

# Memorandum

**Date:** December 22, 2009; Revised January, 2010  
**To:** Michael Mann, Lou Wilkenson (DTE Biomass)  
**CC:** Angela Krueger, Mike Michels (Cornerstone)  
**From:** Peter J. Larson  
**Subject:** Potrero Hills Phase 1 and Phase 2 Landfill Gas Modeling  
**Project No.:** 090429

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## Scope:

Revise Landfill Gas (LFG) Model for Phase 1 and Phase 2 of Potrero Hills Landfill, utilizing information provided by a recent site visit and information provided by DTE.

## Data/Information/References reviewed:

- July 2009 LandGEM produced by Cornerstone Environmental Group.
- Flare test port data collected by SCS field services between 10/01/2008 and 10/30/2009.
- Site visit performed by Mark McKeever on November 13<sup>th</sup>, 2009.
- The existing flow meter is accurate and can be relied upon for an accurate depiction of recent LFG flow. The site owns two flow meters which are rotated on a 12 to 18 month basis. When not in use, the flow meters are sent to Fluid Components International, LLC for bench recalibration.

## Assumptions:

1. The Phase 1 wells are actively extracting gas from the landfill;
2. Phase 2 has no active wells installed and operating.
3. Phase 2 will generate LFG under similar conditions as Phase 1, therefore the calibrated “k” and L<sub>0</sub>” values will be carried through for Phase 2.
4. Phase 1 and Phase 2 future intake values are projected from a daily waste intake rate of 2,800 tpd, 361 operating days per year, and design capacities of 14,000,000 tons for Phase 1 and 56,000,000 tons for Phase 2.
5. Future waste composition will be similar to historic waste composition.

6. Recommended improvements will be made, at considerable capital cost, to the LFG system in order to improve the collection efficiency of the system. Cornerstone will detail multiple improvements that must be made to the collection system in order to achieve 75% collection efficiency according to the model.

**Findings:**

1. Modeling update:

- Cornerstone has updated the projected future waste intake rates to match the current acceptance rate of 2,800 tons per day noted by Mark Mckeever during the site visit. This waste acceptance rate is lower than the permitted acceptance rate of 3,400 tons per day.
- In the July model, Cornerstone had calibrated to a current flow rate of 1,275 scfm (at 50% CH<sub>4</sub>) for 2008. Measured flow rates reported in the flare test port data range from 1,144 to 1,335 with an average of 1,230 scfm in 2008 and from 1,069 to 1,346 with an average of 1,186 scfm in 2009. Measured landfill gas flow has been normalized to 50% methane by volume for comparison. Mark reported normalized flowrates around 1,280 scfm during his visit with a methane percentage of 46%.
- Cornerstone recommends maintaining the site-specific LFG methane generation rate “k” of 0.034 year<sup>-1</sup> utilized in the July 2009 model. This value is dependent primarily on the moisture content of the waste mass. The annual precipitation in Suisun City is 23” per year, qualifying the area as arid (less than 25” per year). Under USEPA Method 2E, 0.02 year<sup>-1</sup> is the recommended value to be used in arid areas while a value of 0.04 year<sup>-1</sup> is recommended for wetter sites. Leachate and condensate is typically re-injected into the Subtitle-D portion of the landfill, although it is occasionally used for dust control between April 15 and October 15. As the rainfall in Suisun City is close to the 25” per year cutoff and the site is performing leachate recirculation, Cornerstone believes that the site-specific “k” value is significantly higher than the recommended standard for arid sites.
- The “k” value of 0.034 year<sup>-1</sup> was selected as it produces the curve that most closely matches the previously measured LFG flow of 1,275 scfm after taking into account a GCCS coverage of 50%, and an assumed collection efficiency of 75%.
- Cornerstone also recommends maintaining the potential LFG generation capacity “Lo” value of 100 m<sup>3</sup>/Mg utilized in the July 2009 model. The potential capacity depends only on the characteristics of the waste stream itself. Since Potrero Hills is not accepting or planning to accept high levels of non-msw waste, Cornerstone recommends the standard value.
- Compared to the projected values, Potrero Hills achieved 38% collection efficiency during the 11/13/2009 site visit. The average collection efficiency in

2008 was 40%, and the average collection efficiency in 2009 was 35%. Cornerstone believes that the recovered gas flow is lower than projected due to a limited GCCS system coverage and various GCCS system deficiencies. Currently, only 51% of the landfill area is covered by the GCCS. The GCCS system deficiencies will be detailed in Cornerstone's full report. If these improvements are not made, Cornerstone projects the collection efficiency will remain around 40%.

