02	7.445E+05	5.002E+01
2070	2.114E+03	1.788E+06	1.202E+02	4.772E+02	7.153E+05	4.806E+01
2071	2.031E+03	1.718E+06	1.154E+02	4.585E+02	6.873E+05	4.618E+01
2072	1.951E+03	1.651E+06	1.109E+02	4.405E+02	6.603E+05	4.437E+01
2073	1.875E+03	1.586E+06	1.066E+02	4.233E+02	6.344E+05	4.263E+01
2074	1.801E+03	1.524E+06	1.024E+02	4.067E+02	6.095E+05	4.096E+01
2075	1.731E+03	1.464E+06	9.837E+01	3.907E+02	5.856E+05	3.935E+01
2076	1.663E+03	1.407E+06	9.452E+01	3.754E+02	5.627E+05	3.781E+01
2077	1.598E+03	1.352E+06	9.081E+01	3.607E+02	5.406E+05	3.632E+01
2078	1.535E+03	1.299E+06	8.725E+01	3.465E+02	5.194E+05	3.490E+01
2079	1.475E+03	1.248E+06	8.383E+01	3.329E+02	4.991E+05	3.353E+01
2080	1.417E+03	1.199E+06	8.054E+01	3.199E+02	4.795E+05	3.222E+01
2081	1.361E+03	1.152E+06	7.738E+01	3.073E+02	4.607E+05	3.095E+01
2082	1.308E+03	1.107E+06	7.435E+01	2.953E+02	4.426E+05	2.974E+01
2083	1.257E+03	1.063E+06	7.143E+01	2.837E+02	4.253E+05	2.857E+01
2084	1.207E+03	1.021E+06	6.863E+01	2.726E+02	4.086E+05	2.745E+01
2085	1.160E+03	9.814E+05	6.594E+01	2.619E+02	3.926E+05	2.638E+01
2086	1.115E+03	9.429E+05	6.336E+01	2.516E+02	3.772E+05	2.534E+01
2087	1.071E+03	9.060E+05	6.087E+01	2.418E+02	3.624E+05	2.435E+01
2088	1.029E+03	8.704E+05	5.848E+01	2.323E+02	3.482E+05	2.339E+01
2089	9.886E+02	8.363E+05	5.619E+01	2.232E+02	3.345E+05	2.248E+01
2090	9.498E+02	8.035E+05	5.399E+01	2.144E+02	3.214E+05	2.160E+01
2091	9.126E+02	7.720E+05	5.187E+01	2.060E+02	3.088E+05	2.075E+01
2092	8.768E+02	7.417E+05	4.984E+01	1.979E+02	2.967E+05	1.993E+01
2093	8.424E+02	7.127E+05	4.788E+01	1.902E+02	2.851E+05	1.915E+01
2094	8.094E+02	6.847E+05	4.601E+01	1.827E+02	2.739E+05	1.840E+01
2095	7.777E+02	6.579E+05	4.420E+01	1.756E+02	2.631E+05	1.768E+01
2096	7.472E+02	6.321E+05	4.247E+01	1.687E+02	2.528E+05	1.699E+01
2097	7.179E+02	6.073E+05	4.080E+01	1.621E+02	2.429E+05	1.632E+01
2098	6.897E+02	5.835E+05	3.920E+01	1.557E+02	2.334E+05	1.568E+01
2099	6.627E+02	5.606E+05	3.767E+01	1.496E+02	2.242E+05	1.507E+01
2100	6.367E+02	5.386E+05	3.619E+01	1.437E+02	2.154E+05	1.448E+01
2101	6.117E+02	5.175E+05	3.477E+01	1.381E+02	2.070E+05	1.391E+01
2102	5.877E+02	4.972E+05	3.341E+01	1.327E+02	1.989E+05	1.336E+01
2103	5.647E+02	4.777E+05	3.210E+01	1.275E+02	1.911E+05	1.284E+01
2104	5.426E+02	4.590E+05	3.084E+01	1.225E+02	1.836E+05	1.234E+01
2105	5.213E+02	4.410E+05	2.963E+01	1.177E+02	1.764E+05	1.185E+01
2106	5.008E+02	4.237E+05	2.847E+01	1.131E+02	1.695E+05	1.139E+01
2107	4.812E+02	4.071E+05	2.735E+01	1.086E+02	1.628E+05	1.094E+01
2108	4.623E+02	3.911E+05	2.628E+01	1.044E+02	1.564E+05	1.051E+01
2109	4.442E+02	3.758E+05	2.525E+01	1.003E+02	1.503E+05	1.010E+01
2110	4.268E+02	3.610E+05	2.426E+01	9.635E+01	1.444E+05	9.703E+00
2111	4.101E+02	3.469E+05	2.331E+01	9.257E+01	1.388E+05	9.323E+00
2112	3.940E+02	3.333E+05	2.239E+01	8.894E+01	1.333E+05	8.957E+00
2113	3.785E+02	3.202E+05	2.152E+01	8.545E+01	1.281E+05	8.606E+00
2114	3.637E+02	3.077E+05	2.067E+01	8.210E+01	1.231E+05	8.269E+00
2115	3.494E+02	2.956E+05	1.986E+01	7.888E+01	1.182E+05	7.944E+00
2116	3.357E+02	2.840E+05	1.908E+01	7.579E+01	1.136E+05	7.633E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2117	3.226E+02	2.729E+05	1.833E+01	7.282E+01	1.091E+05	7.334E+00
2118	3.099E+02	2.622E+05	1.762E+01	6.996E+01	1.049E+05	7.046E+00
2119	2.978E+02	2.519E+05	1.692E+01	6.722E+01	1.008E+05	6.770E+00
2120	2.861E+02	2.420E+05	1.626E+01	6.458E+01	9.681E+04	6.504E+00
2121	2.749E+02	2.325E+05	1.562E+01	6.205E+01	9.301E+04	6.249E+00
2122	2.641E+02	2.234E+05	1.501E+01	5.962E+01	8.936E+04	6.004E+00
2123	2.537E+02	2.146E+05	1.442E+01	5.728E+01	8.586E+04	5.769E+00
2124	2.438E+02	2.062E+05	1.386E+01	5.503E+01	8.249E+04	5.543E+00
2125	2.342E+02	1.981E+05	1.331E+01	5.288E+01	7.926E+04	5.325E+00
2126	2.250E+02	1.904E+05	1.279E+01	5.080E+01	7.615E+04	5.117E+00
2127	2.162E+02	1.829E+05	1.229E+01	4.881E+01	7.316E+04	4.916E+00
2128	2.077E+02	1.757E+05	1.181E+01	4.690E+01	7.030E+04	4.723E+00
2129	1.996E+02	1.688E+05	1.134E+01	4.506E+01	6.754E+04	4.538E+00
2130	1.918E+02	1.622E+05	1.090E+01	4.329E+01	6.489E+04	4.360E+00
2131	1.843E+02	1.559E+05	1.047E+01	4.159E+01	6.235E+04	4.189E+00
2132	1.770E+02	1.498E+05	1.006E+01	3.996E+01	5.990E+04	4.025E+00
2133	1.701E+02	1.439E+05	9.667E+00	3.840E+01	5.755E+04	3.867E+00
2134	1.634E+02	1.382E+05	9.288E+00	3.689E+01	5.530E+04	3.715E+00
2135	1.570E+02	1.328E+05	8.924E+00	3.544E+01	5.313E+04	3.570E+00
2136	1.509E+02	1.276E+05	8.574E+00	3.405E+01	5.104E+04	3.430E+00
2137	1.449E+02	1.226E+05	8.238E+00	3.272E+01	4.904E+04	3.295E+00
2138	1.393E+02	1.178E+05	7.915E+00	3.144E+01	4.712E+04	3.166E+00
2139	1.338E+02	1.132E+05	7.605E+00	3.020E+01	4.527E+04	3.042E+00
2140	1.285E+02	1.087E+05	7.307E+00	2.902E+01	4.350E+04	2.923E+00
2141	1.235E+02	1.045E+05	7.020E+00	2.788E+01	4.179E+04	2.808E+00
2142	1.187E+02	1.004E+05	6.745E+00	2.679E+01	4.015E+04	2.698E+00
2143	1.140E+02	9.645E+04	6.480E+00	2.574E+01	3.858E+04	2.592E+00
2144	1.095E+02	9.267E+04	6.226E+00	2.473E+01	3.707E+04	2.490E+00
2145	1.052E+02	8.903E+04	5.982E+00	2.376E+01	3.561E+04	2.393E+00
2146	1.011E+02	8.554E+04	5.748E+00	2.283E+01	3.422E+04	2.299E+00
2147	9.715E+01	8.219E+04	5.522E+00	2.193E+01	3.287E+04	2.209E+00
2148	9.334E+01	7.896E+04	5.306E+00	2.107E+01	3.159E+04	2.122E+00
2149	8.968E+01	7.587E+04	5.098E+00	2.025E+01	3.035E+04	2.039E+00
2150	8.617E+01	7.289E+04	4.898E+00	1.945E+01	2.916E+04	1.959E+00
2151	8.279E+01	7.004E+04	4.706E+00	1.869E+01	2.801E+04	1.882E+00
2152	7.954E+01	6.729E+04	4.521E+00	1.796E+01	2.692E+04	1.808E+00
2153	7.642E+01	6.465E+04	4.344E+00	1.725E+01	2.586E+04	1.738E+00
2154	7.343E+01	6.212E+04	4.174E+00	1.658E+01	2.485E+04	1.669E+00
2155	7.055E+01	5.968E+04	4.010E+00	1.593E+01	2.387E+04	1.604E+00
2156	6.778E+01	5.734E+04	3.853E+00	1.530E+01	2.294E+04	1.541E+00

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2016	0	0	0	0	0	0
2017	9.665E+02	5.280E+05	3.547E+01	5.376E+00	3.793E+03	2.548E-01
2018	1.895E+03	1.035E+06	6.956E+01	1.054E+01	7.437E+03	4.997E-01
2019	2.787E+03	1.523E+06	1.023E+02	1.550E+01	1.094E+04	7.349E-01
2020	3.644E+03	1.991E+06	1.338E+02	2.027E+01	1.430E+04	9.609E-01
2021	4.468E+03	2.441E+06	1.640E+02	2.485E+01	1.753E+04	1.178E+00
2022	5.259E+03	2.873E+06	1.930E+02	2.925E+01	2.064E+04	1.387E+00
2023	6.019E+03	3.288E+06	2.209E+02	3.348E+01	2.362E+04	1.587E+00
2024	6.750E+03	3.687E+06	2.478E+02	3.755E+01	2.649E+04	1.780E+00
2025	7.452E+03	4.071E+06	2.735E+02	4.145E+01	2.924E+04	1.965E+00
2026	8.126E+03	4.439E+06	2.983E+02	4.520E+01	3.189E+04	2.143E+00
2027	8.774E+03	4.793E+06	3.220E+02	4.880E+01	3.443E+04	2.313E+00
2028	9.396E+03	5.133E+06	3.449E+02	5.227E+01	3.687E+04	2.477E+00
2029	9.994E+03	5.460E+06	3.668E+02	5.559E+01	3.922E+04	2.635E+00
2030	9.728E+03	5.314E+06	3.571E+02	5.411E+01	3.817E+04	2.565E+00
2031	9.347E+03	5.106E+06	3.431E+02	5.199E+01	3.668E+04	2.464E+00
2032	8.980E+03	4.906E+06	3.296E+02	4.995E+01	3.524E+04	2.368E+00
2033	8.628E+03	4.713E+06	3.167E+02	4.799E+01	3.386E+04	2.275E+00
2034	8.290E+03	4.529E+06	3.043E+02	4.611E+01	3.253E+04	2.186E+00
2035	7.965E+03	4.351E+06	2.923E+02	4.430E+01	3.126E+04	2.100E+00
2036	7.652E+03	4.180E+06	2.809E+02	4.257E+01	3.003E+04	2.018E+00
2037	7.352E+03	4.017E+06	2.699E+02	4.090E+01	2.885E+04	1.939E+00
2038	7.064E+03	3.859E+06	2.593E+02	3.929E+01	2.772E+04	1.863E+00
2039	6.787E+03	3.708E+06	2.491E+02	3.775E+01	2.663E+04	1.790E+00
2040	6.521E+03	3.562E+06	2.394E+02	3.627E+01	2.559E+04	1.719E+00
2041	6.265E+03	3.423E+06	2.300E+02	3.485E+01	2.459E+04	1.652E+00
2042	6.020E+03	3.288E+06	2.210E+02	3.348E+01	2.362E+04	1.587E+00
2043	5.783E+03	3.160E+06	2.123E+02	3.217E+01	2.270E+04	1.525E+00
2044	5.557E+03	3.036E+06	2.040E+02	3.091E+01	2.181E+04	1.465E+00
2045	5.339E+03	2.917E+06	1.960E+02	2.970E+01	2.095E+04	1.408E+00
2046	5.129E+03	2.802E+06	1.883E+02	2.853E+01	2.013E+04	1.352E+00
2047	4.928E+03	2.692E+06	1.809E+02	2.741E+01	1.934E+04	1.299E+00
2048	4.735E+03	2.587E+06	1.738E+02	2.634E+01	1.858E+04	1.249E+00
2049	4.549E+03	2.485E+06	1.670E+02	2.531E+01	1.785E+04	1.200E+00
2050	4.371E+03	2.388E+06	1.604E+02	2.431E+01	1.715E+04	1.153E+00
2051	4.200E+03	2.294E+06	1.542E+02	2.336E+01	1.648E+04	1.107E+00
2052	4.035E+03	2.204E+06	1.481E+02	2.244E+01	1.583E+04	1.064E+00
2053	3.877E+03	2.118E+06	1.423E+02	2.156E+01	1.521E+04	1.022E+00
2054	3.725E+03	2.035E+06	1.367E+02	2.072E+01	1.462E+04	9.821E-01
2055	3.579E+03	1.955E+06	1.314E+02	1.991E+01	1.404E+04	9.436E-01
2056	3.438E+03	1.878E+06	1.262E+02	1.913E+01	1.349E+04	9.066E-01
2057	3.304E+03	1.805E+06	1.213E+02	1.838E+01	1.296E+04	8.711E-01
2058	3.174E+03	1.734E+06	1.165E+02	1.766E+01	1.246E+04	8.369E-01
2059	3.050E+03	1.666E+06	1.119E+02	1.696E+01	1.197E+04	8.041E-01
2060	2.930E+03	1.601E+06	1.075E+02	1.630E+01	1.150E+04	7.726E-01
2061	2.815E+03	1.538E+06	1.033E+02	1.566E+01	1.105E+04	7.423E-01
2062	2.705E+03	1.478E+06	9.928E+01	1.505E+01	1.061E+04	7.132E-01
2063	2.599E+03	1.420E+06	9.539E+01	1.446E+01	1.020E+04	6.852E-01
2064	2.497E+03	1.364E+06	9.165E+01	1.389E+01	9.798E+03	6.583E-01
2065	2.399E+03	1.311E+06	8.805E+01	1.334E+01	9.414E+03	6.325E-01

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2066	2.305E+03	1.259E+06	8.460E+01	1.282E+01	9.045E+03	6.077E-01
2067	2.214E+03	1.210E+06	8.128E+01	1.232E+01	8.690E+03	5.839E-01
2068	2.128E+03	1.162E+06	7.810E+01	1.184E+01	8.349E+03	5.610E-01
2069	2.044E+03	1.117E+06	7.503E+01	1.137E+01	8.022E+03	5.390E-01
2070	1.964E+03	1.073E+06	7.209E+01	1.093E+01	7.707E+03	5.179E-01
2071	1.887E+03	1.031E+06	6.926E+01	1.050E+01	7.405E+03	4.976E-01
2072	1.813E+03	9.905E+05	6.655E+01	1.009E+01	7.115E+03	4.780E-01
2073	1.742E+03	9.516E+05	6.394E+01	9.690E+00	6.836E+03	4.593E-01
2074	1.674E+03	9.143E+05	6.143E+01	9.310E+00	6.568E+03	4.413E-01
2075	1.608E+03	8.785E+05	5.902E+01	8.945E+00	6.310E+03	4.240E-01
2076	1.545E+03	8.440E+05	5.671E+01	8.594E+00	6.063E+03	4.074E-01
2077	1.484E+03	8.109E+05	5.449E+01	8.257E+00	5.825E+03	3.914E-01
2078	1.426E+03	7.791E+05	5.235E+01	7.933E+00	5.597E+03	3.760E-01
2079	1.370E+03	7.486E+05	5.030E+01	7.622E+00	5.377E+03	3.613E-01
2080	1.317E+03	7.192E+05	4.832E+01	7.323E+00	5.166E+03	3.471E-01
2081	1.265E+03	6.910E+05	4.643E+01	7.036E+00	4.964E+03	3.335E-01
2082	1.215E+03	6.639E+05	4.461E+01	6.760E+00	4.769E+03	3.204E-01
2083	1.168E+03	6.379E+05	4.286E+01	6.495E+00	4.582E+03	3.079E-01
2084	1.122E+03	6.129E+05	4.118E+01	6.241E+00	4.403E+03	2.958E-01
2085	1.078E+03	5.889E+05	3.956E+01	5.996E+00	4.230E+03	2.842E-01
2086	1.036E+03	5.658E+05	3.801E+01	5.761E+00	4.064E+03	2.731E-01
2087	9.950E+02	5.436E+05	3.652E+01	5.535E+00	3.905E+03	2.624E-01
2088	9.560E+02	5.223E+05	3.509E+01	5.318E+00	3.752E+03	2.521E-01
2089	9.185E+02	5.018E+05	3.371E+01	5.109E+00	3.604E+03	2.422E-01
2090	8.825E+02	4.821E+05	3.239E+01	4.909E+00	3.463E+03	2.327E-01
2091	8.479E+02	4.632E+05	3.112E+01	4.716E+00	3.327E+03	2.236E-01
2092	8.147E+02	4.450E+05	2.990E+01	4.532E+00	3.197E+03	2.148E-01
2093	7.827E+02	4.276E+05	2.873E+01	4.354E+00	3.072E+03	2.064E-01
2094	7.520E+02	4.108E+05	2.760E+01	4.183E+00	2.951E+03	1.983E-01
2095	7.225E+02	3.947E+05	2.652E+01	4.019E+00	2.835E+03	1.905E-01
2096	6.942E+02	3.792E+05	2.548E+01	3.862E+00	2.724E+03	1.830E-01
2097	6.670E+02	3.644E+05	2.448E+01	3.710E+00	2.617E+03	1.759E-01
2098	6.408E+02	3.501E+05	2.352E+01	3.565E+00	2.515E+03	1.690E-01
2099	6.157E+02	3.364E+05	2.260E+01	3.425E+00	2.416E+03	1.623E-01
2100	5.916E+02	3.232E+05	2.171E+01	3.291E+00	2.321E+03	1.560E-01
2101	5.684E+02	3.105E+05	2.086E+01	3.162E+00	2.230E+03	1.499E-01
2102	5.461E+02	2.983E+05	2.004E+01	3.038E+00	2.143E+03	1.440E-01
2103	5.247E+02	2.866E+05	1.926E+01	2.918E+00	2.059E+03	1.383E-01
2104	5.041E+02	2.754E+05	1.850E+01	2.804E+00	1.978E+03	1.329E-01
2105	4.843E+02	2.646E+05	1.778E+01	2.694E+00	1.901E+03	1.277E-01
2106	4.653E+02	2.542E+05	1.708E+01	2.588E+00	1.826E+03	1.227E-01
2107	4.471E+02	2.442E+05	1.641E+01	2.487E+00	1.754E+03	1.179E-01
2108	4.296E+02	2.347E+05	1.577E+01	2.389E+00	1.686E+03	1.133E-01
2109	4.127E+02	2.255E+05	1.515E+01	2.296E+00	1.620E+03	1.088E-01
2110	3.965E+02	2.166E+05	1.456E+01	2.206E+00	1.556E+03	1.046E-01
2111	3.810E+02	2.081E+05	1.398E+01	2.119E+00	1.495E+03	1.005E-01
2112	3.660E+02	2.000E+05	1.344E+01	2.036E+00	1.436E+03	9.652E-02
2113	3.517E+02	1.921E+05	1.291E+01	1.956E+00	1.380E+03	9.273E-02
2114	3.379E+02	1.846E+05	1.240E+01	1.880E+00	1.326E+03	8.909E-02
2115	3.247E+02	1.774E+05	1.192E+01	1.806E+00	1.274E+03	8.560E-02
2116	3.119E+02	1.704E+05	1.145E+01	1.735E+00	1.224E+03	8.225E-02

