ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

February 8, 2019

SUBJECT: Renewal Title V Operating Permit Application
Chambers Development Company, Inc. - Monroeville Landfill
600 Thomas Street
Monroeville, PA 15146

RE: Title V Operating Permit No. 0215
Municipal Waste Landfill

TO: JoAnn Truchan, PE
Chief Engineer

FROM: Hafeez A. Ajenifuja.
Air Quality Engineer

FACILITY DESCRIPTION:

Chambers Development Company, Inc. operates Monroeville Landfill, a municipal solid waste landfill, in Monroeville, Pennsylvania. The landfill is approximately 390 total acres in surface area, comprised of two (2) closed areas (old west and western) and two active areas (eastern and south west expansion). The landfill has an active landfill gas (LFG) collection system with one (1) enclosed ground flare and one (1) utility flare to control the landfill gas emissions collected from closed and active disposal areas. The landfill also has small motor oil, hydraulic oil and diesel fuel storage tanks; landfill operations (land clearing and earth moving) and construction; and vehicular traffic.

The primary source of emissions at the facility is the landfill itself, which emits VOCs and HAPs as defined in CAA section 112. Since the landfill was modified after May 30, 1991 and has a design capacity greater than 2.5 million megagrams, this facility is subject to the requirements of the New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills, 40 CFR 60 Subpart WWW. Pursuant to the requirements of 40 CFR 60, Subpart WWW, landfills having design capacities greater than or equal to 2.5 million megagrams must obtain a Part 70 operating permit. This facility is therefore subject to the Part 70 major source operating permit requirements of '2103.20. This notwithstanding, the Monroeville Landfill is a major source of CO emission and minor source for remaining criteria pollutant and HAP emissions, as defined at '2102.20 (Definitions) of Article XXI.

PROCESS DESCRIPTION:

This is a Title V renewal permit for Chambers Development Company, Inc. - Monroeville Landfill located in Municipality of Monroeville, Allegheny County.

The following changes were made during the Title V renewal:

1) The responsible official name was changed

2) The enclosed flare (S002) rated at 3000 cfm has been removed from the permit. The flare is no longer in service and has been decommissioned. There is no underlying installation permit for the flare.

3) Chambers Landfill requested to incorporate into the permit some suggested alternative compliance requirements to the gas extraction wells. The Department cannot incorporate the requirements as requested. The facility may request for an alternative operating scenario on a case by case basis and include the following well monitoring data:

    a. The list of affected wells
    b. Methane Concentration (Three consecutive month)
    c. Carbon dioxide concentration (Three consecutive month)
    d. Oxygen (Three consecutive month)
    e. Temperature (three consecutive month)
    f. Carbon monoxide (three consecutive month)

The facility's operations and processes are still the same as in the original operating permit and it is described below:

The facility consists of the following emission units:

1. One (1) existing stationary municipal solid waste landfill with a design capacity of 19.37 million megagrams.
2. One (1) active landfill gas collection and control system consisting of one (1) enclosed ground flare, rated at a maximum capacity of 4000 scfm of landfill offgas and exhausting through stacks S001 and and one (1) utility flare, rated at a maximum capacity of 500 scfm and exhausting through stack S003.
3. Three (3) above ground motor oil storage tanks, collectively identified as D001, each having a storage capacity of 500 gallons.
4. Two (2) above ground hydraulic oil storage tanks, collectively identified as D002, each having a storage capacity of 500 gallons.
5. Two (2) underground diesel fuel storage tanks, collectively identified as D003, each having a storage capacity of 2000 gallon.
6. Two (2) leachate storage tanks, collectively identified as D004, each having a storage capacity of 700,000 gallons.
7. Landfill operations and landfill construction.
8. Paved and unpaved roads.

EMISSION CALCULATION:

Pollutants	MSW Landfill (tons/yr)[1]	Two (2) Flares (tons/yr)[1]		Motor Oil Storage Tanks (tons/yr)[1]	Two (2) Hydraulic oil storage tanks (tons/yr)[1]	Landfill Operation & Construction (tons/yr)[1]
		S001 4000 CFM	S003 500 CFM			
PM/PM_{10}	0.00	8.22	1.03	0.00	0.00	60.36[2]
NO_x	0.00	42.05	4.47	0.00	0.00	0.00
SO_X	0.00	8.80	1.10	0.00	0.00	0.00
CO	0.00	105.12	24.31	0.00	0.00	0.00
VOC	16.52	1.11	0.14	0.14	0.23	0.00
NMOC	42.37	2.84	0.36	0.00	0.00	0.00
HAPs(single)[3]	3.03	4.24	0.53	0.00	0.00	0.00
HAPs (total)	10.22	6.90	0.86	0.00	0.00	0.00

1. A year is defined as any consecutive 12-month period.
2. PM and PM 10 emissions from this activity are fugitive emissions only.
3. Single HAP for MSW Landfill is toluene; single HAP for flare is HCl.