- In 2009, with no GCCS improvements, the model projects an LFG recovery rate of 1,360 scfm. Assuming the 40% collection efficiency remains; the maximum recovery flow rate is projected, including the phase 2 expansion, to be 4,465 scfm in 2068.
- Landfills operating under typical conditions with full coverage from a GCCS system typically experience collection efficiencies of 75-80%. Cornerstone believes that, if the GCCS system is expanded and the system deficiencies are corrected, a conservative collection efficiency of 75% could be achieved. At that level of collection, a recovery rate of 2,550 scfm is projected for 2009 and 8,372 scfm is projected as the maximum recovery flow in 2068, including the phase 2 expansion.

## Disclaimer

The modeling techniques used by Cornerstone and the LFG industry are, by definition, hypothetical, and can only be used as a very general tool for producing a range of estimates to aid in determining the direction of further investigations. Actual LFG generation and collection rates are dependent on many variables, including: refuse composition, moisture, pH, cover soil permeability, well spacing, continuing fill rates, etc. Typically these parameters are not well defined at the time of modeling and/or differ somewhat from those actually experienced during future site operation.

The modeling provided herein was performed with today's current standards of practice and no warranty or representation, expressed or implied, is made, as to the actual LFG production that will occur in the future. Opinions and recommendations contained in this report are based on the information available and certain assumptions that were deemed reasonable when our services were performed. We are not responsible for the impacts of any changes in information, site operations or methods that may change in the future.

**Potrero Hills Landfill  
Suisun City, California  
Waste Intake**

Year	Waste Intake (tons)			
	Phase I (tons)	Phase II (tons)	Phase I+II (tons)	Cumulative (tons)
1986	27,370		27,370	27,370
1987	118,260		118,260	145,630
1988	187,980		187,980	333,610
1989	222,650		222,650	556,260
1990	223,380		223,380	779,640
1991	205,860		205,860	985,500
1992	287,620		287,620	1,273,120
1993	224,840		224,840	1,497,960
1994	260,970		260,970	1,758,930
1995	178,490		178,490	1,937,420
1996	229,410		229,410	2,166,830
1997	376,120		376,120	2,542,950
1998	487,480		487,480	3,030,430
1999	380,200		380,200	3,410,630
2000	380,840		380,840	3,791,470
2001	456,250		456,250	4,247,720
2002	753,000		753,000	5,000,720
2003	760,300		760,300	5,761,020
2004	775,510		775,510	6,536,530
2005	896,974		896,974	7,433,504
2006	906,667		906,667	8,340,171
2007	1,008,842		1,008,842	9,349,013
2008	959,957		959,957	10,308,970
2009	1,010,800		1,010,800	11,319,770
2010	1,010,800		1,010,800	12,330,570
2011	1,010,800		1,010,800	13,341,370
2012	658,630	352,170	1,010,800	14,352,170
2013		1,010,800	1,010,800	15,362,970
2014		1,010,800	1,010,800	16,373,770
2015		1,010,800	1,010,800	17,384,570
2016		1,010,800	1,010,800	18,395,370
2017		1,010,800	1,010,800	19,406,170
2018		1,010,800	1,010,800	20,416,970
2019		1,010,800	1,010,800	21,427,770
2020		1,010,800	1,010,800	22,438,570
2021		1,010,800	1,010,800	23,449,370
2022		1,010,800	1,010,800	24,460,170
2023		1,010,800	1,010,800	25,470,970
2024		1,010,800	1,010,800	26,481,770
2025		1,010,800	1,010,800	27,492,570
2026		1,010,800	1,010,800	28,503,370
2027		1,010,800	1,010,800	29,514,170
2028		1,010,800	1,010,800	30,524,970
2029		1,010,800	1,010,800	31,535,770
2030		1,010,800	1,010,800	32,546,570
2031		1,010,800	1,010,800	33,557,370
2032		1,010,800	1,010,800	34,568,170