Results (Continued)

Year	Carbon dioxide			Hydrogen sulfide		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2117	2.997E+02	1.637E+05	1.100E+01	1.667E+00	1.176E+03	7.902E-02
2118	2.879E+02	1.573E+05	1.057E+01	1.602E+00	1.130E+03	7.592E-02
2119	2.767E+02	1.511E+05	1.015E+01	1.539E+00	1.086E+03	7.294E-02
2120	2.658E+02	1.452E+05	9.757E+00	1.479E+00	1.043E+03	7.008E-02
2121	2.554E+02	1.395E+05	9.374E+00	1.421E+00	1.002E+03	6.734E-02
2122	2.454E+02	1.340E+05	9.006E+00	1.365E+00	9.629E+02	6.470E-02
2123	2.357E+02	1.288E+05	8.653E+00	1.311E+00	9.251E+02	6.216E-02
2124	2.265E+02	1.237E+05	8.314E+00	1.260E+00	8.889E+02	5.972E-02
2125	2.176E+02	1.189E+05	7.988E+00	1.211E+00	8.540E+02	5.738E-02
2126	2.091E+02	1.142E+05	7.675E+00	1.163E+00	8.205E+02	5.513E-02
2127	2.009E+02	1.097E+05	7.374E+00	1.117E+00	7.883E+02	5.297E-02
2128	1.930E+02	1.054E+05	7.085E+00	1.074E+00	7.574E+02	5.089E-02
2129	1.854E+02	1.013E+05	6.807E+00	1.032E+00	7.277E+02	4.890E-02
2130	1.782E+02	9.734E+04	6.540E+00	9.911E-01	6.992E+02	4.698E-02
2131	1.712E+02	9.352E+04	6.284E+00	9.522E-01	6.718E+02	4.514E-02
2132	1.645E+02	8.985E+04	6.037E+00	9.149E-01	6.454E+02	4.337E-02
2133	1.580E+02	8.633E+04	5.800E+00	8.790E-01	6.201E+02	4.167E-02
2134	1.518E+02	8.294E+04	5.573E+00	8.446E-01	5.958E+02	4.003E-02
2135	1.459E+02	7.969E+04	5.355E+00	8.114E-01	5.725E+02	3.846E-02
2136	1.402E+02	7.657E+04	5.145E+00	7.796E-01	5.500E+02	3.696E-02
2137	1.347E+02	7.357E+04	4.943E+00	7.491E-01	5.284E+02	3.551E-02
2138	1.294E+02	7.068E+04	4.749E+00	7.197E-01	5.077E+02	3.411E-02
2139	1.243E+02	6.791E+04	4.563E+00	6.915E-01	4.878E+02	3.278E-02
2140	1.194E+02	6.525E+04	4.384E+00	6.644E-01	4.687E+02	3.149E-02
2141	1.148E+02	6.269E+04	4.212E+00	6.383E-01	4.503E+02	3.026E-02
2142	1.103E+02	6.023E+04	4.047E+00	6.133E-01	4.327E+02	2.907E-02
2143	1.059E+02	5.787E+04	3.888E+00	5.892E-01	4.157E+02	2.793E-02
2144	1.018E+02	5.560E+04	3.736E+00	5.661E-01	3.994E+02	2.683E-02
2145	9.778E+01	5.342E+04	3.589E+00	5.439E-01	3.837E+02	2.578E-02
2146	9.395E+01	5.132E+04	3.449E+00	5.226E-01	3.687E+02	2.477E-02
2147	9.027E+01	4.931E+04	3.313E+00	5.021E-01	3.542E+02	2.380E-02
2148	8.673E+01	4.738E+04	3.183E+00	4.824E-01	3.403E+02	2.287E-02
2149	8.333E+01	4.552E+04	3.059E+00	4.635E-01	3.270E+02	2.197E-02
2150	8.006E+01	4.374E+04	2.939E+00	4.453E-01	3.142E+02	2.111E-02
2151	7.692E+01	4.202E+04	2.823E+00	4.279E-01	3.019E+02	2.028E-02
2152	7.390E+01	4.037E+04	2.713E+00	4.111E-01	2.900E+02	1.949E-02
2153	7.101E+01	3.879E+04	2.606E+00	3.950E-01	2.786E+02	1.872E-02
2154	6.822E+01	3.727E+04	2.504E+00	3.795E-01	2.677E+02	1.799E-02
2155	6.555E+01	3.581E+04	2.406E+00	3.646E-01	2.572E+02	1.728E-02
2156	6.298E+01	3.440E+04	2.312E+00	3.503E-01	2.471E+02	1.660E-02

Appendix C-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill
Reference Number: 002
Carroll Landfill

Proposed Uncontrolled Emissions Summary
LandGEM 3.02 Results modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
1,1,2,2-Tetrachloroethane - HAP/VOC	3.40E-02	8.54E-03	3.74E-02	3.40E-02	8.54E-03	3.74E-02			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	5.96E-03	1.50E-03	6.55E-03	5.96E-03	1.50E-03	6.55E-03			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.22E-03	5.58E-04	2.45E-03	2.22E-03	5.58E-04	2.45E-03			
Acrylonitrile - HAP/VOC	4.02E-04	1.01E-04	4.42E-04	4.02E-04	1.01E-04	4.42E-04			
Benzene - No or Unknown Co-disposal - HAP/VOC	7.10E-02	1.78E-02	7.80E-02	7.10E-02	1.78E-02	7.80E-02			
Carbon tetrachloride - HAP/VOC/ODC	4.65E-04	1.17E-04	5.11E-04	4.65E-04	1.17E-04	5.11E-04	4.65E-04	1.17E-04	5.11E-04
Chloroform - HAP/VOC	3.20E-03	8.03E-04	3.52E-03	3.20E-03	8.03E-04	3.52E-03			
Ethylene dibromide - HAP/VOC	1.13E-02	2.84E-03	1.24E-02	1.13E-02	2.84E-03	1.24E-02			
Mercury (total) - HAP				9.26E-06	2.33E-06	1.02E-05			
* Perchloroethylene (tetrachloroethylene) - HAP				1.27E-01	3.20E-02	1.40E-01			
Trichloroethylene (trichloroethene) - HAP/VOC	4.12E-02	1.03E-02	4.53E-02	4.12E-02	1.03E-02	4.53E-02			
Vinyl chloride - HAP/VOC	3.36E-02	8.44E-03	3.69E-02	3.36E-02	8.44E-03	3.69E-02			
1,1,2-trichloroethane - HAP/VOC	7.98E-03	2.00E-03	8.78E-03	7.98E-03	2.00E-03	8.78E-03			
1,3-butadiene - HAP/VOC	3.40E-03	8.53E-04	3.74E-03	3.40E-03	8.53E-04	3.74E-03			
Acetaldehyde - HAP/VOC	1.29E-03	3.24E-04	1.42E-03	1.29E-03	3.24E-04	1.42E-03			
Benzyl chloride - HAP/VOC	8.67E-04	2.18E-04	9.54E-04	8.67E-04	2.18E-04	9.54E-04			
cis-1,3-dichloropropene - HAP/VOC	1.27E-04	3.20E-05	1.40E-04	1.27E-04	3.20E-05	1.40E-04			
Formaldehyde - HAP/VOC	1.33E-04	3.34E-05	1.46E-04	1.33E-04	3.34E-05	1.46E-04			
trans-1,3-dichloropropene - HAP/VOC	3.96E-04	9.95E-05	4.36E-04	3.96E-04	9.95E-05	4.36E-04			
TOTALS	2.03E-01	5.10E-02	2.24E-01	3.31E-01	8.30E-02	3.64E-01	4.65E-04	1.17E-04	5.11E-04

Notes: [1] Emission Rates in Mg/yr and TPY were calculated using LandGEM 3.02 with AP-42 2008 Table 2.4-1 default concentrations
[2] Emission Rate in lbs/hr is based on 8,760 hours per year

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Appendix C-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill
Emission Point: Proposed New Waste's Contribution to 002
Carroll Landfill Expansion Application

Proposed Controlled Emissions Summary
Modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate								
	VOC			HAP			Other		
	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]	Mg/yr[1]	lbs/hr[2]	TPY[1]
1,1,2,2-Tetrachloroethane - HAP/VOC	4.15E-03	1.04E-03	4.57E-03	4.15E-03	1.04E-03	4.57E-03			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	7.28E-04	1.83E-04	8.01E-04	7.28E-04	1.83E-04	8.01E-04			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.72E-04	6.83E-05	2.99E-04	2.72E-04	6.83E-05	2.99E-04			
Acrylonitrile - HAP/VOC	4.91E-05	1.23E-05	5.40E-05	4.91E-05	1.23E-05	5.40E-05			
Benzene - No or Unknown Co-disposal - HAP/VOC	8.67E-03	2.18E-03	9.54E-03	8.67E-03	2.18E-03	9.54E-03			
Carbon tetrachloride - HAP/VOC/ODC	5.68E-05	1.43E-05	6.25E-05	5.68E-05	1.43E-05	6.25E-05	5.68E-05	1.43E-05	6.25E-05
Chloroform - HAP/VOC	3.91E-04	9.82E-05	4.30E-04	3.91E-04	9.82E-05	4.30E-04			
Ethylene dibromide - HAP/VOC	1.38E-03	3.47E-04	1.52E-03	1.38E-03	3.47E-04	1.52E-03			
Mercury (total) - HAP				8.95E-06	2.25E-06	9.84E-06			
* Perchloroethylene (tetrachloroethylene) - HAP				1.56E-02	3.91E-03	1.71E-02			
Trichloroethylene (trichloroethene) - HAP/VOC	5.03E-03	1.26E-03	5.54E-03	5.03E-03	1.26E-03	5.54E-03			
Vinyl chloride - HAP/VOC	4.11E-03	1.03E-03	4.52E-03	4.11E-03	1.03E-03	4.52E-03			
1,1,2-trichloroethane - HAP/VOC	9.75E-04	2.45E-04	1.07E-03	9.75E-04	2.45E-04	1.07E-03			
1,3-butadiene - HAP/VOC	4.15E-04	1.04E-04	4.57E-04	4.15E-04	1.04E-04	4.57E-04			
Acetaldehyde - HAP/VOC	1.58E-04	3.96E-05	1.74E-04	1.58E-04	3.96E-05	1.74E-04			
Benzyl chloride - HAP/VOC	1.06E-04	2.66E-05	1.17E-04	1.06E-04	2.66E-05	1.17E-04			
cis-1,3-dichloropropene - HAP/VOC	1.56E-05	3.91E-06	1.71E-05	1.56E-05	3.91E-06	1.71E-05			
Formaldehyde - HAP/VOC	1.63E-05	4.08E-06	1.79E-05	1.63E-05	4.08E-06	1.79E-05			
trans-1,3-dichloropropene - HAP/VOC	4.84E-05	1.22E-05	5.33E-05	4.84E-05	1.22E-05	5.33E-05			
TOTALS	2.48E-02	6.24E-03	2.73E-02	4.04E-02	1.02E-02	4.45E-02	5.68E-05	1.43E-05	6.25E-05

Notes: [1] Emission Rates were calculated using the formula, collection efficiency, methane oxidation factor, and flare control efficiencies for speciated parameters as presented in Section A.1 of Appendix A-S

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Appendix C-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll & Proposed Carroll C&D Debris Landfills
Emission Point: 002 (TOTAL)
Carroll Landfill Expansion Application

Total Uncontrolled Emissions Summary
Modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate[1]								
	VOC			HAP			Other		
	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY
1,1,2,2-Tetrachloroethane - HAP/VOC	3.43E-02	8.61E-03	3.77E-02	3.43E-02	8.61E-03	3.77E-02			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	6.01E-03	1.51E-03	6.61E-03	6.01E-03	1.51E-03	6.61E-03			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.24E-03	5.64E-04	2.47E-03	2.24E-03	5.64E-04	2.47E-03			
Acrylonitrile - HAP/VOC	4.05E-04	1.02E-04	4.46E-04	4.05E-04	1.02E-04	4.46E-04			
Benzene - No or Unknown Co-disposal - HAP/VOC	7.16E-02	1.80E-02	7.88E-02	7.16E-02	1.80E-02	7.88E-02			
Carbon tetrachloride - HAP/VOC/ODC	4.69E-04	1.18E-04	5.16E-04	4.69E-04	1.18E-04	5.16E-04	4.69E-04	1.18E-04	5.16E-04
Chloroform - HAP/VOC	3.23E-03	8.11E-04	3.55E-03	3.23E-03	8.11E-04	3.55E-03			
Ethylene dibromide - HAP/VOC	1.14E-02	2.87E-03	1.26E-02	1.14E-02	2.87E-03	1.26E-02			
Mercury (total) - HAP				9.35E-06	2.35E-06	1.03E-05			
* Perchloroethylene (tetrachloroethylene) - HAP				1.29E-01	3.23E-02	1.41E-01			
Trichloroethylene (trichloroethene) - HAP/VOC	4.16E-02	1.04E-02	4.57E-02	4.16E-02	1.04E-02	4.57E-02			
Vinyl chloride - HAP/VOC	3.39E-02	8.51E-03	3.73E-02	3.39E-02	8.51E-03	3.73E-02			
1,1,2-trichloroethane - HAP/VOC	8.05E-03	2.02E-03	8.86E-03	8.05E-03	2.02E-03	8.86E-03			
1,3-butadiene - HAP/VOC	3.43E-03	8.61E-04	3.77E-03	3.43E-03	8.61E-04	3.77E-03			
Acetaldehyde - HAP/VOC	1.30E-03	3.27E-04	1.43E-03	1.30E-03	3.27E-04	1.43E-03			
Benzyl chloride - HAP/VOC	8.75E-04	2.20E-04	9.63E-04	8.75E-04	2.20E-04	9.63E-04			
cis-1,3-dichloropropene - HAP/VOC	1.28E-04	3.23E-05	1.41E-04	1.28E-04	3.23E-05	1.41E-04			
Formaldehyde - HAP/VOC	1.34E-04	3.37E-05	1.48E-04	1.34E-04	3.37E-05	1.48E-04			
trans-1,3-dichloropropene - HAP/VOC	4.00E-04	1.00E-04	4.40E-04	4.00E-04	1.00E-04	4.40E-04			
TOTALS	2.05E-01	5.15E-02	2.26E-01	3.34E-01	8.38E-02	3.67E-01	4.69E-04	1.18E-04	5.16E-04

Notes: [1] Emission Rate = Jones-Carroll Uncontrolled + Proposed Carroll Uncontrolled

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

Source: Existing Jones-Carroll & Proposed Carroll C&D Debris Landfills
Emission Point: 002 (TOTAL)
Carroll Landfill Expansion Application

Total Controlled Emissions Summary
Modified for AP-42 2008
Inventory for Year 2029

High Toxicity Air Contaminant	Emission Rate[1]								
	VOC			HAP			Other		
	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY	Mg/yr	lbs/hr	TPY
1,1,2,2-Tetrachloroethane - HAP/VOC	4.19E-03	1.05E-03	4.61E-03	4.19E-03	1.05E-03	4.61E-03			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	7.35E-04	1.84E-04	8.08E-04	7.35E-04	1.84E-04	8.08E-04			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	2.74E-04	6.89E-05	3.02E-04	2.74E-04	6.89E-05	3.02E-04			
Acrylonitrile - HAP/VOC	4.95E-05	1.24E-05	5.45E-05	4.95E-05	1.24E-05	5.45E-05			
Benzene - No or Unknown Co-disposal - HAP/VOC	8.75E-03	2.20E-03	9.63E-03	8.75E-03	2.20E-03	9.63E-03			
Carbon tetrachloride - HAP/VOC/ODC	5.73E-05	1.44E-05	6.30E-05	5.73E-05	1.44E-05	6.30E-05	5.73E-05	1.44E-05	6.30E-05
Chloroform - HAP/VOC	3.95E-04	9.91E-05	4.34E-04	3.95E-04	9.91E-05	4.34E-04			
Ethylene dibromide - HAP/VOC	1.39E-03	3.50E-04	1.53E-03	1.39E-03	3.50E-04	1.53E-03			
Mercury (total) - HAP				9.03E-06	2.27E-06	9.93E-06			
* Perchloroethylene (tetrachloroethylene) - HAP				1.57E-02	3.95E-03	1.73E-02			
Trichloroethylene (trichloroethene) - HAP/VOC	5.08E-03	1.28E-03	5.59E-03	5.08E-03	1.28E-03	5.59E-03			
Vinyl chloride - HAP/VOC	4.14E-03	1.04E-03	4.56E-03	4.14E-03	1.04E-03	4.56E-03			
1,1,2-trichloroethane - HAP/VOC	9.84E-04	2.47E-04	1.08E-03	9.84E-04	2.47E-04	1.08E-03			
1,3-butadiene - HAP/VOC	4.19E-04	1.05E-04	4.61E-04	4.19E-04	1.05E-04	4.61E-04			
Acetaldehyde - HAP/VOC	1.59E-04	4.00E-05	1.75E-04	1.59E-04	4.00E-05	1.75E-04			
Benzyl chloride - HAP/VOC	1.07E-04	2.69E-05	1.18E-04	1.07E-04	2.69E-05	1.18E-04			
cis-1,3-dichloropropene - HAP/VOC	1.57E-05	3.94E-06	1.73E-05	1.57E-05	3.94E-06	1.73E-05			
Formaldehyde - HAP/VOC	1.64E-05	4.12E-06	1.80E-05	1.64E-05	4.12E-06	1.80E-05			
trans-1,3-dichloropropene - HAP/VOC	4.89E-05	1.23E-05	5.37E-05	4.89E-05	1.23E-05	5.37E-05			
TOTALS	0.03	0.01	0.03	0.04	0.01	0.04	0.00	0.00	0.00

Notes: [1] Emission Rate = Jones-Carroll Controlled + Proposed Carroll Controlled

* Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity

AIR QUALITY MONITORING PLAN, Rev 3

By: Daigler Engineering, P.C.