See Appendix A Tables 1 & 2 for the Fugitive HAP emissions from the landfill operation and landfill gas flares.

The highest single HAP for the enclosed flare S001 is hydrochloric acid (HCL)

Sample calculation for the (4,000 cfm) flare single HAP is shown below:

Molecular Weight of HCL = 35.45lbs/lb-mole
Concentration = 48.0 ppmv
Universal Gas Constant = 0.7302 atm-ft^3/lb-mol^{o}R
Standard Temperature = 60°F or 520°R

(4000ft^3/min)*(60min/hr)*(42ppmv/1000000)*(36.50lbs/lbs-mole)*(lbs-mol^{o}R/0.7302atm-ft^3)*(1/520°R)

= **0.969 lb/hr**

0.94 lb/hr * 8760 hrs/yr * tons/2000 lbs = **4.24 tons/yr**

RENEWAL OPERATING APPLICATION COMPONENTS:

1. Renewal Permit Application No. 0215 was received on March 29, 2016.

METHOD OF DEMONSTRATING COMPLIANCE:

Compliance with the landfill gas capture efficiency limitation, control device destruction efficiency, and other operational standards required for this landfill in accordance to 40 CFR 60, Subpart WWW will be demonstrated by complying with the monitoring requirements of §60.756, the reporting requirements of §60.757, and the record keeping requirements of §60.758. Compliance with the fugitive particulate emission limitations for the rock crushing and handling activities will be demonstrated according to the work practice and fugitive dust control measures established in IP No. 0215-001, as incorporated herein.

REGULATORY APPLICABILITY:

1. **Article XX1 Requirements for Issuance:**

The requirements of Article XXI, Parts B and C for the issuance of this renewal permits have been met for this facility. Article XXI, Part D, Part E & Part H will have the necessary sections addressed individually.

2. Testing Requirements:

Plan Approval Order and Agreement Upon Consent Number 253, Dated December 30, 1996:

In order to comply with §2105.06.a of Article XXI, Major Sources of NOx and VOCs Reasonably Available Control Technology, the facility will test enclosed ground flares # 1 & 2 for compliance with the established NMOC destruction efficiency (i.e., 98% by weight, as condition 1.4). Such testing will be conducted once every five (5) years according to approved U.S. EPA test methods and Section 2108.02 of Article XXI.

3. **New Source Performance Standards (NSPS):**

a) 40 CFR PART 60, Subpart WWW-Standards of Performance for Municipal Solid Waste Landfills:

The municipal solid waste landfill is subject to the New Source Performance Standard, Article XXI '2105.05 and '2105.73, (40 CFR 60, Subpart WWW) because the municipal solid waste landfill commenced construction, reconstruction or modification or began accepting waste on or after May 30, 1991. Pursuant to Subpart WWW, the landfill must operate a landfill offgas collection system and the collection system must be operated with a negative pressure head, except under the conditions stated at 40 CFR 60.753. The collected gas must be vented to a control system designed and operated in accordance with '60.752 (b)(2)(iii). This landfill complies with these requirements by using a landfill offgas collection and control system that consists of two (2) enclosed ground flares having a VOC destruction efficiency of at least ninety eight (98) percent by weight. The landfill is also subject to testing, compliance, monitoring, reporting and recordkeeping requirements specified in §60.754, §60.755, §60.756, §60.757 and §60.758, respectively.

Pursuant to 40 CFR 60.752, a municipal solid waste landfill with a design capacity greater than 2.5 million megagrams (Mg) shall comply with 40 CFR 60.752(b)(2)(ii) if the non-methane organic compound emission (NMOC) rate is greater than 50 Mg/year based on calculation procedures specified in 40 CFR 60.754. Based on 40 CFR 60.754(a)(1); the following values for the NMOC calculations: k = 0.05 /yr, Lo = 170 m3/Mg and NMOC = 4,000 ppmv (as hexane); and using the EPA's LandGEM Model (Version 2.01), the calculation shows that the NMOC emission rate exceeds 50 Mg/year. The proposed gas collection and control systems are therefore required to comply with the requirements of 40 CFR 60, Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills).