**Potrero Hills Landfill  
Suisun City, California  
Waste Intake**

Year	Waste Intake (tons)			
	Phase I (tons)	Phase II (tons)	Phase I+II (tons)	Cumulative (tons)
2033		1,010,800	1,010,800	35,578,970
2034		1,010,800	1,010,800	36,589,770
2035		1,010,800	1,010,800	37,600,570
2036		1,010,800	1,010,800	38,611,370
2037		1,010,800	1,010,800	39,622,170
2038		1,010,800	1,010,800	40,632,970
2039		1,010,800	1,010,800	41,643,770
2040		1,010,800	1,010,800	42,654,570
2041		1,010,800	1,010,800	43,665,370
2042		1,010,800	1,010,800	44,676,170
2043		1,010,800	1,010,800	45,686,970
2044		1,010,800	1,010,800	46,697,770
2045		1,010,800	1,010,800	47,708,570
2046		1,010,800	1,010,800	48,719,370
2047		1,010,800	1,010,800	49,730,170
2048		1,010,800	1,010,800	50,740,970
2049		1,010,800	1,010,800	51,751,770
2050		1,010,800	1,010,800	52,762,570
2051		1,010,800	1,010,800	53,773,370
2052		1,010,800	1,010,800	54,784,170
2053		1,010,800	1,010,800	55,794,970
2054		1,010,800	1,010,800	56,805,770
2055		1,010,800	1,010,800	57,816,570
2056		1,010,800	1,010,800	58,827,370
2057		1,010,800	1,010,800	59,838,170
2058		1,010,800	1,010,800	60,848,970
2059		1,010,800	1,010,800	61,859,770
2060		1,010,800	1,010,800	62,870,570
2061		1,010,800	1,010,800	63,881,370
2062		1,010,800	1,010,800	64,892,170
2063		1,010,800	1,010,800	65,902,970
2064		1,010,800	1,010,800	66,913,770
2065		1,010,800	1,010,800	67,924,570
2066		1,010,800	1,010,800	68,935,370
2067		1,010,800	1,010,800	69,946,170
2068		53,830	53,830	70,000,000
<b>Totals</b>	<b>14,000,000</b>	<b>56,000,000</b>	<b>70,000,000</b>	

## Notes:

1. Waste receipts through 2008 were taken from California EPA computer records.
2. Projected waste acceptance rate is projected to be 1,010,800 tpy from 2009 until closure.
3. Landfill design capacity is 14,000,000 tons for Phase 1 and 56,000,000 tons for Phase 2.