March 2015
Last Revised: April 2017

AIR QUALITY MONITORING PLAN

CARROLL LANDFILL

CARROLL, NEW YORK

SEALAND WASTE, LLC

Prepared on behalf of:

Sealand Waste, LLC
85 High Tech Drive
Rush, New York 14543

Prepared by:

DAIGLER ENGINEERING P.C.
2620 Grand Island Blvd.
Grand Island, New York 14072-2131

March 2015

Last Revised April 2017

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AIR QUALITY MONITORING PLAN

Sealand Waste, LLC

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AIR QUALITY MONITORING PLAN

Sealand Waste, LLC

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1 INTRODUCTION

Landfill gas (LFG) is produced by all landfills as the waste within biodegrades. Construction and demolition (C&D) debris landfills typically have low levels of biodegradable wastes, estimated at 40% or less of the accepted waste, and therefore, produce significantly less LFG than municipal solid waste landfills. However, C&D landfills can emit significant quantities of hydrogen sulfide (H_2S), which is an odorous gas that produces the rotten egg smell. The biodegradation of drywall, a growing component[1] of C&D debris waste, is the known culprit of elevated H_2S emissions from C&D landfills.

1.1 PURPOSE

The primary purpose of the Air Quality Monitoring Plan (AQMP) is to detect offensive odors from hydrogen sulfide emissions generated by the biodegrading drywall and other C&D wastes before they become an offsite nuisance. The monitoring plan also shall confirm state and federal regulations are met in accordance with the Carroll Landfill's Air State Facility Permit. The AQMP also will be used as a check to help ensure the Landfill Gas Collection and Control System (LFGCCS) is running properly.

1.2 REGULATORY REQUIREMENTS

The regulations provided in 6 NYCRR Subpart 360-7 require LFG control systems to prevent migration of landfill gases offsite in compliance with subdivision 360-2.15(e). This subdivision states that a gas venting layer must be designed and constructed upon landfill closure in accordance with the regulations in subdivision 360-2.13(p). The construction requirements call for a permeable gas venting layer to be incorporated into the final cover system which vents to the atmosphere through riser pipes installed at a spacing of one per acre of final cover. Therefore, there is no direct regulatory mandate for the LFGCCS proposed for the Carroll Landfill.

That said, one of the purposes of the LFG control system, as stated in subdivision 360-2.15(e), is control of objectionable odors due to LFG emissions. NYSDEC's Division of Air Resources has a similar requirement in 6 NYCRR section 211.1 which states that emissions of air contaminants

[1] Sandler, K. (2003). Analyzing What's Recyclable in C&D Debris. Biocycle. 44(11), November, 51-54. Available online at www.epa.gov/climatechange/wcyd/waste/downloads /Analyzing_C_D_Debris.pdf. Accessed on 7/28/11.

that “unreasonably interfere with the comfortable enjoyment of life or property”, including odors, are prohibited. Due to the estimated elevated levels of H_2S, it is reasonable to assume that a more sophisticated LFG control system will be necessary to control objectionable odors. The LFGCCS as described in Section 2 has been designed to meet this objective of subdivision 360-2.15(e).

According to calculations detailed elsewhere[2], all estimated emission rates for the facility are below their respective thresholds to be classified as a major source. However, the conservative estimate for H_2S and Greenhouse Gases (GHGs) exceed 50 TPY and 50,000 TPY in CO_2-e, respectively. Therefore, the facility is subject to an Air State Facility Permit. Air State Facility Permits are issued in New York State under Subpart 201-5.

One purpose of the Air State Facility Permit according to the New York State Department of Environmental Conservation (NYSDEC) is to help ensure ambient air quality standards listed in 6 NYCRR Part 257 are met. Ambient air quality limits for H_2S are provided in Subpart 257-10. The maximum average H_2S concentration within any given one-hour period must be less than 0.01 parts per million (ppm). This AQMP will be implemented to document compliance with the H_2S ambient air quality standard. The thresholds contained herein are mandated as stated conditions of the Carroll Landfill’s Air State Facility Permit.

[2] Daigler Engineering, PC. (2015) *Air Emissions Inventory for the Draft Environmental Impact Statement, Carroll Landfill Expansion Application, Revision 3*; Last revised March 2015 and Daigler Engineering, P.C. (2017) *Supplemental Air Emissions Inventory, Carroll Landfill Expansion Application, Revision 1,* Last revised March 2017.

2 LANDFILL GAS COLLECTION AND CONTROL SYSTEM DESCRIPTION

The basic components of the LFGCCS are briefly described below. For additional details of the LFGCCS, see Section 4.8 of the Engineering Report.

2.1 COLLECTION SYSTEM

The LFG collection system is composed of the following:

- Main header;
- Subheaders;
- Wellheads;
- Condensate drains;
- Primary leachate collection and removal system (PLCRS) collectors;
- Horizontal collectors;
- Vertical collectors (if required); and,
- Gas venting layer.

The LFG collection system will be an active system using vacuum pressure created by one or more blowers to pull the landfill gas into the collectors connected to the subheader pipes that direct the collected gas to the main header pipe. Condensate must be removed from the LFGCCS. Condensate drains are positioned at the low points of the main header to allow for condensate drainage into the PLRCS. A wellhead is to be installed at each connection of below-grade, horizontal collectors to the main header, at each above-grade, horizontal collector to the sub-headers and between each PLCRS cleanout riser and the main header. Vertical collectors will be installed if the collection efficiency of the horizontal collectors declines to a degree that the LFGCCS is no longer effective. Upon closure, a gas venting layer will be placed directly below a geomembrane barrier layer in compliance with Part 360 regulations. The gas venting layer will not vent directly to the atmosphere as its name implies and as is allowed by the applicable Part 360 regulations. Instead, the gas venting layer will be connected to the subheader trenches and incorporated into the LFGCCS.

2.2 EXTRACTION AND CONTROL SYSTEM

The extraction and control system includes:

- Knockout pot;
- One or more blowers;
- H_2S control units; and,
- Enclosed LFG flare.

The main header pipe from the collection system will direct landfill gas to the extraction and control system. The knockout pot removes moisture from the LFG pulled from the collection system by the blowers. SulfaTreat adsorber vessels will be installed as pretreatment to the enclosed LFG flare. The flare and the SulfaTreat system operate together and comprise the control system. The enclosed flare will control GHGs, hazardous air pollutants, and volatile organic compounds that are found within LFG. Combustion of H_2S gas and other sulfur containing compounds will produce secondary emissions of sulfur dioxide. Sulfur dioxide itself is a regulated air pollutant with its own ambient air quality standards. The SulfaTreat system will be installed in a lead-lag arrangement to pretreat the LFG prior to the enclosed flare. The SulfaTreat media adsorbs H_2S, removing it from the LFG to control secondary emissions of sulfur dioxide from the enclosed flare.

3 AIR QUALITY MONITORING

3.1 PLAN DESCRIPTION

The AQMP will be implemented to measure and record landfill gas component concentrations and percentages. As detailed below, the plan includes monitoring of LFG at wellheads and the inlet and outlets of the SulfaTreat adsorber vessels. Monitoring of the enclosed flare includes operational parameters, such as temperature and flow rate to help ensure proper operation. More information on the operation and maintenance of the LFGCCS is covered in the Carroll Landfill Operation and Maintenance Manual[3]. Ambient air monitoring will also be conducted through landfill surface scans and at points up and downwind of the landfill at the property boundary. Monitoring results will be evaluated and compared to allowable thresholds stipulated in the facility's Air State Facility Permit, see Section 4.

3.2 MONITORING LOCATIONS AND FREQUENCY

Monitoring will be performed at a number of locations at various frequencies, as summarized in Table 3-1.

TABLE 3-1: MONITORING LOCATIONS AND FREQUENCIES

Monitoring Locations	Frequency
SulfaTreat Inlet/Outlets	Continuous/Daily
Enclosed LFG Flare	Continuous/Daily
Wellheads	Monthly
Surface Scan Nodes	Quarterly
Upwind/Downwind Points	Quarterly

According to the Carroll Landfill's O&M Manual and Air State Facility Permit, LFG monitoring at the SulfaTreat control unit and enclosed flare will be continuous, or at a minimum interval of

[3] Daigler Engineering, PC. (2016), *Carroll Landfill Operation and Maintenance Manual, Revision 5*; Last revised September 2016. Or most recent version.

once per hour, with levels recorded daily. Wellheads are to be monitored monthly. The additional ambient air monitoring required by this AQMP will be conducted quarterly.

3.3 PARAMETERS OF INTEREST

Monitored parameters include: H_2S, carbon dioxide (CO_2), oxygen (O_2), balance gas (BAL), temperature, barometric pressure (BAR), relative pressure (REL), static pressure, flow rate, and total gas flow. Due to the small concentration of methane and other explosive gases, in LFG produced by C&D debris landfills, percent methane (CH_4) will be measured as well, but explosive gases are not expected to be a primary component of the gas as it would for a municipal waste landfill.

3.4 MONITORING PROTOCOLS

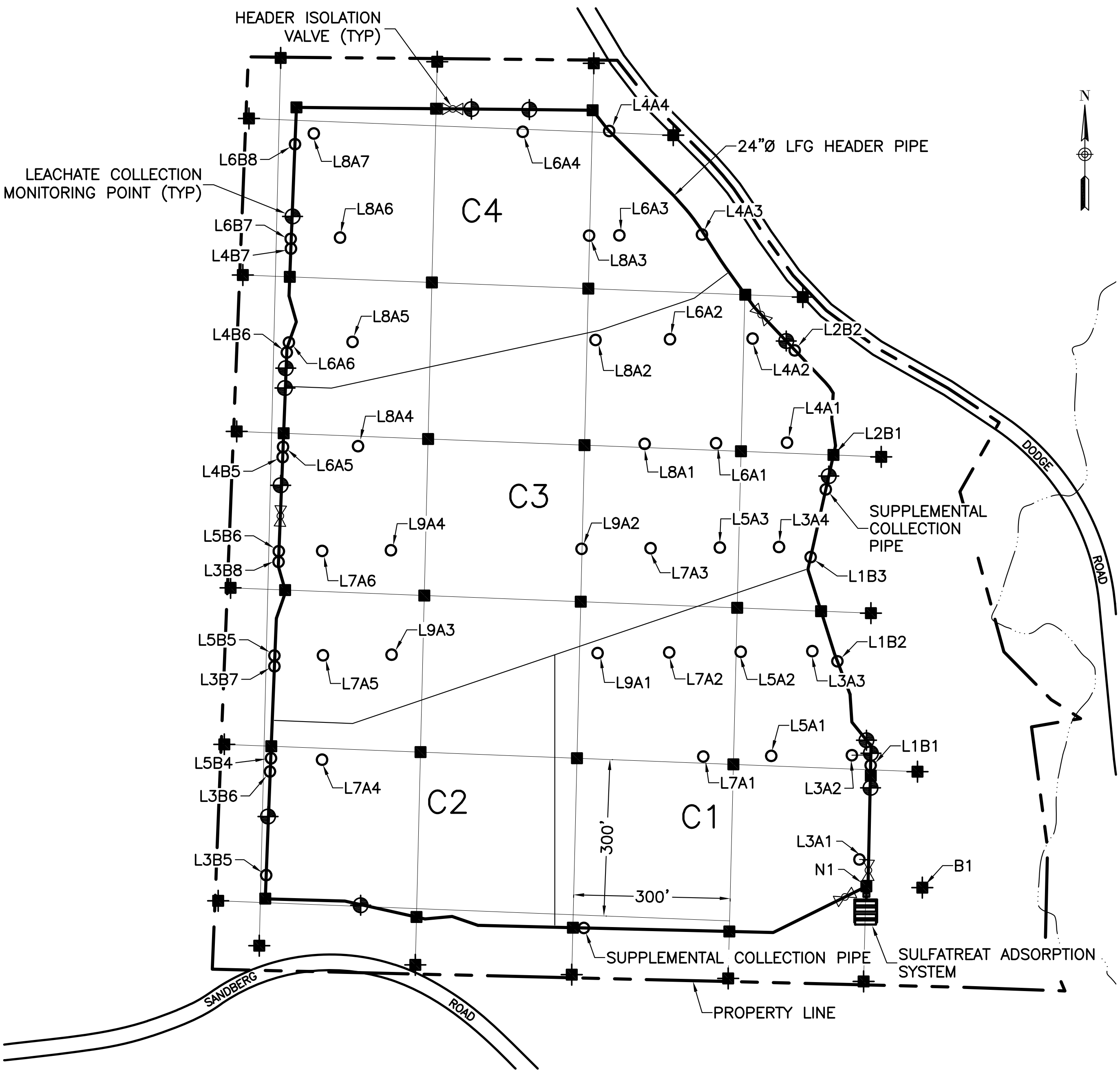
3.4.1 SulfaTreat Control Unit

To determine the efficiency of H_2S removed by the control system and document compliance with emission limits contained in the Air State Facility Permit, both the influent and the effluent gas concentrations will be monitored continuously, with the exception of H_2S which will be measured on a programmed regular interval of no less than once per hour. Both the lead and lag effluent will be monitored to help determine the appropriate media change-out time. The parameters of interest (H_2S, CO_2, O_2, and CH_4) will be read off the fixed gas analyzer and manually recorded daily on the Daily Landfill Gas SulfaTreat Control Unit Readings form provided in Appendix A. Instantaneous flow rate, totalized flow and temperature will be recorded from the gas flow meter and static pressure will be recorded from the pressure gauge on the inlet side of the SulfaTreat unit only. An effort will be made to record daily readings at roughly the same time every day.

In addition to the continuous monitoring of the SulfaTreat lead and lag unit effluent gas, manual measurements with a low-range H_2S, handheld device must be taken at the outlets of the SulfaTreat Control Units to confirm the low-level readings from the continuous monitor. These manual measurements must be performed quarterly, in conjunction with the surface scan event.

3.4.2 Enclosed LFG Flare

Controls on the enclosed LFG flare will monitor the temperature in the combustion chamber and be equipped with a low temperature alarm, at a minimum. Continuous temperature and total gas



LEGEND:

- SURFACE SCAN BASE LOCATIONS
- SURFACE SCAN NODE
- LFG SAMPLE PORT
- L1 COLLECTOR LEVEL IDENTIFIER
- B2 BELOW BERM/LATERAL NUMBER
- A1 ABOVE BERM/LATERAL NUMBER
- LEACHATE COLLECTION MONITORING POINT
- C1 LANDFILL CELL NUMBERS

NOTE:

THE 24" Ø LFG HEADER PIPE ROUGHLY COINCIDES WITH THE LIMIT OF WASTE. ONLY THE HEADER PIPE IS SHOWN HEREON FOR CLARITY.

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072
(716) 773-6872 (716) 773-6873 FAX

AIR QUALITY MONITORING PLAN

CARROLL LANDFILL EXPANSION APPLICATION

SEALAND WASTE, LLC			FIGURE 1
TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK	
November 2014	SCALE: 1"=300'	REVISION # 0	

Q:\Sealand\02-0104 Carroll Landfill\Air Quality Impacts\Air Quality Monitoring Plan\ACAD\AIR QUALITY MONITORING PLAN.dwg 11/20/2014 9:54 AM

flow data loggers will also be supplied with the flare. The control panel will be checked for any alarms or system malfunctions on a daily basis. Any such alarms will be documented and cleared. The current flare temperature and gas flow rate and damper positions will be recorded. The logged temperature data will be reviewed for minimum and maximum flare temperatures since the last daily observation. The pressure in the pilot fuel tank and the differential pressure across the flame arrestor will be recorded as well. Daily observations will be documented on the Daily Landfill Gas/Flare Readings Form (see Appendix A).

3.4.3 Wellheads

Wellheads come equipped with monitoring ports, making them ideal locations to take landfill gas measurements. At full buildout, there will be a total of 66 wellheads; 13 at connections to the PLCRS cleanouts, 34 above berm lateral connections, 17 below berm lateral connections and 2 supplemental LFG collectors. Each of these wellhead locations is shown on Figure 1. Measurements will be taken monthly at the monitoring ports of every operational wellhead and recorded on the Monthly Landfill Gas Wellhead Readings form provided in Appendix A. The monitoring equipment tube shall be secured on the sample port and the petcock handle shall be turned to allow the flow of air to enter the analyzer. Wellheads will be monitored for all parameters of interest, except for H_2S.

3.4.4 Surface Scans

Surface monitoring is completed by taking measurements in ambient air in intervals of 98.425 feet (30 meters) around the perimeter of the landfill and creating a grid inside the landfill of approximately 30 × 30 meters. The nodes, i.e., grid intersections, will be numbered in a serpentine pattern with the first node (N1) located on the southeast corner of the landfill perimeter. The rest of the nodes will be located by pacing with a compass and measuring wheel. The proposed grid pattern can be found on Figure 1. Sampling of the ambient air will occur at the limit of waste and at each node. This monitoring method will allow for samples to be taken across the entire area of the landfill surface.

The full grid of surface scan locations, as shown in Figure 1, consists of 194 nodes. However, node readings will only be taken if the node is located over daily cover, intermediate cover, or final cover. Locations over areas of the landfill not yet built will not be included in the quarterly events. Therefore, in the early stages of the landfill development the number of nodes will be much lower than is shown in Figure 1.