b) *40 CFR PART 60, Subpart Ka- Standards of Performance for Volatile Organic Liquid Storage Vessels for Petroleum Liquids:*

The three (3) motor oil storage tanks, with capacities of 500 gallons each, are not subject to the New Source Performance Standard, Article XXI '2105.05, (40 CFR 60, Subpart Ka) because the storage capacities of all the tanks are less than the rule applicability threshold of 40,000 gallons. The two (2) hydraulic oil storage tanks, with capacities of 500 gallons each, are not subject to the New Source Performance Standard, Article XXI '2105.05, (40 CFR 60, Subpart Ka) because the storage capacities of all the tanks are less than the rule applicability threshold of 40,000 gallons. The two (2) underground diesel storage tanks, with capacities of 2000 gallons each, are not subject to the New Source Performance Standard, Article XXI '2105.05, (40 CFR 60, Subpart Ka) because diesel fuel oil does not meet the definition of petroleum liquids and also the storage capacities of all the tanks are less than the rule applicability threshold of 40,000 gallons.

c) *40 CFR PART 60, Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels:*

The two (2) 700,00 gallons leachate storage tanks are not subject to the New Source Performance Standard, Article XXI '2105.05, (40 CFR 60, Subpart Kb), because leachate does not meet the definition of volatile organic liquid. Further the six (6) tanks described below (Subpart Ka) are not subject to this rule because the storage capacities of all tanks are less than the rule applicability threshold of 75 m3 (19,812.9 gallons).

d) *40 CFR PART 60, Subpart OOO- Standards of Performance for Nonmetallic Mineral Processing Plants:*

The landfill clearing and earthmoving activities, including cover soil stockpiling at this plant are not subject to the New Source Performance Standard, Article XXI '2105.05, (40 CFR Part 60, Subpart OOO) because the landfill does not have crushing or grinding operations and it is not considered as a nonmetallic mineral processing plant, as defined at §60.671.

4. **NESHAP and MACT Standards:**

The municipal solid waste landfill is subject to the National Emission Standards for Hazardous Air Pollutants for Municipal Solid Waste Landfills, 40 CFR 63, Subpart AAAA. This landfill, as an area source of HAP emissions, has a design capacity greater than 2.5 megagrams (Mg) and 2.5 million cubic meters (m^3) and has uncontrolled emissions greater than 50 Mg NMOC as calculated pursuant to 40 CFR 60.754(a) (see above discussion on Subpart WWW applicability). As such, the permittee is required to comply with the applicable requirements for an existing affected source that is an area source. These requirements are incorporated into the permit and primarily require the permittee to comply with all requirements of Subpart WWW. One additional requirement pursuant to Subpart AAAA is for the permittee to prepare and maintain a startup, shutdown and malfunction (SSM) plan, and such is incorporated into the permit.

5. **Compliance Assurance Monitoring:**

The Compliance Assurance Monitoring (CAM) rule found in 40 CFR 64 is not applicable to the facility pursuant to §64.2(b)(1), which states “emission limitations or standards proposed by the administrator after November 15, 1990 pursuant to section 111 or 112 of the Act”. Section 111, which is the NSPS Subpart WWW, is applicable to the facility since it is a landfill and it was promulgated on March 12, 1996, while Section 112 which is the NESHAP (MACT) Subpart AAAA is also applicable to the facility. Subpart AAAA referenced Subpart WWW and it was promulgated on January 16, 2003.

6. Reasonably Available Control Technology (RACT) (§2105.06):

Section 2105.06 of Article XXI requires that RACT be applied to all major sources of VOC (and NOx). This landfill was determined to be subject to this rule as a major source of VOC, since the existing plant off-gas collection and control system was not considered as federally enforceable by the U.S. EPA, and the uncontrolled potential to emit of VOC exceeded 50 tons per year. Plan Approval Order and Agreement No. 253 issued on December 17, 1996, determined RACT to be thermal incineration (i.e., ground flaring), with the flare properly maintained and operated at a minimum destruction efficiency of 98% by weight, and an average off-gas collection system efficiency of 75%. Related testing, recordkeeping, reporting and monitoring were also required. This approval made the existing off-gas collection and control system federally enforceable, with potential VOC emissions thereafter determined by taking the existing collection/control system into account.

7. Greenhouse Gases:

Calculations of greenhouse gases are based on methodology found in 40 CFR Part 98, Subpart HH and EPA Climate Leaders Greenhouse Gas Inventory Protocol-Core Module Guidance, October 2004.