**Potrero Hills Landfill**  
**Suisun City, California**  
**LandGEM Results**

Year	Waste Intake (tons)	Projected Phase I Landfill Gas (scfm) k=0.034, Lo=100	Projected Phase II Landfill Gas (scfm) k=0.034, Lo=100	Total Projected Landfill Gas (scfm) k=0.034, Lo=100	Landfill Gas Recovery (scfm) at the Flare Skid (50% Methane) <sup>1</sup>	Landfill Gas Efficiency (%)	Landfill Gas System Coverage @ 60% (scfm)	Improved Landfill Gas Efficiency and Recovery @ 75% (scfm)
1986	27,370	0		0			0	0
1987	118,260	11		11			7	8
1988	187,980	59		59			36	44
1989	222,650	134		134			80	101
1990	223,380	221		221			132	166
1991	205,860	305		305			183	229
1992	287,620	379		379			227	284
1993	224,840	484		484			290	363
1994	260,970	560		560			336	420
1995	178,490	648		648			389	486
1996	229,410	699		699			419	524
1997	376,120	769		769			462	577
1998	487,480	898		898			539	673
1999	380,200	1,067		1,067			640	800
2000	380,840	1,187		1,187			712	890
2001	456,250	1,303		1,303			782	977
2002	753,000	1,446		1,446			868	1,085
2003	760,300	1,706		1,706			1,023	1,279
2004	775,510	1,960		1,960			1,176	1,470
2005	896,974	2,211		2,211			1,327	1,659
2006	906,667	2,504		2,504			1,503	1,878
2007	1,008,842	2,792		2,792			1,675	2,094
2008	959,957	3,111		3,111	1,230	40%	1,867	2,333
2009	1,010,800	3,400		3,400	1,280	38%	2,040	2,550
2010	1,010,800	3,700		3,700			2,220	2,775
2011	1,010,800	3,989		3,989			2,394	2,992
2012	1,010,800	4,269	0	4,269			2,562	3,202
2013	1,010,800	4,396	144	4,540			2,724	3,405
2014	1,010,800	4,249	553	4,802			2,881	3,601
2015	1,010,800	4,107	948	5,055			3,033	3,791
2016	1,010,800	3,970	1,330	5,299			3,180	3,975
2017	1,010,800	3,837	1,699	5,536			3,321	4,152
2018	1,010,800	3,709	2,055	5,764			3,459	4,323
2019	1,010,800	3,585	2,400	5,985			3,591	4,489
2020	1,010,800	3,465	2,733	6,198			3,719	4,649
2021	1,010,800	3,349	3,055	6,405			3,843	4,804
2022	1,010,800	3,237	3,367	6,604			3,962	4,953

**Potrero Hills Landfill  
Suisun City, California  
LandGEM Results**

Year	Waste Intake (tons)	Projected Phase I Landfill Gas (scfm) k=0.034, Lo=100	Projected Phase II Landfill Gas (scfm) k=0.034, Lo=100	Total Projected Landfill Gas (scfm) k=0.034, Lo=100	Landfill Gas Recovery (scfm) at the Flare Skid (50% Methane) <sup>1</sup>	Landfill Gas Efficiency (%)	Landfill Gas System Coverage @ 60% (scfm)	Improved Landfill Gas Efficiency and Recovery @ 75% (scfm)
2023	1,010,800	3,129	3,668	6,797			4,078	5,098
2024	1,010,800	3,024	3,959	6,983			4,190	5,237
2025	1,010,800	2,923	4,240	7,163			4,298	5,372
2026	1,010,800	2,826	4,512	7,337			4,402	5,503
2027	1,010,800	2,731	4,774	7,505			4,503	5,629
2028	1,010,800	2,640	5,028	7,668			4,601	5,751
2029	1,010,800	2,552	5,273	7,825			4,695	5,869
2030	1,010,800	2,466	5,511	7,977			4,786	5,983
2031	1,010,800	2,384	5,740	8,124			4,874	6,093
2032	1,010,800	2,304	5,962	8,266			4,959	6,199
2033	1,010,800	2,227	6,176	8,403			5,042	6,302
2034	1,010,800	2,153	6,383	8,536			5,121	6,402
2035	1,010,800	2,081	6,583	8,664			5,198	6,498
2036	1,010,800	2,011	6,776	8,788			5,273	6,591
2037	1,010,800	1,944	6,963	8,907			5,344	6,680
2038	1,010,800	1,879	7,144	9,023			5,414	6,767
2039	1,010,800	1,816	7,319	9,135			5,481	6,851
2040	1,010,800	1,755	7,488	9,243			5,546	6,932
2041	1,010,800	1,697	7,651	9,348			5,609	7,011
2042	1,010,800	1,640	7,808	9,449			5,669	7,086
2043	1,010,800	1,585	7,961	9,546			5,728	7,160
2044	1,010,800	1,532	8,108	9,641			5,784	7,230
2045	1,010,800	1,481	8,251	9,732			5,839	7,299
2046	1,010,800	1,432	8,388	9,820			5,892	7,365
2047	1,010,800	1,384	8,521	9,905			5,943	7,429
2048	1,010,800	1,337	8,650	9,988			5,993	7,491
2049	1,010,800	1,293	8,774	10,067			6,040	7,550
2050	1,010,800	1,249	8,895	10,144			6,086	7,608
2051	1,010,800	1,208	9,011	10,218			6,131	7,664
2052	1,010,800	1,167	9,123	10,290			6,174	7,718
2053	1,010,800	1,128	9,232	10,360			6,216	7,770
2054	1,010,800	1,091	9,336	10,427			6,256	7,820
2055	1,010,800	1,054	9,438	10,492			6,295	7,869
2056	1,010,800	1,019	9,536	10,555			6,333	7,916
2057	1,010,800	985	9,631	10,615			6,369	7,962
2058	1,010,800	952	9,722	10,674			6,404	8,006
2059	1,010,800	920	9,811	10,731			6,438	8,048