During surface scans, the inlet probe of the monitoring equipment shall be maintained a constant distance of one to two inches (three to five centimeters) above the ground by mounting the equipment on a pole or similar device. Surface scans will monitor all parameters of interest except for static pressure and flow rate. The probe inlet shall be held in place at each node until the readings stabilize (approximately two times the instrument response time at a minimum). Measured values will be recorded on the Quarterly Surface Scan Readings form provided in Appendix A. The quarterly form must be accompanied by a figure, such as Figure 1 with active node numbers labeled as they correspond to the measured values.

While traversing the landfill during surface scan events, the landfill cover will be visually observed to locate areas that indicate elevated levels of LFG, such as distressed vegetation or cracks and gaps in the cover. Additional ambient air measurements will be taken at these locations in a manner similar to other surface scan locations. The locations of these defects shall be noted on a drawing and the measurements recorded on the Quarterly Surface Scan Readings form. Any defects shall be brought to the Landfill Manager’s attention for immediate repair.

Quarterly surface scan events should be scheduled during favorable weather conditions, i.e., clear, calm days. Wind interference is the primary concern. Preferably, average wind speed during the event should be less than five miles per hour, with gusts not-to-exceed ten miles per hour. If these conditions are not met, a wind barrier, similar to a funnel surrounding the probe, must be employed while taking measurements. If average wind speeds are in excess of 25 miles per hour, the surface scan event must be re-scheduled.

3.4.5 Upwind and Downwind Background Locations

A background surface reading at one upwind and one downwind location shall be taken at the property boundary. The background readings will be located based on the wind direction taken from the onsite weather station. The background readings shall be taken in the same manner as the surface scan readings. Ambient air will be monitored for all parameters of interest except for static pressure and flow rate.

3.5 MONITORING EQUIPMENT

Two types of equipment will be used to complete the monitoring as detailed in this AQMP, portable and fixed analyzers. Equipment will be operated, calibrated, and maintained in accordance with instructions from the manufacturer.

3.5.1 Jerome J605 Gold Film Hydrogen Sulfide Analyzer

A portable gas monitor, Jerome J605 Gold Film Hydrogen Sulfide Analyzer manufactured by Arizona Instrument LLC of Chandler, Arizona (or equivalent), will be used to measure H_2S concentrations for surface scans, and upwind and downwind ambient air monitoring. The monitor can detect H_2S concentrations as low as three parts per billion (ppb) and will be sufficient for initiating odor control measures. The accuracy of the meter is ± one ppb in the low end of its range, up to 0.3 ppm at readings above five ppm.

TABLE 3-2: ACCEPTABLE RANGE FOR THE JEROME J605

Parameter of Interest	Range
H_2S	0.003 – 10 ppm

3.5.2 GEM™ 2000

The Jerome J605 Gold Film Hydrogen Sulfide Analyzer only detects H_2S, so another portable monitoring device is needed to measure the concentrations of the other parameters of interest. The GEM™ 2000, manufactured by LandTec of Colton, California, or an equivalent portable gas monitor, will be used to measure the CO_2, O_2, CH_4, BAL, temperature, BAR, and REL for the surface scan monitoring and upwind/downwind ambient air locations. The GEM™ 2000 will be used as the primary and only meter for LFG measurements taken at wellheads. Flow rate and static pressure will be measured by the GEM™ 2000 in addition to the parameters listed above.

TABLE 3-3: ACCEPTABLE RANGES FOR THE GEM™ 2000

Parameter of Interest	Range
CO_2	0 – 60 %
O_2	0 – 25 %
CH_4	0 – 100 %
BAL	0 – 100 %
Temperature	14 – 167 °F
BAR	0 – 100 in. WC
REL	0 – 10 in. WC
Static Pressure	0 – 100 in. WC
Flow rate	Note (1) scfm

Note (1): Depends on the model of Accu-Flo wellhead.

3.5.3 GA3000 PLUS

The GA3000 PLUS, manufactured by Geotechnical Instruments Ltd of Warwickshire, United Kingdom, will be used to monitor H_2S, CH_4, CO_2, and O_2 at the SulfaTreat inlet and outlets. The GA3000 PLUS is a fixed landfill gas analyzer. The reading interval is user defined up to continuous. However, the continuous reading option is not available for H_2S. Readings for H_2S will be taken at a minimum of once every hour. The accuracy of the H_2S analyzer is ±100 ppm or 5% of the reading whichever is greater for the inlet end range and 1.5% of the reading for the outlet end range. Accuracy on the other parameters range from 0.5 to 2.0% depending on the parameter and the reading.

TABLE 3-4: ACCEPTABLE RANGES FOR THE GA3000 PLUS

Parameter of Interest	Range
H_2S (inlet end)	0 – 5,000 ppm
H_2S (outlet end)	0 – 50 ppm
CH_4	0 – 100 %
CO_2	0 – 100 %
O_2	0 – 25 %

3.5.4 Accu-Flo Meter

The Accu-Flo meter, manufactured by LandTec of Colton, California (or equivalent), will be used to measure the LFG flow rate and temperature before the control system. The Accu-Flo meter displays both mass flow rate and totalized flow. The meter will be placed before the influent monitoring point to obtain the most accurate flow rate measurement without the obstruction of the media.

TABLE 3-5: ACCEPTABLE RANGES FOR THE ACCU-FLO METER

Parameter of Interest	Range
Flow Rate	5 scfm (minimum)
Temperature	(-40) – 200 °F

3.5.5 Magnehelic® Gage

The site vacuum, filter differential, and positive pressure to the control unit will be measured by a Magnehelic® gage manufactured by Dwyer Instruments, Inc. of Michigan City, Indiana (or equivalent). This gage is a fixed meter with available models that range from 0.05 up to 250 inches of water column (in. WC).

3.6 MONITORING DATA EVALUATIONS

Daily gas flow rate measurements recorded at the inlet to the SulfaTreat control unit will be used to calculate a 30-day rolling average. The calculation is to be performed each day following data collection by summing the previous 29 days plus the current measurement, then dividing by 30. For non-business days (weekends or holidays), or in the event that a daily record is inadvertently missed, an average daily flow rate will be calculated using the flow totalizer readings to fill in the missing readings.

The control system reportedly has a removal efficiency greater or equal to 99.925%. Using the measured inlet and outlet values obtained during daily monitoring, the removal efficiency will be calculated using the following equation:

$$removal\ efficiency\ (\%) = \frac{(inlet\ concentration - outlet\ concentration)}{inlet\ concentration} \times 100$$

Removal efficiency of both the individual adsorber units and the system as a whole will be computed.

3.7 NOTIFICATION, REPORTING, AND RECORDKEEPING

In the event any of the thresholds discussed in Section 4 are exceeded, the NYSDEC will be notified within 24 hours. Within 28 days, a written report of the incident, including the remediation measures taken to address the problem and actions that will be implemented to prevent a repeat occurrence, shall be submitted to the NYSDEC.

Normal reporting will be quarterly (based on the calendar year) and shall include all measurements collected during the quarterly H_2S surface scan events. The raw results as recorded on the Quarterly Surface Scan Readings log sheets (Appendix A) will be submitted to the NYSDEC for the reporting period. The submission to the NYSDEC will also include a monitoring location map, probe calibration information, and a brief discussion of the data collected and the weather on the collection date. Quarterly reports are due 30 days after the reporting period and shall be submitted to the Regional Air Pollution Control Engineer at the following address:

Division of Air Resources
NYS Department of Environmental Conservation
Region 9
270 Michigan Ave.
Buffalo, NY 14203

All monitoring logs and evaluations performed under this Plan are to be maintained onsite for a minimum five-year period. The records must be easily accessible and made available upon request by the NYSDEC.

4 THRESHOLDS AND CONTINGENCY MEASURES

4.1 THRESHOLDS

A threshold of 617 scfm is placed on the 30-day rolling average flow rate by the facility's permit. Modeling performed as part of permitting process predicted the maximum expected total collected gas flow rate to be 617 scfm. Should the 30-day rolling average flow rate exceed this upper permit limit, emissions estimates and/or the operation and design of the LFGCCS may need to be re-evaluated.

Temperature monitoring of the enclosed flare's combustion chamber has an upper and lower permit limit of 1,600 and 1,400 degrees Fahrenheit, respectively. Operating temperatures must not fall outside this range, except under normal startup and shutdown procedures.

The human nose can detect H_2S at low concentrations of approximately 8 ppb. Given its disagreeable odor, the NYSDEC set an ambient air quality standard of 10 ppb for a one-hour average. Site--specific air dispersion modeling was performed for the proposed Carroll Landfill using AERMOD under a NYSDEC accepted protocol. The modeling used proposed thresholds of 10 ppm for an average surface scan concentration and 3 ppm for the maximum SulfaTreat outlet concentration. The maximum resulting H_2S emission rates were, on average, 9.8 $\mu g/m^3$ with a one-hour averaging time, or approximately 70% of the one-hour State H_2S ambient air standard of14 $\mu g/m^3$ (0.01 ppm), and 0.22 $\mu g/m^3$ with an annual averaging time, or 11% of the annual guidance concentration specified in the NYSDEC DAR-1[4] Tables of 2 $\mu g/m^3$, for the three years of meteorological data modeled. The proposed thresholds, as listed in the table below, are considered sufficient to prevent a violation of ambient air quality standards for H_2S and sulfur dioxide.

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[4] New York State Department of Environmental Conservation (NYSDEC) (1997). Guidelines for the control of toxic ambient air contaminants. Division of Air Resources, Air Guide-1, Issued November 21, 1997.

TABLE 4-1: THRESHOLDS FOR THE CARROLL LANDFILL

Monitoring Location	Parameter	Threshold
SulfaTreat Control Unit Inlet	Flow rate	617 scfm (30-day rolling average)
Flare Combustion Chamber	Temperature	1,400 – 1,600 °F
SulfaTreat Lag Unit Outlet	H_2S	3 ppmv (maximum, not-to-exceed value)
Surface Scan Nodes	H_2S	10 ppmv (maximum, not-to-exceed value)
Upwind/Downwind Background Locations	H_2S	10 ppmv (maximum, not-to-exceed value)

4.2 CONTINGENCY MONITORING

In the event an exceedance of a H_2S threshold is identified during a quarterly monitoring event, the following steps should be taken similar to the program specified in the New Source Performance Standards for municipal solid waste landfills (40 CFR 60, Subpart WWW)[5]:

1. Notify the NYSDEC as soon as is practicable after identifying the threshold exceedance;
2. Implement corrective actions (see Section 4.3); and,
3. Repeat monitoring within ten days of of the first exceedance.

If the re-monitoring event results in a second threshold exceedance, further corrective action will be taken in a timely manner followed by a third re-monitoring event. In the event that a third exceedance occurs within the same quarterly period, more substantial alternative actions must be proposed. Alternative actions, such as upgrading header pipes, control devices, or the blower, will be submitted to the NYSDEC for approval including a corresponding timeline for installation.

When only one threshold exceedance occurs and gas concentrations are below threshold levels after the first re-monitoring, no further contingency monitoring will be required.

[5] US EPA (2013). 40 CFR §60.755. Website: www.gpo.gov/fdsys/pkg/cfr-2013-title40-vol7/xml/cfr-2013-title40-vol7-sec60-755.xml. Last updated on July 1, 2014. Accessed on July 3, 2014.

4.3 CONTINGENCY MEASURES

To meet the required thresholds, contingency measures may need to be completed. The following non-exhaustive list includes possible corrective actions that could be taken in the event of a threshold exceedance:

- Application of additional cover soils;
- Use of alternative cover materials;
- Increase vacuum on the active collection and control system;
- Adjust individual wellheads to improve overall collection system performance;
- Perform maintenance on wellheads or leachate cleanouts;
- Perform maintenance on the landfill cover system; and,
- Replace media in the SulfaTreat adsorber vessels.

If the source of the fugitive LFG causing the threshold exceedance cannot be readily identified, additional gas monitoring will be necessary. Further details regarding contingency measures for odor control can be found in Section 4.5 of the Carroll Landfill Contingency Plan[6].

[6] Daigler Engineering, PC. (2016), *Carroll Landfill Contingency Plan, Revision 5*; Last revised September 2016. Or most recent version.

APPENDIX A

Monitoring Logs

CARROLL LANDFILL

DAILY LANDFILL GAS SULFATREAT CONTROL UNIT READINGS

Date	Time	Monitoring Point	H_2S (ppm)	% O_2	% CH_4	% CO_2	% BAL	Temp (°F)	Static Pressure (in. WC)	Flow Rate (scfm)
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		
		Inlet								
		Lead Outlet						Flow Totalizer (scf):		
		Lag Outlet						________________________		

CARROLL LANDFILL

DAILY LANDFILL GAS/FLARE READINGS

Date	Time	Alarms Indicated (Yes or No)			Flare Temperature	Gas Flow	Damper Positions (% Open)		Flame Arrestor Differential Pressure	Pilot Fuel Tank Pressure	Comments
		Flare Low Temp	Flame Alarm	Low Vacuum	(Deg. F)	(SCFM)	1	2	(in. W.C.)	(psig)	

CARROLL LANDFILL

MONTHLY LANDFILL GAS WELLHEAD READINGS

Weather Conditions:________________________________ Date:________________ Time:____________

Monitoring Point	% O_2	%CO_2	% BAL	% CH_4	Temp (°F)	Static Pressure (in. WC)	Flow Rate (scfm)	Valve Position		Notes
								Initial	Adjusted	

CARROLL LANDFILL

QUARTERLY SURFACE SCAN READINGS

Date:_________________ **Inspector:_______________________** **Wind Speed:______________**
Time:_________________ **Weather:_________________________** **Wind Direction:___________**

Location	**Measured Values**							
Node#	**H_2S (ppb)**	**CH_4 (%)**	**CO_2 (%)**	**O_2 (%)**	**BAL (%)**	**BAR (in. WC)**	**REL (in. WC)**	**Temp (°F)**
N1								

QUARTERLY BACKGROUND READINGS

Upwind								
Downwind								

CARROLL LANDFILL

QUARTERLY SURFACE SCAN READINGS, CONT.

Date:_________________ **Inspector:**_______________________ **Wind Speed:**______________
Time:_________________ **Weather:**________________________ **Wind Direction:**___________

Location	Measured Values							
Node#	H_2S (ppb)	CH_4 (%)	CO_2 (%)	O_2 (%)	BAL (%)	BAR (in. WC)	REL (in. WC)	Temp (°F)

Final Emissions Estimate Calculations Letter (Revised)

Letter from: Bethany Acquisto, Daigler Engineering, PC

To: Alfred Carlacci, Regional Air Pollution Control Engineer, New York State Department of Environmental Conservation

May 12, 2017

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING

2620 Grand Island Blvd. Grand Island, New York 14072 ph (716) 773-6872 /fax (716) 773-6873 www.daiglerengineering.com

May 12, 2017

Mr. Alfred Carlacci
Regional Air Pollution Control Engineer
New York State Department of Environmental Conservation – Region 9
Division of Environmental Permits
270 Michigan Avenue
Buffalo, New York 14203-2915

Re: Carroll Landfill Expansion Application
Final Emissions Estimate Calculations, Revised

Dear Mr. Carlacci:

During negotiations with Ms. Connie Laport of your office in April and May of 2017 regarding the proposed Carroll Landfill expansion application, some changes were made to the terms and/or assumptions used in the calculation of final emissions estimates. This letter provides documentation of the agreed upon facility-wide emissions including the calculations where they differ from that presented in the *Air Emissions Inventory* (AEI), Rev 3 (Last Revised March 2015, by Daigler Engineering, P.C.) and the *Supplemental Air Emissions Inventory* (SAEI) (Last Revised March 2017, by Daigler Engineering, P.C.). The tables below summarize the final facility-wide emissions totals and the final emissions estimates by source. The remainder of this letter details the changes made. The necessary calculations are attached.

Carroll C&D Management Facility

FACILITY WIDE TOTALS

Pollutant	ERP Emissions TPY	PTE Emissions TPY	Actual Emissions TPY
NOx	31.16	33.40	3.59
CO	58.79	99.30	45.10
PM-2.5	21.7	6.0	2.43
H_2S	61.7	2.1	2.11
SOx	1.24	1.53	1.08
NMOCs	21.72	2.37	2.37
GHG in CO_2-e	87,753	43,782	26,217

FINAL EMISSIONS ESTIMATES BY SOURCE
Carroll Landfill Expansion Application
Sealand Waste, LLC

Emission Rate Potential Pollutant Emissions (TPY)

Em. Pt.	Source	CO	H_2S	NOx	PM-10	PM-2.5	SOx	NMOC	CO_2-e	GHGs
01	Existing Jones-Carroll Landfill Gases[1]	0.01	0.56					0.20	612	125
02	Proposed Landfill Gases[1]	1.63	61.2					21.53	67,088	13,665
	Composting Fugitive Gases								375	325
03	Facility Operations[2]				186.42	21.19			19,215	19,056
04	Stationary Internal Combustion Engines	57.10		30.83	0.47	0.46	0.12		NOTE 3	NOTE 3
05	Waste Oil Space Heaters	0.04		0.34	0.78		1.12		463	463
	TOTAL	**58.79**	**61.71**	**31.16**	**187.67**	**21.65**	**1.24**	**21.72**	**87,753**	**33,633**

[1] LandGEM estimated maximum emissions for Year 2029; Uncontrolled.
[2] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[3] GHG emissions included in Facility Operations.

Potential-To-Emit Criteria Pollutant Emissions (TPY)

Em. Pt.	Source	CO	H_2S	NOx	PM-10	PM-2.5	SOx	NMOC	CO_2-e	GHGs
01	Existing Jones-Carroll Landfill Gases[1]	0.38	0.02	0.02	0.01	0.01	0.004	0.02	211	157
02	Proposed Landfill Gases[1]	41.78	2.09	2.22	0.94	0.94	0.39	2.35	23,125	17,195
	Composting Fugitive Gases								375	325
03	Facility Operations[2]				27.24	4.62			19,609	19,448
04	Stationary Internal Combustion Engines	57.10		30.83	0.47	0.46	0.01		NOTE 3	NOTE 3
05	Waste Oil Space Heaters	0.04		0.34	0.78		1.12		463	463
	TOTAL	**99.30**	**2.11**	**33.40**	**29.45**	**6.03**	**1.53**	**2.37**	**43,782**	**37,587**

[1] LandGEM estimated maximum emissions for Year 2029.
[2] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[3] GHG emissions included in Facility Operations.