The 40 CFR Part 98, Subpart HH only addressed the reporting of methane (CH_4) emission even though CO_2 and CH_4 are made up of approximately equal amounts on a volumetric basis. According to the October 2004, EPA Climate Leaders Greenhouse Gas Inventory Protocol-Core Module Guidance, methane accounts for the majority of the GHG emissions from landfills. It was assumed that waste decomposition does not contribute to the net addition of CO_2 to the atmosphere, and this is consistent with intergovernmental panel on climate change (IPCC) guidance. The EPA guidance believes that CO_2 is produced from combustion of CH_4 in captured LFG, and it is considered biomass CO_2, which does not contribute to CO_2-equivalent emissions. This is evident in Table A–1 to Subpart A of Part 98, that shows the global warming potential of CO_2 is 1, that of while CH_4 is 21.

Pursuant to 40 CFR Part 98, Subpart C (§98.32), the facility must report CO_2, CH_4, and N_2O mass emissions from each stationary fuel combustion unit. The table below is the greenhouse gas emissions from flare.

Table 1

Total LFG Generated[A] =	4843.96	cfm
Collection Efficiency =	75%	
Total LFG Combusted =	3632.9691	cfm
LFG to Flares =	3632.9691	cfm
Fugitive LFG =	1210.9897	cfm

Table 2- Combustion Emission Factors

	Combustion Emission Factors		
	CO2	CH4	N2O
	kg/MMBtu	kg/MMBtu	kg/MMBtu
Enclosed 4,000-cfm	52.07	3.20E-03	6.30E-04
Enclosed 3,000-cfm	52.07	3.20E-03	6.30E-04
Open 500-cfm	52.07	3.20E-03	6.30E-04
GWP	1	25	298

Table 3-Emissions

Flare Type	Operating Conditions		Estimated Potential Flare Emissions (TPY)							
	CFM	Hours	Combustion CO2	Combustion CH4	Combustion N2O	Escape CH4	Colected CH4	Collected CO2	Biogenic CO2	Anthropogenic CO2
Enclosed 4,000-cfm	3,633	8760	55,457.32	3.40	0.67	403.57	20,178.71	47,503.74	102,961.06	10,373.92
Open 500-cfm			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Emissions (TPY)		55,457.32	3.40	0.67	403.57	20,178.71	47,503.74	102,961.06	10,373.92
	Total Emissions (tons CO2e)		55,457.32	85.03	199.53	10,089.36		47,503.74	102,961.06	10,373.92
	Total Emissions (tons CO2e) 4,000-cfm		113,334.98							
	Total Emissions (tons CO2e) 500-cfm		0.00							
	Total Emissions (tons CO2e)		113,334.98							
Note:	**The calculation is based on the highest LFG produced (year 2045) through LANDGem and not the capacity of the flare.**									

Note:

A	Based on amount of LFG generated in peak year of LFG production from LandGEM in 2014 Title V Renewal
Combustion CO2	Emission factor referenced from Table C-1 of 40 CFR Part 98, Subpart C
Combustion CH4	Emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Combustion N2O	Emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Escape CH4	Collected methane that escapes destruction in flares
Collected CO2	Portion of LFG that already contains CO2
Biogenic CO2	Combustion CO2 + Collected CO2
Anthropogenic CO2	Combustion CH4 + Combustion N2O + Escape CH4, expressed as CO2equivalents
Total GHG	Total emissions expressed in tons of CO2 equivalents

Table 4- Landfill Gas Constant

Heating value	506	BTU/scf (adjusted for methane)	
CH4 Destruction Efficiency	98%	% (manufacturer guarantee DE for LFG Enclosed Flares	
LFG CH4 Concentration	50%	%	
LFG CO2 Concentration	43%	%	Site data
CH4 Density	0.0423	pound per cubic foot	
CO2 Density	0.1160	pound per cubic foot	

Table 5- Fugitive GHG Emissions

	Fugitive GHG Emissions					
	Fugitive LFG (ft3/yr)	Fugitive CH4 (tpy)	Oxidized CO2 (tpy)	Fugitive Biogenic CO2 (tpy)	Fugitive Anthropogenic GHG (tpy)	Total Fugitive GHG (tpy)
	636,496,187	6,053.61	1,845.52	17,680.10	151,340.36	169,020.46

Fugitive CH4 Emissions (tpy) = [Fugitive LFG (ft3/yr)] * [% CH4] * [0.0423 lb/ft3 CH4] * [90% oxidation factor] / [2000 lb/ton]