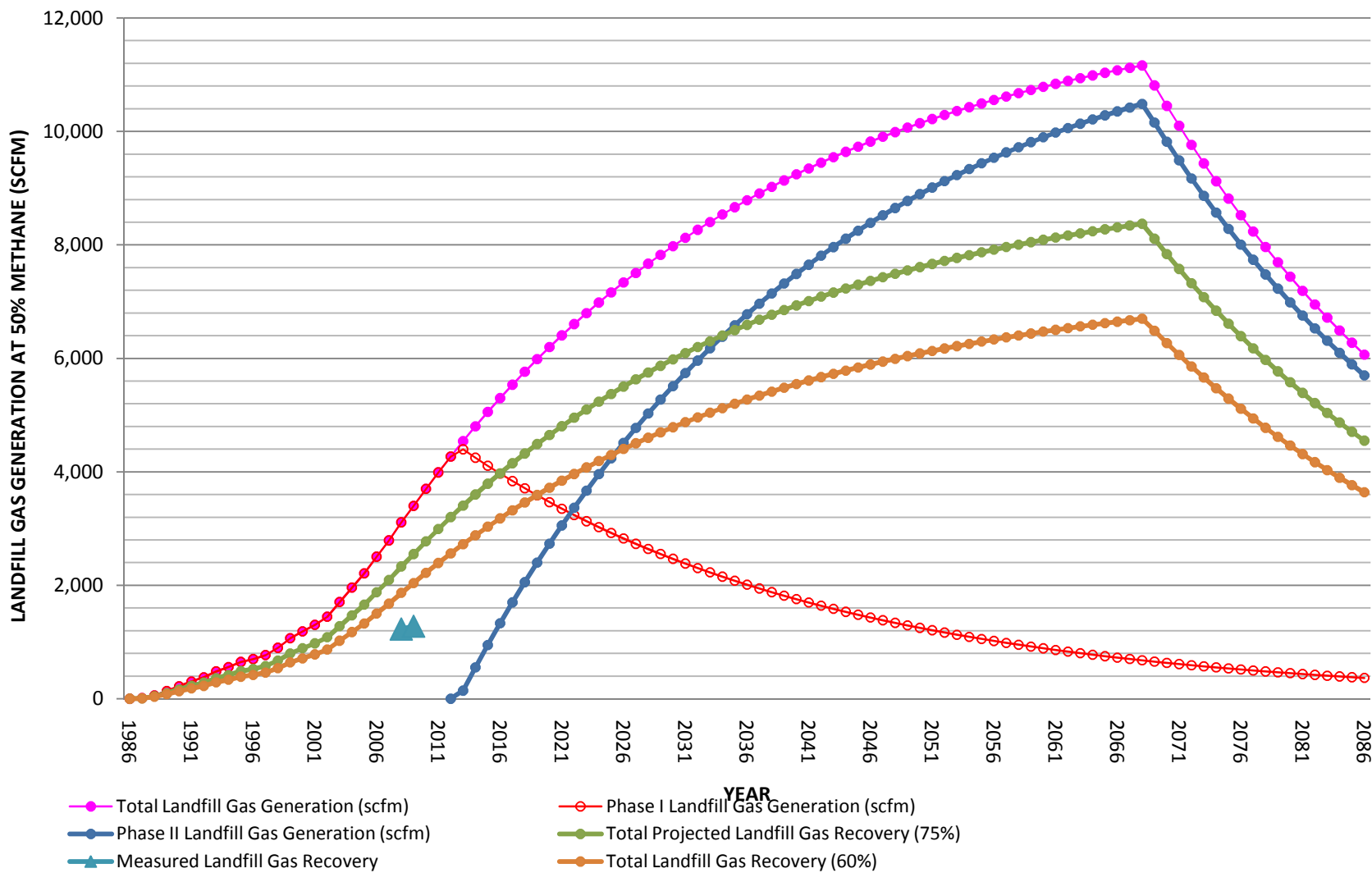
**Potrero Hills Landfill  
Suisun City, California  
LandGEM Results**