Actual Criteria Pollutants Emissions (TPY)

Em. Pt.	Source	CO	H_2S	NOx	PM-10	PM-2.5	SOx	NMOC	CO_2-e	GHGs
01	Existing Jones-Carroll Landfill Gases[1]	0.38	0.02	0.02	0.01	0.01	0.004	0.02	211	157
02	Proposed Landfill Gases[1]	41.78	2.09	2.22		0.94	0.39	2.35	23,125	17,195
	Composting Fugitive Gases[2]								375	325
03	Facility Operations[3]				8.21	1.45			2,237	2,218
04	Stationary Internal Combustion Engines	2.92		1.15	0.03	0.03	0.03		NOTE 4	NOTE 4
05	Waste Oil Space Heaters	0.03		0.20	0.45		0.65		269	269
	TOTAL	**45.10**	**2.11**	**3.59**	**8.70**	**2.43**	**1.08**	**2.37**	**26,217**	**20,163**

[1] Controlled, LandGEM estimated maximum emissions for Year 2029.
[2] Conservatively assumed to be the same as PTE.
[3] Includes use of onsite vehicles, machinery, and equipment which will produce fugitive particulate matter emissions and GHG emissions.
[4] GHG emissions included in Facility Operations.

Definitions

Previous submissions did not apply the regulatory definitions of the different emissions estimates, in part because the conditions of the permit were unknown at the time of submittal. The emissions tables presented herein strictly apply the following definitions from 6 NYCRR Part 201-2.1. These definitions are defined and interpreted as follows:

- Emission Rate Potential (ERP) – The maximum rate at which a specified air contaminant from an emission source would be emitted to the outdoor atmosphere in the absence of any control equipment. These estimates include the pre-control emissions, running 8,760 hours per year wherever applicable.
- Potential-to-Emit (PTE) – The maximum capacity of an air contamination source to emit any regulated air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the emission source to emit a regulated air pollutant, including air pollution control equipment and/or restrictions on the hours of operation, or on the type or amount of material combusted, stored, or processed, shall be treated as a part of the design if the limitation is enforceable by the department and the administrator. These estimates include landfill gas (LFG) emissions after the emission control equipment since the permit requires operation of the Sulfa-treat system and flare. These estimates also include watering for particulate emissions from unpaved roads and controlled emission factors for the operational dust from the construction and demolition debris processing operation (CDPO) since these are permit conditions as well. However, since the permit does not restrict hours of operation on any the emission PTE assumes 8,760 hours per year operation wherever applicable.
- Actual Emissions – Emissions resulting from normal daily operations. These estimates are the calculated emissions after the required control equipment and using the anticipated normal hours of operation.

Landfill Gases (Emission Points 01 & 02)

The effect of adding an enclosed flare to the LFG control system on the controlled emissions estimates was evaluated in the SAEI. The calculations in the SAEI used a combination of emission factors from AP-42, Section 2.4 Municipal Solid Waste Landfills (ver. 11/98; henceforth referred to as AP-42 1998) and from a more recent draft of AP-42, Section 2.4 (ver. 10/08; henceforth referred to as AP-42 2008). While the emission factors associated with enclosed flares from the draft version were only used when the reliability rating of the factor had significantly improved over AP-42 1998, it was decided that only the final version of AP-42 1998 could be used to estimate emissions used for preparation of the draft Air State Facility Permit. These changes include:

- The control efficiency of non-methane organic carbons (NMOCs) attributed to an enclosed flare used in AP-42, Section 2.4.4.2, Equation (5) increased from 97.7 (per AP-42 2008) to 99.2 (per AP-42 1998), thereby decreasing the emission estimates of NMOCs;

- The emission factors of secondary compounds produced by an enclosed flare including nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter (all assumed to be less than 2.5 microns in diameter, therefore Particulate Matter (PM) = PM-10 = PM-2.5) increased. In the case of NOx and PM, the increases were slight, from 39 lbs/10^6 ft^3 CH_4 (per AP-42 2008) to 40 lbs/10^6 ft^3 CH_4 (per AP-42 1998) for NOx and from 15 lbs/10^6 ft^3 CH_4 (per AP-42 2008) to 17 lbs/10^6 ft^3 CH_4 (per AP-42 1998) for PM. However, the difference was much more significant for CO, which increased from 46 lbs/10^6 ft^3 CH_4 (per AP-42 2008) to 750 lbs/10^6 ft^3 CH_4 (per AP-42 1998);

- The ERP estimates are the same as was previously presented in the AEI as simply uncontrolled emissions from the year of maximum LFG emissions (Tables 3-4 for the existing landfill and Table 3-6 for the proposed landfill). Notably absent from the ERP emissions are NOx, PM, and sulfur oxides (SOx) which are only not naturally in LFG; and,

- Given that the emission control equipment specified by the permit (specifically the flare) produces secondary emissions, the controlled emissions (PTE) are higher than the uncontrolled emissions (ERP) for CO, NOx, PM, and SOx. Also, since LFG emissions are innately 8,760 hours per year, emissions estimates for PTE are equal to the actual emissions estimates.

Facility Operations (Emission Point 03)

The following revisions were made to the PM facility operations estimates:

- For fugitive emissions from unpaved roads (A.), the ERP emissions estimates has no control, not even natural control from rain as there is the potential for drought conditions. The PTE emissions estimates now includes both natural control and control from the water truck since watering is a permit condition. Except for the fleet vehicles (A.5), the hours of operation were not modified as these hours will be controlled by permit conditions in the Part 360 permit for waste acceptance rates. The hours of operation for fleet vehicles was adjusted to 8,760 hours per year for both PTE and ERP estimates. One exception is that the water truck in the ERP estimate is excluded since there is no use for the water truck if watering controls are not to be included in the ERP emissions.

- For fugitive emissions from active landfilling (B.), the estimates associated with waste trucks (B.1) was not modified since there are no associated controls and hours will be controlled by permit conditions in the Part 360 permit for waste acceptance rates. For the waste and cover bulldozing and compacting estimates, the hours of operation for PTE and ERP emissions estimates was increased to 8,760 hours per year.

- Fugitive emissions from liner construction (C.) will not change as they do not have associated controls and the hours of operation are controlled by defined material quantities necessary for liner construction. For these emissions ERP equals PTE.

- For fugitive emissions from the borrow area (D.), the hours of operation were increased for site preparation of the borrow area (D.1) by assuming the task will take the same number of days, but assuming a 24-hour a day operation. The number of operating hours was also increased for the dumping and reloading of excavated cover soils (D.2) by assuming a 365 day per year operation.

- For fugitive emissions from the CDPO (E.), the maximum daily throughput for the CDPO used in calculation of PTE and ERP emissions was increased from 320 tons per year (tpy) to 330 tpy to be consistent with other parts of the application. The hours of operation for ERP and PTE emissions estimates were increased to 8,760 hours per year. Also, the controlled emission factors were used for PTE emission estimates because the permit includes the installation of permanent engineering dust controls on the CDPO equipment.

In addition to the PM emissions, the facility operations emissions includes estimates for greenhouse gases (GHGs) due to the operation of fleet vehicles, equipment, and machinery stationary internal combustion engines. These emissions were updated to include:

- The emergency generator was added to the calculation. Assumptions on the operation of the emergency generator were consistent with those used in the revised stationary internal combustion engines calculations discussed below.
- The previous assumption for PTE usage (50% greater than proposed up to the maximum number of facility operating hours of 2,912 per year) was increased significantly to assume all vehicles were being operated continuously (i.e., 8,760 hours per year.).
- ERP emissions estimates were added which are the same as PTE, with the exception of the water truck which would be unnecessary under a "no-controls" scenario.

Stationary Internal Combustion Engines (Emission Point 04)

The emissions estimates for stationary internal combustion engines were revised to include the emergency generator. The proposed average usage of the emergency generator was assumed to be 600 hours per year. For the purpose of estimating PTE and ERP emissions, the maximum usage was assumed to be year-round (8,760 hours per year) for all five engines. Since there are no controls associated with these emissions, PTE equals ERP.

Waste Oil Space Heaters (Emission Point 05)

The emissions estimates were modified to assume that the PTE and ERP maximum annual operating hours is 8,760 hours per year. Since there are no controls associated with these emissions, PTE equals ERP.

All other emission points included in the AEI and SAEI have been excluded as insignificant sources. We trust that this letter provides sufficient documentation to back up the emissions estimates required for the Air State Facility Permit. Should you have any questions or comments, please do not hesitate to contact us.

Sincerely,
DAIGLER ENGINEERING, PC

Bethany Acquisto, Ph.D.
bethany@jadenvegr.com

cc: Connie Laport, NYSDEC
Daniel Bree, Sealand Waste LLC

Attachments

Calculation of Controlled Landfill Gas Emissions Using only AP-42 1998 Emissions Factors:

Controlled Emissions of Speciated Parameters

Controlled emissions of all parameters speciated in the inventory produced by LandGEM, except carbon dioxide, carbon monoxide, hydrogen sulfide, and mercury can be calculated using the following equation (AP-42, Section 2.4.4.2, Equation (5), modified to include a methane oxidation factor for fugitive emissions as per 40 CFR 98.348).

$$M_{c,P} = \left[M_{u,P} \times \left(1 - \frac{\eta_{col}}{100}\right) \times \left(1 - \frac{M_{OX}}{100}\right)\right] + \left[M_{u,P} \times \frac{\eta_{col}}{100} \times \left(1 - \frac{\eta_{cnt}}{100}\right)\right]$$

where, $M_{c,P}$ = Controlled mass emissions of parameter P (Mg/yr, lbs/hr, or ton/yr)

$M_{u,P}$ = Uncontrolled mass emissions of parameter P (Mg/yr, lbs/hr, or ton/yr), from LandGEM, 3.02 model

η_{col} = Collection efficiency of the landfill gas collection system (%)

= 86.35%, estimated average collection efficiency for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

M_{OX} = Methane oxidation factor (%)

= 25%, for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

η_{cnt} = Control efficiency of the landfill gas control device (%)

= 99% for methane, per flare manufacturer’s technical data

= 99.2% for NMOCs, per AP-42 1998*

*Modified from SAEI.

Controlled emissions rates of CO_2 and all speciated (primary) parameters are summarized in the following tables.

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll C&D Debris Landfill **Existing Controlled Emissions Summary**
Emission Point: Existing Waste's Contribution to 002
Carroll Landfill Expansion Application Inventory for Year 2029

Parameter	Emission Rate								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY
* Methane							2.46	0.62	2.70
Carbon dioxide							140.04	35.17	154.05
Non-Methane Organic Compounds (NMOC)							0.02	0.00	0.02
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				2.41E-05	6.06E-06	2.66E-05	2.41E-05	6.06E-06	2.66E-05
1,1,2,2-Tetrachloroethane - HAP/VOC	6.96E-05	1.75E-05	7.66E-05	6.96E-05	1.75E-05	7.66E-05			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	8.96E-05	2.25E-05	9.85E-05	8.96E-05	2.25E-05	9.85E-05			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	7.31E-06	1.84E-06	8.04E-06	7.31E-06	1.84E-06	8.04E-06			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	1.53E-05	3.84E-06	1.68E-05	1.53E-05	3.84E-06	1.68E-05			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	7.67E-06	1.93E-06	8.44E-06	7.67E-06	1.93E-06	8.44E-06			
2-Propanol (isopropyl alcohol) - VOC	1.13E-03	2.85E-04	1.25E-03						
* Acetone							1.53E-04	3.85E-05	1.69E-04
Acrylonitrile - HAP/VOC	1.26E-04	3.17E-05	1.39E-04	1.26E-04	3.17E-05	1.39E-04			
Benzene - No or Unknown Co-disposal - HAP/VOC	5.60E-05	1.41E-05	6.16E-05	5.60E-05	1.41E-05	6.16E-05			
Bromodichloromethane - VOC	1.91E-04	4.81E-05	2.11E-04						
Butane - VOC	1.10E-04	2.75E-05	1.21E-04						
Carbon disulfide - HAP/VOC	1.66E-05	4.18E-06	1.83E-05	1.66E-05	4.18E-06	1.83E-05			
Carbon monoxide[2]							*NC*[2]	8.70E-02	3.81E-01
Carbon tetrachloride - HAP/VOC/ODC	2.32E-07	5.83E-08	2.55E-07	2.32E-07	5.83E-08	2.55E-07	2.32E-07	5.83E-08	2.55E-07
Carbonyl sulfide - HAP/VOC	1.11E-05	2.79E-06	1.22E-05	1.11E-05	2.79E-06	1.22E-05			
Chlorobenzene - HAP/VOC	1.06E-05	2.66E-06	1.17E-05	1.06E-05	2.66E-06	1.17E-05			
* Chlorodifluoromethane - HCFC-22							4.24E-05	1.06E-05	4.66E-05
Chloroethane (ethyl chloride) - HAP/VOC	3.16E-05	7.94E-06	3.48E-05	3.16E-05	7.94E-06	3.48E-05			
Chloroform - HAP/VOC	1.35E-06	3.39E-07	1.49E-06	1.35E-06	3.39E-07	1.49E-06			
Chloromethane (methyl chloride) - HAP/VOC	2.28E-05	5.74E-06	2.51E-05	2.28E-05	5.74E-06	2.51E-05			
Dichlorobenzene (1,4 isomer) - HAP/VOC	1.16E-05	2.92E-06	1.28E-05	1.16E-05	2.92E-06	1.28E-05			
* Dichlorodifluoromethane - CFC-12							7.29E-04	1.83E-04	8.02E-04
Dichlorofluoromethane - VOC/HCFC-21	1.01E-04	2.53E-05	1.11E-04				1.01E-04	2.53E-05	1.11E-04
* Dichloromethane (methylene chloride) - HAP				4.48E-04	1.13E-04	4.93E-04			
Dimethyl sulfide (methyl sulfide) - VOC	1.83E-04	4.59E-05	2.01E-04						
* Ethane	0.00E+00	0.00E+00	0.00E+00				1.01E-02	2.53E-03	1.11E-02
Ethanol - VOC	4.69E-04	1.18E-04	5.16E-04						
Ethyl mercaptan (ethanethiol) - VOC	5.39E-05	1.35E-05	5.93E-05						
Ethylbenzene - HAP/VOC	1.84E-04	4.62E-05	2.03E-04	1.84E-04	4.62E-05	2.03E-04			
Ethylene dibromide - HAP/VOC	7.08E-08	1.78E-08	7.79E-08	7.08E-08	1.78E-08	7.79E-08			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							3.94E-05	9.89E-06	4.33E-05
Hexane - HAP/VOC	2.14E-04	5.39E-05	2.36E-04	2.14E-04	5.39E-05	2.36E-04			
Hydrogen sulfide[3]							1.73E-02	4.34E-03	1.90E-02
Mercury (total)[4] - HAP				1.94E-07	4.87E-08	2.13E-07			
Methyl ethyl ketone - HAP/VOC	1.93E-04	4.85E-05	2.12E-04	1.93E-04	4.85E-05	2.12E-04			
Methyl isobutyl ketone - HAP/VOC	7.18E-05	1.80E-05	7.89E-05	7.18E-05	1.80E-05	7.89E-05			
Methyl mercaptan - VOC	4.54E-05	1.14E-05	4.99E-05						
Pentane - VOC	8.98E-05	2.25E-05	9.88E-05						
* Perchloroethylene (tetrachloroethylene) - HAP				2.31E-04	5.81E-05	2.54E-04			
Propane - VOC	1.83E-04	4.59E-05	2.01E-04						
* t-1,2-Dichloroethene							1.02E-04	2.57E-05	1.13E-04
Toluene - No or Unknown Co-disposal - HAP/VOC	1.35E-03	3.40E-04	1.49E-03	1.35E-03	3.40E-04	1.49E-03			
Trichloroethylene (trichloroethene) - HAP/VOC	1.39E-04	3.48E-05	1.53E-04	1.39E-04	3.48E-05	1.53E-04			
Vinyl chloride - HAP/VOC	1.72E-04	4.32E-05	1.89E-04	1.72E-04	4.32E-05	1.89E-04			
Xylenes - HAP/VOC	4.80E-04	1.21E-04	5.28E-04	4.80E-04	1.21E-04	5.28E-04			
TOTALS	5.85E-03	1.47E-03	6.43E-03	3.99E-03	1.00E-03	4.39E-03	142.55	35.89	157.18

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate in lbs/hr is based on 8,760 hours per year
[2] Secondary compound, see separate calculation; *NC* = not calculated
[3] H_2S controlled = fugitive emissions only [=Uncontrolled landfill emissions*(1-86.35%)*(1-75% Diffusive reduction factor)] as the flare will convert all H_2S to SO_2
[4] The control efficiency for mercury from an enclosed flare is assumed to be 0% per AP-42, Section 2.4 (10/2008)
ODC = Classified ozone depleting chemical (SUM = 0.0009 Mg/yr, 0.0002 lbs/hr, 0.0010 TPY)

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Proposed Carroll C&D Debris Landfill **Proposed Controlled Emissions Summary**
Emission Point: Proposed New Waste's Contribution to 002
Carroll Landfill Expansion Application Inventory for Year 2029