Oxidized CO2 Emissions (tpy) = [Fugitive LFG (ft3/yr)] * [% CH4] * [0.116 lb/ft3 CH4] * [10% oxidation factor] / [2000 lb/ton]

Fugitive Biogenic CO2 Emissions (tpy) = [Fugitive LFG (ft3/yr)] * [% CO2] * [0.116 lb/ft3 CH4] / [2000 lb/ton] + Oxidized CO2 Emissions

Fugitive Anthropogenic GHG Emissions (tons CO2e) = [Fugitive CH4 Emissions] * 25

Sample Emissions from landfill gas combustion is calculate based on equation (For enclosed flare and candle stick flare. Combined 4500 cfm)

$CO_2 = (1x10^{-3})*Fuel*HHV*EF$

Where:

CO_2 = Annual CO_2 mass emissions for the specific fuel type (metric tons).

Fuel = Mass or volume of fuel combusted per year, from company records as defined in §98.6 (express mass in short tons for solid fuel, volume in standard cubic feet for gaseous fuel, and volume in gallons for liquid fuel).

HHV = Default high heat value of the fuel, from Table C-1 of this subpart (MMBtu per mass or MMBtu per volume, as applicable).

EF = Fuel-specific default CO_2 emission factor, from Table C-1 of this subpart (kg CO_2/MMBtu).

<u>Sample CO_2 Emissions from landfill gas combustion</u>

$(3,633f^3/min)*(506Btu/ft^3)*(60\ min/hr)*8760hr/yr)*(52.07kg/MMBtu)*(2.2046lb/kg)*(tons/2000lb$

CO_2 = **55,457.32 tons/yr**

<u>CH_4 emissions from landfill gas combustion</u>:

$(3633f^3/min)*(506Btu/ft^3)*(60\ min/hr)*8760hr/yr)*(0.0032kg/MMBtu)*(2.2046lb/kg)*(tons/2000lb)$

CH_4 = 3.40 tons/yr

<u>N_2O emissions from landfill gas combustion</u>:

$(3,633f^3/min)*(506Btu/ft^3)*(60\ min/hr)*8760hr/yr)*(0.00063kg/MMBtu)*(2.2046lb/kg)*(tons/2000lb)$

<u>N_2O = 0.67 tons/yr</u>

<u>Methane Emissions from Landfill gas</u>

The CH_4 emission that contributes to CO_2-equivalent emissions is estimated using the equation HH-8 from 40 CFR Part 98, Subpart HH or equation from the EPA Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, October 2004.

$$CH_4\ Emissions = [(\frac{CH_4\ Collected}{Collection_{eff}} - CH_4\ Collected) \times (1 - OF)] + (CH_4\ Collected \times Vent) \text{ - eq.1}$$

Equation 1 above is from EPA Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, October 2004.

Where:

CH_4 Collected = CH_4 Collected by active gas collection system

$Coll_{eff}$ = collection system efficiency

OF = oxidation fraction

Vent = fraction vented

$$\text{Emissions} = \left[\left(\frac{R}{CE \times f_{Rec}} - R\right) \times (1 - OX) + R \times \left(1 - (DE \times f_{Dest})\right)\right] \qquad \text{(Eq. HH-8)}$$

Where:

Emissions (CH_4) = Methane emissions from the landfill in the reporting year (metric tons CH_4).

R = Quantity of recovered CH_4 [from Equation HH–4 of this section in metric tons CH_4] or CH_4 collected for the reporting year.

CE = Collection efficiency estimated at landfill, taking into account system coverage, operation, and cover system materials from Table HH–3 of this subpart. If area by soil cover type information is not available, use default value of 0.75 (CE4 in table HH–3 of this subpart) for all areas under active influence of the collection system.

f_{Rec}= Fraction of hours the recovery system was operating (annual operating hours/8760 hours per year).

OX = Oxidation fraction. Use the oxidation fractions default value of 0.1 (10%).

DE = Destruction efficiency, (lesser of manufacturer's specified destruction efficiency and 0.98). If the gas is transported off-site for destruction, use DE = 1.

f_{Dest}= Fraction of hours the destruction device was operating (device operating hours/8760 hours per year). If the gas is destroyed in a back-up flare (or similar device) or if the gas is transported off-site for destruction, use f_{Dest}= 1.

<u>Step 1: Determine the landfill methane generation rate</u>. This is done using the LandGEM model based on First Order Decomposition Rate Equation below.