Parameter	Emission Rate								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY	Mg/yr	lbs/hr[1]	TPY
* Methane							269.57	67.70	296.53
Carbon dioxide							15361.90	3858.01	16898.09
Non-Methane Organic Compounds (NMOC)							2.14	0.54	2.35
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				0.0026	0.0007	0.0029	0.0026	0.0007	0.0029
1,1,2,2-Tetrachloroethane - HAP/VOC	0.0076	0.0019	0.0084	0.0076	0.0019	0.0084			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	0.0098	0.0025	0.0108	0.0098	0.0025	0.0108			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.0008	0.0002	0.0009	0.0008	0.0002	0.0009			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.0017	0.0004	0.0018	0.0017	0.0004	0.0018			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.0008	0.0002	0.0009	0.0008	0.0002	0.0009			
2-Propanol (isopropyl alcohol) - VOC	0.1243	0.0312	0.1367						
* Acetone							0.0168	0.0042	0.0185
Acrylonitrile - HAP/VOC	0.0138	0.0035	0.0152	0.0138	0.0035	0.0152			
Benzene - No or Unknown Co-disposal - HAP/VOC	0.0061	0.0015	0.0068	0.0061	0.0015	0.0068			
Bromodichloromethane - VOC	0.0210	0.0053	0.0231						
Butane - VOC	0.0120	0.0030	0.0132						
Carbon disulfide - HAP/VOC	0.0018	0.0005	0.0020	0.0018	0.0005	0.0020			
Carbon monoxide[2]							*NC*[2]	9.5381	41.7770
Carbon tetrachloride - HAP/VOC/ODC	0.00003	0.00001	0.00003	0.00003	0.00001	0.00003	0.000025	0.000006	0.000028
Carbonyl sulfide - HAP/VOC	0.0012	0.0003	0.0013	0.0012	0.0003	0.0013			
Chlorobenzene - HAP/VOC	0.0012	0.0003	0.0013	0.0012	0.0003	0.0013			
* Chlorodifluoromethane - HCFC-22							0.0046	0.0012	0.0051
Chloroethane (ethyl chloride) - HAP/VOC	0.0035	0.0009	0.0038	0.0035	0.0009	0.0038			
Chloroform - HAP/VOC	0.0001	0.0000	0.0002	0.00015	0.00004	0.00016			
Chloromethane (methyl chloride) - HAP/VOC	0.0025	0.0006	0.0028	0.0025	0.0006	0.0028			
Dichlorobenzene (1,4 isomer) - HAP/VOC	0.0013	0.0003	0.0014	0.0013	0.0003	0.0014			
* Dichlorodifluoromethane - CFC-12							0.0800	0.0201	0.0880
Dichlorofluoromethane - VOC/HCFC-21	0.0111	0.0028	0.0122				0.0111	0.0028	0.0122
* Dichloromethane (methylene chloride) - HAP				0.0492	0.0124	0.0541			
Dimethyl sulfide (methyl sulfide) - VOC	0.0200	0.0050	0.0220						
* Ethane							1.1069	0.2780	1.2176
Ethanol - VOC	0.0515	0.0129	0.0566						
Ethyl mercaptan (ethanethiol) - VOC	0.0059	0.0015	0.0065						
Ethylbenzene - HAP/VOC	0.0202	0.0051	0.0222	0.0202	0.0051	0.0222			
Ethylene dibromide - HAP/VOC	0.0000	0.0000	0.0000	0.000008	0.000002	0.000009			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							0.0043	0.0011	0.0048
Hexane - HAP/VOC	0.0235	0.0059	0.0259	0.0235	0.0059	0.0259			
Hydrogen sulfide[3]							1.8971	0.4764	2.0868
Mercury (total)[4] - HAP				0.000021	0.000005	0.000023			
Methyl ethyl ketone - HAP/VOC	0.0212	0.0053	0.0233	0.0212	0.0053	0.0233			
Methyl isobutyl ketone - HAP/VOC	0.0079	0.0020	0.0087	0.0079	0.0020	0.0087			
Methyl mercaptan - VOC	0.0050	0.0012	0.0055						
Pentane - VOC	0.0098	0.0025	0.0108						
* Perchloroethylene (tetrachloroethylene) - HAP				0.0254	0.0064	0.0279			
Propane - VOC	0.0201	0.0050	0.0221						
* t-1,2-Dichloroethene							0.0112	0.0028	0.0123
Toluene - No or Unknown Co-disposal - HAP/VOC	0.1486	0.0373	0.1635	0.1486	0.0373	0.1635			
Trichloroethylene (trichloroethene) - HAP/VOC	0.0152	0.0038	0.0167	0.0152	0.0038	0.0167			
Vinyl chloride - HAP/VOC	0.0189	0.0047	0.0208	0.0189	0.0047	0.0208			
Xylenes - HAP/VOC	0.0527	0.0132	0.0580	0.0527	0.0132	0.0580			
TOTALS	0.64	0.16	0.71	0.44	0.11	0.48	15636.75	3936.58	17242.20

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate in lbs/hr is based on 8,760 hours per year
[2] Secondary compound, see separate calculation; *NC* = not calculated
[3] H_2S controlled = fugitive emissions only [=Uncontrolled landfill emissions*(1-86.35%)*(1-75% Diffusive reduction factor)] as the flare will convert all H_2S to SO_2
[4] The control efficiency for mercury from an enclosed flare is assumed to be 0% per AP-42, Section 2.4 (10/2008)
ODC = Classified ozone depleting chemical (SUM = 0.1027 Mg/yr, 0.0258 lbs/hr, 0.1130 TPY)

Appendix A-S
Supplemental Air Emissions Inventory
Carroll Landfill Expansion Application
Sealand Waste, LLC

Source: Existing Jones-Carroll & Proposed Carroll C&D Debris Landfills **Total Controlled Emissions Summary**
Emission Point: 002 (TOTAL)
Carroll Landfill Expansion Application Inventory for Year 2029

Parameter	Emission Rate[1]								
	VOC			HAP			Other		
	Mg/yr	lbs/hr[2]	TPY	Mg/yr	lbs/hr[2]	TPY	Mg/yr	lbs/hr[2]	TPY
* Methane							272.03	68.32	299.23
Carbon dioxide							15501.94	3893.18	17052.14
Non-Methane Organic Compounds (NMOC)							2.16	0.54	2.37
* 1,1,1-Trichloroethane (methyl chloroform) - HAP/ODC				2.67E-03	6.71E-04	2.94E-03	2.67E-03	6.71E-04	2.94E-03
1,1,2,2-Tetrachloroethane - HAP/VOC	7.71E-03	1.94E-03	8.48E-03	7.71E-03	1.94E-03	8.48E-03			
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	9.91E-03	2.49E-03	1.09E-02	9.91E-03	2.49E-03	1.09E-02			
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	8.09E-04	2.03E-04	8.90E-04	8.09E-04	2.03E-04	8.90E-04			
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	1.69E-03	4.25E-04	1.86E-03	1.69E-03	4.25E-04	1.86E-03			
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	8.49E-04	2.13E-04	9.34E-04	8.49E-04	2.13E-04	9.34E-04			
2-Propanol (isopropyl alcohol) - VOC	1.25E-01	3.15E-02	1.38E-01						
* Acetone							1.70E-02	4.26E-03	1.87E-02
Acrylonitrile - HAP/VOC	1.40E-02	3.50E-03	1.53E-02	1.40E-02	3.50E-03	1.53E-02			
Benzene - No or Unknown Co-disposal - HAP/VOC	6.19E-03	1.56E-03	6.81E-03	6.19E-03	1.56E-03	6.81E-03			
Bromodichloromethane - VOC	2.12E-02	5.32E-03	2.33E-02						
Butane - VOC	1.21E-02	3.05E-03	1.33E-02						
Carbon disulfide - HAP/VOC	1.84E-03	4.63E-04	2.03E-03	1.84E-03	4.63E-04	2.03E-03			
Carbon monoxide							*NC*[4]	9.63E+00	4.22E+01
Carbon tetrachloride - HAP/VOC/ODC	2.57E-05	6.45E-06	2.83E-05	2.57E-05	6.45E-06	2.83E-05	2.57E-05	6.45E-06	2.83E-05
Carbonyl sulfide - HAP/VOC	1.23E-03	3.09E-04	1.35E-03	1.23E-03	3.09E-04	1.35E-03			
Chlorobenzene - HAP/VOC	1.17E-03	2.95E-04	1.29E-03	1.17E-03	2.95E-04	1.29E-03			
* Chlorodifluoromethane - HCFC-22							4.69E-03	1.18E-03	5.16E-03
Chloroethane (ethyl chloride) - HAP/VOC	3.50E-03	8.79E-04	3.85E-03	3.50E-03	8.79E-04	3.85E-03			
Chloroform - HAP/VOC	1.49E-04	3.75E-05	1.64E-04	1.49E-04	3.75E-05	1.64E-04			
Chloromethane (methyl chloride) - HAP/VOC	2.53E-03	6.35E-04	2.78E-03	2.53E-03	6.35E-04	2.78E-03			
Dichlorobenzene (1,4 isomer) - HAP/VOC	1.29E-03	3.24E-04	1.42E-03	1.29E-03	3.24E-04	1.42E-03			
* Dichlorodifluoromethane - CFC-12							8.07E-02	2.03E-02	8.88E-02
Dichlorofluoromethane - VOC/HCFC-21	1.12E-02	2.80E-03	1.23E-02				1.12E-02	2.80E-03	1.23E-02
* Dichloromethane (methylene chloride) - HAP				4.96E-02	1.25E-02	5.46E-02			
Dimethyl sulfide (methyl sulfide) - VOC	2.02E-02	5.08E-03	2.22E-02						
* Ethane							1.12E+00	2.81E-01	1.23E+00
Ethanol - VOC	5.19E-02	1.30E-02	5.71E-02						
Ethyl mercaptan (ethanethiol) - VOC	5.96E-03	1.50E-03	6.56E-03						
Ethylbenzene - HAP/VOC	2.04E-02	5.12E-03	2.24E-02	2.04E-02	5.12E-03	2.24E-02			
Ethylene dibromide - HAP/VOC	7.84E-06	1.97E-06	8.63E-06	7.84E-06	1.97E-06	8.63E-06			
* Fluorotrichloromethane (trichlorofluoromethane) - CFC-11							4.36E-03	1.09E-03	4.79E-03
Hexane - HAP/VOC	2.37E-02	5.96E-03	2.61E-02	2.37E-02	5.96E-03	2.61E-02			
Hydrogen sulfide							1.91E+00	4.81E-01	2.11E+00
Mercury (total) - HAP				2.15E-05	5.39E-06	2.36E-05			
Methyl ethyl ketone - HAP/VOC	2.14E-02	5.37E-03	2.35E-02	2.14E-02	5.37E-03	2.35E-02			
Methyl isobutyl ketone - HAP/VOC	7.94E-03	1.99E-03	8.74E-03	7.94E-03	1.99E-03	8.74E-03			
Methyl mercaptan - VOC	5.02E-03	1.26E-03	5.52E-03						
Pentane - VOC	9.94E-03	2.50E-03	1.09E-02						
* Perchloroethylene (tetrachloroethylene) - HAP				2.56E-02	6.43E-03	2.82E-02			
Propane - VOC	2.02E-02	5.08E-03	2.23E-02						
* t-1,2-Dichloroethene							1.13E-02	2.85E-03	1.25E-02
Toluene - No or Unknown Co-disposal - HAP/VOC	1.50E-01	3.77E-02	1.65E-01	1.50E-01	3.77E-02	1.65E-01			
Trichloroethylene (trichloroethene) - HAP/VOC	1.54E-02	3.86E-03	1.69E-02	1.54E-02	3.86E-03	1.69E-02			
Vinyl chloride - HAP/VOC	1.90E-02	4.78E-03	2.09E-02	1.90E-02	4.78E-03	2.09E-02			
Xylenes - HAP/VOC	5.32E-02	1.34E-02	5.85E-02	5.32E-02	1.34E-02	5.85E-02			
TOTALS	0.65	0.16	0.71	0.44	0.11	0.49	15779.29	3972.46	17399.38

Notes: * Denotes compounds that are exempt VOCs as defined in 40 CFR 51.100(s)(1), as having negligible photochemical reactivity
[1] Emission Rate = Jones-Carroll Controlled + Proposed Carroll Controlled
[2] Emission Rate in lbs/hr is based on 8,760 hours per year
[3] *NC* = not calculated
ODC = Classified ozone depleting chemical (SUM = 0.1037 Mg/yr, 0.0260 lbs/hr, 0.1140 TPY)

NOx, CO, and PM emissions

$$Q_{col,CH_4} = Q_{u,CH_4} \times \frac{\eta_{col}}{100}$$

where, Q_{col,CH_4} = Collected flow rate of methane (ft^3/yr)

Q_{u,CH_4} = Uncontrolled flow rate of methane (ft^3/yr), from LandGEM, 3.02 model

= 1.172E+06 ft^3/yr, existing Jones-Carroll Landfill

= 1.285E+08 ft^3/yr, proposed Carroll Landfill

η_{col} = Collection efficiency of the landfill gas collection system (%)

= 86.35%, estimated average collection efficiency for year of maximum emissions, 2029; calculation presented in Appendix A of the AEI, Rev3

- **Collected Emissions of Methane originating from the Jones-Carroll Landfill in 2029**

$$Q_{col,CH_4} = 1.172\text{E}+06 \times \frac{86.35}{100}$$

= 1.012E+06 ft^3/yr

- **Collected Emissions of Methane originating from the Proposed Landfill in 2029**

$$Q_{col,CH_4} = 1.285\text{E}+08 \times \frac{86.35}{100}$$

= 1.110E+08 ft^3/yr

- **Calculation of Annual Emission Rates**

$M_{c,\,P} = Q_{col,CH_4} \times EF_P \div 2{,}000$ lbs/ton

where, $M_{c,\,P}$ = Controlled mass emissions of parameter P (tons/yr)
EF_P = Emission factor for parameter P (lbs/10^6 ft^3 of CH_4)

- **Calculation of Hourly Emission Rates, (assumes 24-7, year-round operation)**

$M_{c,\,P}$ (lbs/hr) = $M_{c,\,P}$ (ton/yr) × 2,000 lbs/ton ÷ 8,760 hr/yr

- **Controlled Estimated Emission Rates for 2029**

Parameter	Emission Factors (lbs/10^6 ft^3 CH_4)**	Existing Jones-Carroll Landfill		Proposed Carroll Landfill		TOTAL	
		lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
NOx	40	0.005	0.020	0.507	2.219	0.511	2.239
CO^+	750	0.087	0.380	9.500	41.610	9.587	41.989
PM*	17	0.002	0.009	0.215	0.943	0.217	0.952

$^+$CO is also a primary compound from LandGEM. Total emission rates listed in the inventories = secondary emission rates in the table above + fugitive emissions of CO (uncontrolled emissions × (1 – collection efficiency) × (1 – methane oxidation factor)).

*All PM is assumed less than 2.5 microns, therefore PM = PM-10 = PM-2.5.
** Modified from SAEI.

A. FUGITIVE PARTICULATE EMISSIONS FROM UNPAVED ROADS

A.1 Waste Delivery Trucks:

Proposed Annual Acceptance Rate (loads/year) =	18,383		
Proposed Daily Acceptance Rate (loads/day) =	60		
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	6.0		
Proposed Maximum (Saturday) Hourly Acceptance Rate (loads/hour) =	8.6		
Proposed Average Hourly Acceptance Rate (loads/hour) =	6.4		
Estimated Vehicle Miles Traveled per Load (VMT/load) =	0.91		
Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45
s (%) =	7.45		
W (tons) =	26.6		
P (days) =	324		
P (natural) =	160		
P (controlled) =	164		

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**6.16**	**8.80**	**8.21**	**8.80**	**73.09**	**78.38**
PM-10 =	**1.71**	**2.45**	**2.28**	**2.45**	**20.34**	**21.81**
PM-2.5 =	**0.17**	**0.25**	**0.23**	**0.25**	**2.03**	**2.18**

A.2 Recycling Facility Trucks:

Composting Operation (in)	
Proposed Annual Acceptance Rate (loads/year) =	800
Proposed Daily Acceptance Rate (loads/day) =	4
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	0.36
Proposed Maximum Hourly Acceptance Rate (loads/hour) =	0.51
Proposed Average Hourly Acceptance Rate (loads/hour) =	0.38
W (tons) =	2.75

Composting Operation (out)	
Proposed Annual Shipping Rate (loads/year) =	18
Proposed Daily Shipping Rate (loads/day) =	0.06
Proposed Hourly Shipping Rate (loads/hour) =	0.01
W,avg. (tons) =	16.3

CDPO (in)	
Proposed Typical Annual Acceptance Rate (loads/year) =	3,070
Proposed Typical Daily Acceptance Rate (loads/day) =	10
Maximum Annual Acceptance Rate (loads/year) =	6,140
Maximum Daily Acceptance Rate (loads/day) =	20
Proposed Hourly Weekday Acceptance Rate (loads/hour) =	1.00
Proposed Maximum (Saturday) Acceptance Rate (loads/hour) =	1.43
Proposed Average Hourly Acceptance Rate (loads/hour) =	1.07
W (tons) =	26.6

CDPO (out)	
Proposed Annual Shipping Rate (loads/year) =	614
Proposed Daily Shipping Rate (loads/day) =	2.00
Maximum Annual Shipping Rate (loads/year) =	1,228
Maximum Daily Shipping Rate (loads/day) =	4.00
Proposed Hourly Weekday Shipping Rate (loads/hour) =	0.20
Proposed Maximum (Saturday) Shipping Rate (loads/hour) =	0.29
Proposed Average Hourly Shipping Rate (loads/hour) =	0.21
W (tons) =	19

Estimated Vehicle Miles Traveled per load (VMT/load) = 0.59

Emperical Constants:	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45

s (%) =	7.45
P (days) =	324
P (natural) =	160
P (controlled) =	164

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.86**	**1.21**	**1.15**	**2.33**	**10.27**	**20.73**
PM-10 =	**0.24**	**0.34**	**0.32**	**0.65**	**2.86**	**5.77**
PM-2.5 =	**0.02**	**0.03**	**0.03**	**0.06**	**0.29**	**0.58**

A.3 Leachate Hauling Vehicles:

Annual Leachate Hauling Rate (loads/year) =	678		
Average Hourly Leachate Hauling Rate (loads/hour) =	0.26		
Maximum Hourly Leachate Hauling Rate (loads/hour) =	2.0		
Estimated Vehicle Miles Traveled per Load (VMT/load) =	0.22		
Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45
s (%) =	7.45		
W (tons) =	28.5		
P (days) =	324		
P (natural) =	160		
P (controlled) =	164		

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.06**	**0.08**	**0.48**	**0.08**	**4.25**	**0.72**
PM-10 =	**0.02**	**0.02**	**0.13**	**0.02**	**1.18**	**0.20**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**	**0.12**	**0.02**

A.4 Landfill Liner Construction Material Delivery Trucks:

Stone Deliveries:

Cell 2 Area =	222,660	sq.ft.
Slope and Waste Factor =	1.05	
Total Stone Liner Thickness =	2.1	ft
Volume of stone handled =	490,965	cf
Assumed density of stone =	1.5	ton/cy
Ton of material Handled =	27,276	ton
Assumed Weight per load =	20	ton/load
Number of loads of stone required =	1,364	loads
Number of loads per day over 12 mos =	5	loads/day
Hourly stone delivery rate =	0.529	loads/hour
Empty Weight of Stone delivery truck =	18	ton

Two-Axle Truck Deliveries:

	Geomembrane	Geotextile	Geocomposite	Geosynthetic Clay Liner	
Number of layers =	2	3	2	1	
Total area Required =	467,586	701,379	467,586	233,793	
Typical area per roll (sq. ft.) =	9,080	4,500	2,770	2,065	
Typical # of rolls per truck =	12	40	27	16	
Total number of rolls =	52	156	169	114	
Total number of trucks =	5	4	7	8	Total = 24
Approximate weight of material (lbs/roll) =	3,900	330	1,990	2,600	
Empty weight of delivery truck (ton) =	16	16	16	16	
Operating weight of delivery truck (ton) =	39.4	22.6	42.865	36.8	

Total number of construction related deliveries =	706	loads/year	Assumes half the stone will be delivered prior to the modeled year
	1.2	loads/day	Proposed average number of non-stone deliveries per day over a one month period.
	0.6	loads/hour	Typical total hourly deliveries of construction materials
	4.0	loads/day	Maximum non-stone deliveries
	0.9	loads/hour	Assumed maximum total hourly deliveries of construction materials

Estimated Vehicle Miles Traveled per load (VMT/load) = 0.73

Emperical Constants	*k*	*a*	*b*
PM =	4.9	0.7	0.45
PM-10 =	1.5	0.9	0.45
PM-2.5 =	0.15	0.9	0.45

s (%) = 7.45

W (tons, weighted) = 56.9

P (days) = 324
P (natural) = 160
P (controlled) = 164

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.70**	**0.38**	**1.00**	**0.38**	**8.95**	**3.40**
PM-10 =	**0.20**	**0.11**	**0.28**	**0.11**	**2.49**	**0.95**
PM-2.5 =	**0.02**	**0.01**	**0.03**	**0.01**	**0.25**	**0.09**

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A.5 Onsite Vehicle Fleet:

Equipment	Mean Operating Weight (tons)	(% per day)	Proposed Average Equipment Use (days/year)	(hours/year)	PTE Usage (hours/year)	ERP Usage (hours/year)	Assumed Average Speed (mph)	Average VMT (miles/year)	PTE VMT (miles/year)	ERP VMT (miles/year)	Weight Avg VMT	Weight PTE VMT	Weight ERP VMT
D25 Off-Road Dump	30.5	0.55	307	1,602	8,760	8,760	5	2,002	10,950	10,950	61,061	333,975	333,975
D25 Off-Road Dump	30.5	0.55	307	1,602	8,760	8,760	5	2,002	10,950	10,950	61,061	333,975	333,975
2,000 Gallon Water Truck*	9	0.55	164	856	8,760	0	10	6,845	21,900	0	61,602	197,100	0
Equipment Maintenance Truck	13.5	0.18	260	444	8,760	8,760	10	1,110	21,900	21,900	14,982	295,650	295,650
Tool Truck	11	0.18	260	444	8,760	8,760	10	1,110	21,900	21,900	12,208	240,900	240,900
Fuel/Lube Truck	13	0.3	307	874	8,760	8,760	10	2,184	21,900	21,900	28,392	284,700	284,700
Tractor	4	0.18	130	222	8,760	8,760	5	277	10,950	10,950	1,110	43,800	43,800
Pickup Truck	2.5	0.91	307	2,650	8,760	8,760	20	13,250	43,800	43,800	33,124	109,500	109,500
Pickup Truck	2.5	0.36	260	888	8,760	8,760	20	4,439	43,800	43,800	11,098	109,500	109,500
Average =	**12.9**						**TOTAL =**	**33,218**	**208,050**	**186,150**	**284,637**	**1,949,100**	**1,752,000**
			Sum =	**9,580**	**78,840**	**70,080**				**Weighted Average Weight =**	**8.57**	**9.37**	**9.41**

Emissions:	Proposed Hourly (lbs/hr)	Proposed Annually (tons/yr)	Potential-to-Emit Hourly (lbs/hr)	Potential-to-Emit Annually (tons/yr)	Emission Rate Potential Hourly (lbs/hr)	Emission Rate Potential Annually (tons/yr)
PM =	**2.19**	**10.50**	**1.74**	**68.46**	**15.60**	**546.46**
PM-10 =	**0.61**	**2.92**	**0.48**	**19.05**	**4.34**	**152.07**
PM-2.5 =	**0.06**	**0.29**	**0.05**	**1.91**	**0.43**	**15.21**

*For ERP emissions no watering is performed, therefore the water truck is not used.

A.1 + A.2 + A.3 + A.4 + A.5

TOTAL FOR UNPAVED ROADS:

Emissions:	Proposed Hourly (lbs/hr)	Proposed Annually (tons/yr)	Potential-to-Emit Hourly (lbs/hr)	Potential-to-Emit Annually (tons/yr)	Emission Rate Potential Hourly (lbs/hr)	Emission Rate Potential Annually (tons/yr)
PM =	**9.98**	**20.98**	**12.58**	**80.06**	**112.15**	**649.69**
PM-10 =	**2.78**	**5.84**	**3.50**	**22.28**	**31.21**	**180.80**
PM-2.5 =	**0.28**	**0.58**	**0.35**	**2.23**	**3.12**	**18.08**

B. FUGITIVE EMISSIONS FROM ACTIVE LANDFILLING AREA

B.1 Waste Deposition or Waste Truck Unloading and Truck Dumping of Cover Soil

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
Emissions:			
E-PM =	**0.0002189**	**lbs/ton**	
E-PM-10 =	**0.0001035**	**lbs/ton**	
E-PM-2.5 =	**1.567E-05**	**lbs/ton**	
Proposed Waste Acceptance Rate =	1,000	tons/day	
Average waste in-place density =	0.375	ton/cy	
Proposed Waste Acceptance Rate by volume =	2,667	cy/day	
Volume of cover material is assumed to be 3% of the waste.			Source: See waste volume calculation Appendix A
Proposed volume of cover materials =	80	cy/day	
Average Density of cover material =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Proposed weight of cover materials =	141.1236	tons/day	
Total weight of materials handled =	1,141	tons/day	= waste + cover
Annual Materials Handling Rate =	350,325	tons/year	
Average Hourly Materials Handling Rate =	122	tons/hour	
Maximum Hourly Materials Handling Rate =	163	tons/hour	

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Emissions:	**Proposed Average**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.03**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**
PM-10 =	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
PM-2.5 =	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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B.2 Waste & Cover Material Bulldozing and Compacting Emissions

Proposed # of Facility Operating Hours/yr = 2,912
Hours/yr = 8,760

Equipment	Proposed Equipment Use			PTE Eq. Use	ERP Eq. Use
	(% per day)	(days/year)	(hours/year)	(hours/year)	(hours/year)
Cat 826 Landfill Compactor	0.73	307	2,126	8,760	8,760
D6 Bulldozer	0.73	307	2,126	8,760	8,760
D6 Bulldozer	0.36	307	1,048	8,760	8,760
Proposed Annual Equipment Operating Hours =			5,300	26,280	26,280 = Maximum Annual Equipment Operating

<u>Emission Factors:</u>
PM (lbs/hr) = 5.7*s^1.2/M^1.3
PM-10 (lbs/hr) = 0.75*s^1.5/M^1.4
PM-2.5 scaling factor = 0.105

s, cover soils (%) = 39.97 Source: Site Investigation Report, PJ Carey & Associates, September 2013
s, waste (%) = 5.22 Source: based on crushed concrete block from recycled from C&D waste
s, weighted average (%) = 6.2625

M (%) = 16.66 Source: Site Investigation Report, PJ Carey & Associates, September 2013

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**2.42**	**3.52**	**3.99**	**17.47**	**3.99**	**17.47**
PM-10 =	**0.42**	**0.61**	**0.69**	**3.01**	**0.69**	**3.01**
PM-2.5 =	**0.25**	**0.37**	**0.42**	**1.83**	**0.42**	**1.83**

B.1 + B.2

TOTAL FOR AREA SOURCE A1 (Active Landfilling Area)						
Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**2.45**	**3.56**	**4.03**	**17.51**	**4.03**	**17.51**
PM-10 =	**0.43**	**0.62**	**0.70**	**3.03**	**0.70**	**3.03**
PM-2.5 =	**0.26**	**0.37**	**0.42**	**1.84**	**0.42**	**1.84**

C. FUGITIVE EMISSIONS FROM LINER CONSTRUCTION AREA

C.1 Excavation and Truck Loading of Excavated Materials

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013

<u>Emission Factors:</u>

E-PM =	0.0002189	lbs/ton	
E-PM-10 =	0.0001035	lbs/ton	
E-PM-2.5 =	1.567E-05	lbs/ton	
Modeled volume to be excavated within Cell 2 =	85,615	cy	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Tons of Materials Handled =	151,029	ton	
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

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Emissions:	**Proposed Average**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.13**	**0.03**	**0.22**	**0.03**	**0.22**	**0.03**
PM-10 =	**0.06**	**0.02**	**0.10**	**0.02**	**0.10**	**0.02**
PM-2.5 =	**0.01**	**0.00**	**0.02**	**0.00**	**0.02**	**0.00**

C.2 Truck Dumping of Soil Liner Components

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
Emission Factors:			
E-PM =	0.0002189	lbs/ton	
E-PM-10 =	0.0001035	lbs/ton	
E-PM-2.5 =	1.567E-05	lbs/ton	
2D Area of Cell 2 =	222,660	sf	
Total Soil Liner Thickness =	3	ft	
Slope Factor =	1.05		
Volume of materials handled =	701,379	cf	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Ton of Materials Handled =	45,825	ton	
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

.

Emissions:	**Proposed Average**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.07**	**0.01**	**0.11**	**0.01**	**0.11**	**0.01**
PM-10 =	**0.03**	**0.00**	**0.05**	**0.00**	**0.05**	**0.00**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**

C.3 Truck Dumping of Stone Liner Components

Truck Unloading – Fragmented Stone

<u>Emission Factors:</u>

E -PM =	0.0000483	lbs/ton of material throughput
E -PM-10 =	0.000016	lbs/ton of material throughput
E -PM-2.5 =	0.000016	lbs/ton of material throughput

2D Area of Cell 2	222,660	sf
Total Stone Liner Thickness =	2.1	ft
Slope & Waste Factor =	1.05	
Volume of materials handled =	490,965	cf
Assumed density of stone =	1.5	ton/cy
Ton of Materials Handled =	27,276	ton
Average Hourly Production Rate =	300	ton/hour
Maximum Hourly Production Rate =	500	ton/hour

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Emissions:	**Proposed Average**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.01**	**0.00**	**0.02**	**0.00**	**0.02**	**0.00**
PM-10 =	**0.00**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**

C.4 Bulldozing and Compacting of Soil and Stone Liner Components

Emission Factors:

PM (lbs/hr)=	5.7*s^1.2/M^1.3
PM-10 (lbs/hr) =	0.75*s^1.5/M^1.4
PM-2.5 scaling factor =	0.105
s , soils (%) =	39.97
s , stone (%) =	3.9
s , weighted average (%) =	26.5
M (%) =	16.66
M , stone (%) =	2.1
M , weighted average (%) =	11.2
Average hourly production rate =	300 ton/hour
Total Weight of Materials Handled =	73,100 ton
Hours of Handling at Average Production Rate =	244 hours
Maximum pieces of equipment in use at any given time =	2

Emissions:	Proposed Average		Potential-to-Emit		Emission Rate Potential	
	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)
PM =	**25.10**	**3.06**	**25.10**	**3.06**	**25.10**	**3.06**
PM-10 =	**6.93**	**0.84**	**6.93**	**0.84**	**6.93**	**0.84**
PM-2.5 =	**2.64**	**0.32**	**2.64**	**0.32**	**2.64**	**0.32**

C.1 + C.2 + C.3 + C.4

TOTAL FOR AREA SOURCE A2 (Liner Construction Area)

Emissions:	Proposed Average		Potential-to-Emit		Emission Rate Potential	
	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)
PM =	**25.31**	**3.10**	**25.45**	**3.10**	**25.45**	**3.10**
PM-10 =	**7.03**	**0.86**	**7.10**	**0.86**	**7.10**	**0.86**
PM-2.5 =	**2.65**	**0.32**	**2.67**	**0.32**	**2.67**	**0.32**

D. FUGITIVE EMISSIONS FROM BORROW/FILL AREA

D.1 Site Preparation of the Borrow/Fill Area (Bulldozing of Overburden)

Emission Factors:		
PM (lbs/hr)=	5.7*s^1.2/M^1.3	
PM-10 (lbs/hr) =	0.75*s^1.5/M^1.4	
PM-2.5 scaling factor =	0.105	
s (%) =	39.97	Source: Site Investigation Report, PJ Carey & Associates, September 2013
M (%) =	16.66	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Total Borrow/Fill Area =	217,195 sf	
Staging Area and Embankment area already prepared =	112,880 sf	
Total area requiring site preparation =	104,315 sf	
Rate of site preparation =	0.5 acres/day	
	21,780 sf/day	
Total number of days required to complete the Task =	4.8 days	
Proposed Hours per day equipment is in use =	8 hours/day	
Proposed Total number of hours required to complete the Task =	38 hours	
Total number of days required to complete the Task =	4.8 days	
Maximum Hours per day equipment is in use =	24 hours/day	
Maximum Total number of hours required to complete the Task =	115 hours	

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**12.30**	**0.24**	**12.30**	**0.71**	**12.30**	**0.71**
PM-10 =	**3.69**	**0.07**	**3.69**	**0.21**	**3.69**	**0.21**
PM-2.5 =	**1.29**	**0.02**	**1.29**	**0.07**	**1.29**	**0.07**

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D.2 Truck Dumping and Reloading of Excavated Materials From A2

E (lbs/ton of material handled) = k(0.0032)*((U/5)^1.3/(M/2)^1.4)

Size-specific k			
PM =	0.74	(<30um is assumed to be Total PM)	
PM-10 scaling factor =	0.35		
PM-2.5 scaling factor =	0.053		
U (mph) =	7.85		Source: Weather Underground
M (%) =	16.66		Source: Site Investigation Report, PJ Carey & Associates, September 2013
Emission Factors:			
E-PM =	0.0002189	lbs/ton	
E-PM-10 =	0.0001035	lbs/ton	
E-PM-2.5 =	1.567E-05	lbs/ton	
Volume of Materials Excavated from Cell 2 =	85,615	cy	
Volume of Materials Required for Soil Liner Components =	25,977	cy	
Daily Rate of cover soil usage =	80	cy/day	
Proposed Number of operating days per year =	307	days/year	
Proposed Annual Volume of Cover Soil =	24,560	cy/year	
Proposed Total Volume of Materials Handled =	136,152	cy	
Proposed Ton of Materials Handled =	240,178	ton	
Maximum Number of operating days per year =	365	days/year	
Maximum Annual Volume of Cover Soil =	29,200	cy/year	
Maximum Total Volume of Materials Handled =	140,792	cy	
Maximum Ton of Materials Handled =	248,363	ton	
Wet weight density of in-situ materials =	130.67	lbs/cf	Source: Site Investigation Report, PJ Carey & Associates, September 2013
Average Hourly Production Rate =	300	ton/hour	
Maximum Hourly Production Rate =	500	ton/hour	

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.07**	**0.03**	**0.11**	**0.03**	**0.11**	**0.03**
PM-10 =	**0.03**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**
PM-2.5 =	**0.00**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**

D.3 Truck Dumping & Reloading of Stone Materials from Offsite

<u>Emission Factors:</u> (lbs/ton of material throughput)

Source	*E*-PM	*E*-PM-10	*E*-PM-2.5
Truck Unloading – Fragmented Stone	0.000048	0.000016	0.000016
Truck Loading – Conveyor, Crushed Stone	0.0003	0.0001	0.0001

Ton of Materials Loaded =	27,276	ton
Ton of Materials Unloaded =	13,638	ton
Hourly stone delivery rate =	0.529	loads/hour
Weight of stone per load =	20	ton/load
Average Stone Unloading Rate =	10.57	ton/hour
Maximum Stone Delivery Rate =	40	ton/hour
Average hourly stone loading rate =	80	ton/hour
Maximum hourly stone loading rate =	140	ton/hour

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**0.02**	**0.00**	**0.04**	**0.00**	**0.04**	**0.00**
PM-10 =	**0.01**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**
PM-2.5 =	**0.01**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**

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D.4 Bulldozing and Shaping of the Embankment/Screening Berm

Emission Factors:
PM (lbs/hr)= 5.7*s^1.2/M^1.3
PM-10 (lbs/hr) = 0.75*s^1.5/M^1.4
PM-2.5 scaling factor = 0.105

s (%) = 39.97 Source: Site Investigation Report, PJ Carey & Associates, September 2013

M (%) = 16.66 Source: Site Investigation Report, PJ Carey & Associates, September 2013

Average Hourly Production Rate = 300 ton/hour
Wet weight density of in-situ materials = 130.67 lbs/cf Source: Site Investigation Report, PJ Carey & Associates, September 2013
Volume of Materials Handled = 35,078 cy
Total Weight of Materials Handled = 61,879 ton
Total Hours Required to Complete Task = 206 hours (at average hourly production rate)

Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**12.30**	**1.27**	**12.30**	**1.27**	**12.30**	**1.27**
PM-10 =	**3.69**	**0.76**	**3.69**	**0.76**	**3.69**	**0.76**
PM-2.5 =	**1.29**	**0.13**	**1.29**	**0.13**	**1.29**	**0.13**

D.1 + D.2 + D.3 + D.4

TOTAL FOR SOURCE AREA A3 (Borrow/Fill Area)						
Emissions:	**Proposed**		**Potential-to-Emit**		**Emission Rate Potential**	
	Hourly (lbs/hr)	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**	**Hourly (lbs/hr)**	**Annually (tons/yr)**
PM =	**24.68**	**1.53**	**24.75**	**2.01**	**24.75**	**2.01**
PM-10 =	**7.42**	**0.85**	**7.45**	**0.99**	**7.45**	**0.99**
PM-2.5 =	**2.60**	**0.16**	**2.60**	**0.21**	**2.60**	**0.21**

E. FUGITIVE EMISSIONS FROM C&D PROCESSING AREA

C&D Processing Facility Typical Throughput =	160	ton/day
C&D Processing Facility Maximum Throughput =	330	ton/day
Proposed Operating Days/year =	307	
Proposed Operating Hours/year =	2,912	
Minimum # of Operating Hours/day =	7	
Maximum Operating Days/year =	365	
Maximum Operating Hours/year =	8,760	

Emission Factors: (lbs/ton of material throughput)

Source	*E*-PM	*E*-PM-10	*E*-PM-2.5
Crushing	0.0054	0.0024	0.0024
Crushing (controlled)	0.0012	0.00054	0.0001
Screening	0.025	0.0087	0.0087
Screening (controlled)	0.0022	0.00074	0.00005
Conveyor Transfer Point	0.003	0.0011	0.00111
Conveyor Transfer Point (controlled)	0.00014	0.000046	0.000013
Truck Unloading – Fragmented Stone	0.000048	0.000016	0.000016
Truck Loading – Converyor, Crushed Stone	0.0003	0.0001	0.0001

TOTAL FOR SOURCE AREA A4 (CDPO)

Emissions:	Proposed Actual		Potential-to-Emit		Emission Rate Potential	
	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)	Hourly (lbs/hr)	Annually (tons/yr)
PM =	0.07	0.10	0.18	0.23	1.59	2.03
PM-10 =	0.02	0.04	0.07	0.09	0.58	0.74
PM-2.5 =	0.00	0.01	0.01	0.02	0.58	0.74