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

From the model output result provided by Chambers Landfill, the highest landfill gas produced is 4,844 cfm in the reporting year 2045. Chambers Landfill assumes 50% methane.

Step 2: Determine the amount of methane collected or recovered.

The methane generation rate or methane collected in tons per year (tons/yr) =

(Landfill gas collected in ft^3/min)*(percent methane in the gas)*(density of methane in lb/ft^3)*(60min/hr)*(8760hr/yr)*(tons/2000lbs)

(3,633f^3/min)*(0.423lb/ft^3)*(60 min/hr)*(8760hr/yr)*(0.5)*(tons/2000lb)

= **20,178.71 tons/yr**

Step 3: Determine the collection efficiency:

The collection efficiency is assumed to be 75% by volume from EPA AP-42, Section 2, and page 2.4-6. Note that the 3,633f^3/min of landfill gas in step 2 above has already factored in the collection efficiency.

Step 4: Determine the fraction of methane oxidized

The fraction oxidized is assumed to be 10% by volume, according to 40 CFR §98.343 and the October 2004 EPA- Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance (Direct Emissions from Municipal Solid Waste Landfill)

Step 5: Determine the fraction of methane vented (or escape)

This is the amount of the collected gas that is vented directly to the atmosphere. It could either be through an active venting system, or in some cases gas may also be vented during scheduled startup/shut down and malfunction period or gas that is not destroy.

The amount of methane vented or escape is determined by using part of equation HH-8 of this section**.**

[1-(DE x $f_{Dest.}$)], Where DE = Destruction efficiency = 98% (based on the 2014 spreadsheet submitted with the TVOP renewal application and f_{Dest} = 1 (is the default factor recommended by the equation HH-8)

(CH_4 Collected × (1-OF) or DE- destruction efficiency

From above, Methane Collected

(20,178.71 tons/yr)* (1-0.98)

= **403.57 tons/yr**

Step 6: Calculate fugitive methane emissions (Emissions from the uncollected LFG):

Pursuant to AP-42, Section 2, and page 2.4-6; Landfill gas collection efficiency is assumed to be 75% by

volume, and the remaining 25% is considered fugitive. 75% of the methane gas is collected and sent to the flare. Based on the TVOP, the enclosed flare is required to meet 98% control efficiency. Therefore, 2% is left uncontrolled and escaped to the atmosphere.

$$CH_4 \text{ Emissions} = \left[\left(\frac{CH_4 \text{ Collected}}{\text{Collection}_{eff}} - CH_4 \text{ Collected}\right) \times (1 - OF)\right] + (CH_4 \text{ Collected} \times (1\text{-}DE) - \text{Vent}) \quad \text{– eq. 1}$$

$$= \left[\left(\frac{20{,}178.71 \text{ tons/yr}}{0.75}\right) - (20{,}178.71 \text{ tons/yr})\right] \text{ x } [(1 - 0.10)] + [(20{,}178.71 \text{ tons/yr} * 0.02)] -$$

$$= \quad [\mathbf{6{,}053.61 \text{ ton/yr}] + 403.57}$$

Therefore, the total CH_4 Emissions in tons/yr. = **6,457.18 tons/yr.**

The Anthropogenic (methane) emissions in tons CO_2e = [(methane emissions) + (methane emissions from LFG combustion)]*25

[(6,457.18) + (3.40)] *25 = **161,514.61**

=**161,514.61 ton/yr. of CO_2e**

The potential methane emission from Chambers Landfill is 161.514.61 ton and it is higher than the reporting threshold of 25,000 metric ton of CO_2e. Therefore, the facility is subject to the GHG reporting.

8. EMISSIONS SUMMARY:

The allowable emission summary for the Chambers Landfill is given in Table below:

EMISSION SUMMARY

TABLE VIII-1: Emission Limitations Summary

POLLUTANT	ANNUAL EMISSION LIMIT (tons/year)*
Particulate Matter	69.61
PM_{10}	43.73
$PM_{2.5}$	35.64
CO	129.43
Nitrogen Oxides	46.52
Sulfur Oxides	9.90
Volatile Organic Compounds	17.78
NMOC	45.57
HCL	7.25
Total HAPs	17.98
CH_4	6,460.59
CO_2	120,641
CO_2e (both CH_4 & CO_2)	282,355

***A year is defined as any consecutive 12-month period.**

RECOMMENDATIONS:

All applicable Federal, State and County regulations have been addressed in the permit. The Title V operating permit should be approved with the emission limitations, terms and conditions in the Title Operating Permit No. 0215.