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Source	Proposed Actual Emission Rates					
	PM		PM-10		PM-2.5	
	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)
A.Unpaved Roads	10.0	21.0	2.78	5.84	0.28	0.58
B. Active Landfilling	2.45	3.56	0.43	0.62	0.26	0.37
C. Liner Construction	25.3	3.10	7.03	0.86	2.65	0.32
D. Borrow/Fill Activities	24.7	1.53	7.42	0.85	2.60	0.16
E. C&D Processing	0.07	0.10	0.02	0.04	0.00	0.01
TOTAL	**62.5**	**29.3**	**17.7**	**8.2**	**5.79**	**1.45**

Source	Potential-to-Emit Emission Rates					
	PM		PM-10		PM-2.5	
	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)
A.Unpaved Roads	12.6	80	3.5	22.3	0.35	2.23
B. Active Landfilling	4.03	17.51	0.70	3.03	0.42	1.84
C. Liner Construction	25.5	3.10	7.10	0.86	2.67	0.32
D. Borrow/Fill Activities	24.7	2.01	7.45	0.99	2.60	0.21
E. C&D Processing	0.18	0.23	0.07	0.09	0.01	0.02
TOTAL	**67**	**102.9**	**18.8**	**27.2**	**6.06**	**4.62**

Source	Emission Rate Potential Emission Rates					
	PM		PM-10		PM-2.5	
	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)
A.Unpaved Roads	112.2	649.7	31.2	180.8	3.12	18.08
B. Active Landfilling	4.03	17.5	0.70	3.03	0.42	1.84
C. Liner Construction	25.5	3.10	7.10	0.86	2.67	0.32
D. Borrow/Fill Activities	24.7	2.01	7.45	0.99	2.60	0.21
E. C&D Processing	1.59	2.03	0.58	0.74	0.58	0.74
TOTAL	**168.0**	**674.3**	**47.0**	**186.4**	**9.39**	**21.19**

B.1. CO_2 Emissions from Proposed Carroll Landfill Fleet Vehicles, Equipment, and Machinery Engines

Equipment	Consumption Rate (gallons/hour)	Average Equipment Use (% per day)	(days/year)	(hours/year)	Projected Fuel Consumption (gallons/year)	PTE Usage (hours/year)	PTE Fuel Consumption (gallons/year)	ERP Usage (hours/year)	ERP Fuel Consumption (gallons/year)	
Cat 826 Landfill Compactor	15	0.73	307	2,126	31,886	8,760	131,400	8,760	131,400	
D25 Off-Road Dump	13	0.55	307	1,602	20,821	8,760	113,880	8,760	113,880	
D25 Off-Road Dump	10	0.55	307	1,602	16,016	8,760	87,600	8,760	87,600	
D6 Bulldozer	9	0.73	307	2,126	19,132	8,760	78,840	8,760	78,840	
D6 Bulldozer	7	0.36	307	1,048	7,338	8,760	61,320	8,760	61,320	
IR SD-100 Soil Compactor	3	0.5	120	569	1,707	8,760	26,280	8,760	26,280	
336D Excavator	10	0.75	307	2,184	21,840	8,760	87,600	8,760	87,600	
416E Backhoe	3	0.5	100	474	1,423	8,760	26,280	8,760	26,280	
962 Loader	7	0.55	307	1,602	11,211	8,760	61,320	8,760	61,320	
2,000 Gallon Water Truck	4	0.55	164	856	3,422	8,760	35,040	0	0	
Equipment Maintenance Truck	5	0.18	260	444	2,220	8,760	43,800	8,760	43,800	
Tool Truck	6	0.18	260	444	2,663	8,760	52,560	8,760	52,560	
Fuel/Lube Truck	4	0.3	307	874	3,494	8,760	35,040	8,760	35,040	
Tractor	2	0.18	130	222	444	8,760	17,520	8,760	17,520	
Vacuum Sweeper	2	0.36	260	888	1,776	8,760	17,520	8,760	17,520	
Tub Grinder	33	0.5	52	247	8,138	8,760	289,080	8,760	289,080	
Impact Crusher	16	0.68	104	671	10,733	8,760	140,160	8,760	140,160	
Shaker Screen	3.5	0.32	156	474	1,657	8,760	30,660	8,760	30,660	
Stacking Conveyor	1	0.44	307	1,281	1,281	8,760	8,760	8,760	8,760	
Emergency Generator	41.4	--	--	600	24,840	8,760	362,664	8,760	362,664	
				Total Diesel Usage/Year =	**192,044**		**1,707,324**		**1,672,284**	gals/yr
				$E\text{-}CO_2$ (diesel) =	**10.15**		**10.15**		**10.15**	kg/gal
Pickup Truck	2	0.91	307	2,650	5,300	8,760	17,520	8,760	17,520	
Pickup Truck	2	0.36	260	888	1,776	8,760	17,520	8,760	17,520	
				Total Gasoline Usage/Year =	**7,075**		**35,040**		**35,040**	gals/yr
				$E\text{-}CO_2$ (gasoline) =	**8.91**		**8.91**		**8.91**	kg/gal
				Total Annual CO_2 Emissions (TPY) =	**2,218**		**19,446**		**19,054**	
				Hours of Facility Operation per Year =	2,912		8,760		8,760	
				Total Hourly CO_2 Emissions (lbs/hr) =	**1,523**		**4,440**		**4,350**	

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B.2. N_2O & CH_4 Emissions from Proposed Carroll Landfill Construction Vehicle and Machinery Engines

Equipment	Consumption Rate (gallons/hour)	Average Equipment Use (% per day)	(days/year)	(hours/year)	Projected Fuel Consumption (gallons/year)	PTE Usage (hours/year)	PTE Fuel Consumption (gallons/year)	ERP Usage (hours/year)	ERP Fuel Consumption (gallons/year)
Cat 826 Landfill Compactor	15	0.73	307	2,126	31,886	8,760	131,400	8,760	131,400
D25 Off-Road Dump	13	0.55	307	1,602	20,821	8,760	113,880	8,760	113,880
D25 Off-Road Dump	10	0.55	307	1,602	16,016	8,760	87,600	8,760	87,600
D6 Bulldozer	9	0.73	307	2,126	19,132	8,760	78,840	8,760	78,840
D6 Bulldozer	7	0.36	307	1,048	7,338	8,760	61,320	8,760	61,320
IR SD-100 Soil Compactor	3	0.5	120	569	1,707	8,760	26,280	8,760	26,280
336D Excavator	10	0.75	307	2,184	21,840	8,760	87,600	8,760	87,600
416E Backhoe	3	0.5	100	474	1,423	8,760	26,280	8,760	26,280
962 Loader	7	0.55	307	1,602	11,211	8,760	61,320	8,760	61,320
Tractor	2	0.18	130	222	444	8,760	17,520	8,760	17,520
Tub Grinder	33	0.5	52	247	8,138	8,760	289,080	8,760	289,080
Impact Crusher	16	0.68	104	671	10,733	8,760	140,160	8,760	140,160
Shaker Screen	3.5	0.32	156	474	1,657	8,760	30,660	8,760	30,660
Stacking Conveyor	1	0.44	307	1,281	1,281	8,760	8,760	8,760	8,760
Emergency Generator	41.4	--	--	600	24,840	8,760	362,664	8,760	362,664
				Total Diesel Usage/Year =	**178,468**		**1,523,364**		**1,523,364**
				Hours of Facility Operation per Year =	2,912		8,760		8,760

	Ex, Diesel Emission Factor (g/gal)	Projected Emissions (lbs/hr)	(TPY)	PTE Emissions (lbs/hr)	(TPY)	ERP Emissions (lbs/hr)	(TPY)	Global Warming Potential
N_2O	0.26	0.035	0.051	0.100	0.437	0.100	0.437	310
CH_4	0.58	0.078	0.114	0.222	0.974	0.222	0.974	21
TOTAL GHG		0.113	0.165	0.322	1.411	0.322	1.411	
GHG (CO_2-e)		**12.5**	**18.3**	**35.6**	**155.8**	**35.6**	**155.8**	

B.3. N_2O & CH_4 Emissions from Proposed Carroll Landfill Onsite Fleet of Highway Vehicle Non-Stationary Combustion Engines.

DIESEL Equipment	**Proposed Average Equipment Use** (% per day)	(days/year)	(hours/year)	**PTE Usage** (hours/year)	**Assumed Average Speed** (mph)	**Average VMT** (miles/year)	**PTE VMT** (miles/year)	**ERP Usage** (hours/year)	**ERP VMT** (miles/year)
2,000 Gallon Water Truck	0.55	164	856	8,760	10	8,556	87,600	0	0
Equipment Maintenance Truck	0.18	260	444	8,760	10	4,439	87,600	8,760	87,600
Tool Truck	0.18	260	444	8,760	10	4,439	87,600	8,760	87,600
Fuel/Lube Truck	0.3	307	874	8,760	10	8,736	87,600	8,760	87,600
					TOTAL =	**26,170**	**350,400**		**262,800**

Diesel Heavy-Duty Vehicles (Advanced)	Diesel Emission Factor (g/mile)	Proposed (lbs/hr)	(TPY)	Potential-To-Emit (lbs/hr)	(TPY)	Emission Rate Potenial (lbs/hr)	(TPY)	Global Warming Potential
N_2O	0.0480	0.0010	0.0014	0.0127	0.0185	0.0096	0.0139	310
CH_4	0.0051	0.0001	0.0001	0.0014	0.0020	0.0010	0.0015	21
Total GHG		0.0011	0.0015	0.0141	0.0205	0.0106	0.0154	
GHG (CO_2-e)		0.30	0.43	3.98	5.79	2.98	4.34	

GASOLINE Equipment	**Proposed Average Equipment Use** (% per day)	(days/year)	(hours/year)	**PTE Usage** (hours/year)	**Assumed Average Speed** (mph)	**Average VMT** (miles/year)	**PTE VMT** (miles/year)	**ERP Usage** (hours/year)	**ERP VMT** (miles/year)
Pickup Truck	0.91	307	2,650	8,760	20	52,998	175,200	8,760	175,200
Pickup Truck	0.36	260	888	8,760	20	17,757	175,200	8,760	175,200
					TOTAL =	**70,755**	**350,400**		**350,400**

Gasoline Light-Duty Trucks (EPA Tier 2)	Gasoline Emission Factor (g/mile)	Proposed (lb/hr)	(TPY)	Potential-To-Emit (lb/hr)	(TPY)	Emission Rate Potenial (lbs/hr)	(TPY)	Global Warming Potential
N_2O	0.0066	0.0004	0.0005	0.0018	0.0025	0.0018	0.0025	310
CH_4	0.0163	0.0009	0.0013	0.0043	0.0063	0.0043	0.0063	21
Total GHG		0.0012	0.0018	0.0061	0.0088	0.0061	0.0088	
GHG (CO_2-e)		0.13	0.19	0.63	0.92	0.63	0.92	

TOTAL FOR B.3. (Onsite Fleet of Highway Vehicles)						
Emissions:	**Proposed (lbs/hr)**	**(TPY)**	**Potential-To-Emit (lbs/hr)**	**(TPY)**	**Emission Rate Potential (lbs/hr)**	**(TPY)**
N_2O	**0.001**	**0.002**	**0.014**	**0.021**	**0.011**	**0.016**
CH_4	**0.001**	**0.001**	**0.006**	**0.008**	**0.005**	**0.008**
Total GHG	**0.002**	**0.003**	**0.020**	**0.029**	**0.017**	**0.024**
GHG (CO_2-e)	**0.4**	**0.6**	**4.6**	**6.7**	**3.6**	**5.3**

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Summary Table of Facility Operations GHG Emission Estimates

TOTAL B.	**Actual Emissions**		**PTE Emissions**		**Emission Rate Potential**	
	(TPY)	**(lbs/hr)**	**(TPY)**	**(lbs/hr)**	**(TPY)**	**(lbs/hr)**
CO_2	2,218	1,523	19,446	4,440	19,054	4,350
N_2O	0.053	0.036	0.458	0.114	0.453	0.111
CH_4	0.116	0.079	0.982	0.228	0.982	0.228
GHG Total	2,218	1,524	19,448	4,440	19,056	4,351
GHG (CO_2-e)	2,237	1,536	19,609	4,480	19,215	4,390

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Stationary Internal Combustion Engine Emissions Estimates

Equipment	Engine Power Rating		Equipment Usage	
			Proposed Actual	Maximum
	HP	kW	hours/yr	hours/yr
Emergency Generator	724	540	600	8,760
Tub Grinder	1050	782	247	8,760
Impact Crusher	300	224	1,281	8,760
Shaker Screen	84	62	2,126	8,760
Stacking Conveyor	48	35	1,602	8,760

Regulated Air Pollutants

CO

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate		
			Proposed Actual	Potential-to-Emit	Emission Rate Potential
	g/kW-hr	lbs/hr	tons/yr	tons/yr	tons/yr
Emergency Generator	3.5	4.17	1.25	18.25	18.25
Tub Grinder	3.5	6.03	0.75	26.43	26.43
Impact Crusher	3.5	1.73	1.11	7.57	7.57
Shaker Screen	5	0.68	0.73	2.99	2.99
Stacking Conveyor	5.5	0.42	0.34	1.86	1.86
TOTAL		**8.87**	**2.92**	**57.10**	**57.10**

NOx

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate		
			Proposed Actual	Potential-to-Emit	Emission Rate Potential
	g/kW-hr	lbs/hr	tons/yr	tons/yr	tons/yr
Emergency Generator	0.4	0.48	0.14	2.09	2.09
Tub Grinder	3.5	6.03	0.75	26.43	26.43
Impact Crusher	0.4	0.20	0.13	0.87	0.87
Shaker Screen	0.4	0.05	0.06	0.24	0.24
Stacking Conveyor*	3.572	0.28	0.22	1.21	1.21
TOTAL		**6.56**	**1.15**	**30.83**	**30.83**

*The applicable Tier 4 final Emission Standard for this engine is the sum of NOx and NMHCs = 4.7 g/kW-hr. A ratio of NOx to NMHC of 76:24% was assumed based on the linear relationship of NOX to NMHC from Table 1 of Subpart IIII, Table 1 from 40 CFR 89.112, to Tables 4, 5, and 6 from 40 CFR 1039.102.

PM-10 (PM-2.5)*

Equipment	Tier 4 final Emission Standard	Hourly Emission Rate	Annual Emission Rate		
			Proposed Actual	Potential-to-Emit	Emission Rate Potential
	g/kW-hr	lbs/hr	tons/yr	tons/yr	tons/yr
Emergency Generator	0.02	0.024 (0.023)	0.007 (0.007)	0.104 (0.101)	0.104 (0.101)
Tub Grinder	0.04	0.069 (0.067)	0.009 (0.008)	0.302 (0.293)	0.302 (0.293)
Impact Crusher	0.02	0.010 (0.010)	0.006 (0.006)	0.043 (0.042)	0.043 (0.042)
Shaker Screen	0.02	0.003 (0.003)	0.003 (0.003)	0.012 (0.012)	0.012 (0.012)
Stacking Conveyor	0.03	0.002 (0.002)	0.002 (0.002)	0.010 (0.010)	0.010 (0.010)
TOTAL		**0.11 (0.10)**	**0.03 (0.03)**	**0.47 (0.46)**	**0.47 (0.46)**

*All PM assumed to be < 10µm and PM-2.5 is assumed to be 97% of PM-10
per Alpha-Gamma Technologies, Inc. Memorandum, June 3, 2005.

SO_2

Equipment	AP-42, Ch. 3.4 Emission Factor	Hourly Emission Rate	Annual Emission Rate		
			Proposed Actual	Potential-to-Emit	Emission Rate Potential
	lb/HP-hr	lbs/hr	tons/yr	tons/yr	tons/yr
Emergeny Generator	1.21E-05	0.009	0.003	0.038	0.038
Tub Grinder	1.21E-05	0.013	0.002	0.056	0.056
Impact Crusher	1.21E-05	0.004	0.002	0.016	0.016
Shaker Screen	1.21E-05	0.001	0.001	0.004	0.004
Stacking Conveyor	1.21E-05	0.001	0.0005	0.003	0.003
TOTAL		**0.03**	**0.01**	**0.12**	**0.12**

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Waste Oil Space Heaters Emission Estimates

Rated Fuel Usage per Heater =	2.4	gal/hr
Est. Annual Operating Hours =	5,088	hr
Maximum Annual Operating Hours =	8,760	hr
Number of Heaters Required =	2	

Waste Oil Components:

% Ash (A)	0.65	%
% Sulfur (S)	0.50	%
% Lead (L)	0.0048	%

Pollutant	Emission Factor lbs/1,000gal burned	Hourly Emission Rate lbs/hr	Annual Emission Rate Proposed Average tons/yr	Potential-to-Emit tons/yr	Emission Rate Potential tons/yr
Regulated Air Pollutants					
CO	2.1	0.0101	0.0256	0.0442	0.0442
NOx	16	0.0768	0.1954	0.3364	0.3364
PM	66A = 42.9	0.2059	0.5239	0.9019	0.9019
PM-10	57A = 37.05	0.1778	0.4524	0.7789	0.7789
SOx	107S = 53.5	0.2568	0.6533	1.1248	1.1248
TOC (Assumed = total VOCs)	1	0.0048	0.0122	0.0210	0.0210
Hazardous Air Pollutants					
Antimony	4.5E-03	0.000022	0.000055	0.000095	0.000095
Arsenic	6.0E-02	0.000288	0.000733	0.001261	0.001261
Beryllium	1.8E-03	0.000009	0.000022	0.000038	0.000038
Cadmium	1.2E-02	0.000058	0.000147	0.000252	0.000252
Chromium	1.8E-01	0.000864	0.002198	0.003784	0.003784
Cobalt	5.2E-03	0.000025	0.000063	0.000109	0.000109
Dibutylphthalate	3.4E-05	1.63E-07	4.15E-07	7.15E-07	7.15E-07
Lead	50L = 0.24	0.001152	0.00293	0.0050	0.0050
Manganese	5.0E-02	0.000240	0.000611	0.001051	0.001051
Naphthalene	9.2E-05	4.42E-07	1.12E-06	1.93E-06	1.93E-06
Nickel	1.6E-01	0.000768	0.001954	0.003364	0.003364
Phenol	2.8E-05	1.34E-07	3.42E-07	5.89E-07	5.89E-07
Total HAPs		**0.00**	**0.01**	**0.02**	**0.02**
Greenhouse Gas Emissions					
CO_2	22,000	106	269	463	463