Year	Waste Intake (tons)	Projected Phase I Landfill Gas (scfm) k=0.034, Lo=100	Projected Phase II Landfill Gas (scfm) k=0.034, Lo=100	Total Projected Landfill Gas (scfm) k=0.034, Lo=100	Landfill Gas Recovery (scfm) at the Flare Skid (50% Methane) <sup>1</sup>	Landfill Gas Efficiency (%)	Landfill Gas System Coverage @ 60% (scfm)	Improved Landfill Gas Efficiency and Recovery @ 75% (scfm)
2060	1,010,800	889	9,896	10,785			6,471	8,089
2061	1,010,800	860	9,979	10,838			6,503	8,129
2062	1,010,800	831	10,059	10,890			6,534	8,167
2063	1,010,800	803	10,136	10,939			6,563	8,204
2064	1,010,800	776	10,211	10,987			6,592	8,240
2065	1,010,800	750	10,283	11,033			6,620	8,275
2066	1,010,800	725	10,353	11,078			6,647	8,308
2067	1,010,800	701	10,420	11,121			6,673	8,341
2068	53,830	678	10,485	11,163			6,698	8,372
2069		655	10,157	10,812			6,487	8,109
2070		633	9,817	10,450			6,270	7,838
2071		612	9,489	10,101			6,060	7,576
2072		591	9,172	9,763			5,858	7,322
2073		572	8,865	9,437			5,662	7,078
2074		553	8,569	9,121			5,473	6,841
2075		534	8,282	8,816			5,290	6,612
2076		516	8,005	8,522			5,113	6,391
2077		499	7,738	8,237			4,942	6,178
2078		482	7,479	7,961			4,777	5,971
2079		466	7,229	7,695			4,617	5,771
2080		451	6,988	7,438			4,463	5,579
2081		435	6,754	7,189			4,314	5,392
2082		421	6,528	6,949			4,169	5,212
2083		407	6,310	6,717			4,030	5,038
2084		393	6,099	6,492			3,895	4,869
2085		380	5,895	6,275			3,765	4,706
2086		367	5,698	6,065			3,639	4,549
Totals	70,000,000							

1. LFG flow measured at the flare skid is taken from the average flare test port data for 2008 and the 11/13/2009 Cornerstone site visit for 2009.

2. Improved Landfill Gas Efficiency and Recovery assumes all GCCS improvements suggested in Cornerstone's report will be implemented.

**Potrero Hills Landfill Gas Generation and Recovery**  
**2,800 Tons per Day**





## Summary Report

**Landfill Name or Identifier:** POTRERO HILLS LANDFILL Phase I

**Date:** Monday, December 21, 2009

**Description/Comments:**

**About LandGEM:**

First-Order Decomposition Rate Equation:

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

Where,

$Q_{CH_4}$  = 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 ( $m^3/Ma$ )

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

$t_{ij}$  = 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 conventional 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	<b>1986</b>	
Landfill Closure Year (with 80-year limit)	<b>2012</b>	
Actual Closure Year (without limit)	<b>2012</b>	
Have Model Calculate Closure Year?	<b>No</b>	
Waste Design Capacity	<b>3,000,000</b>	<i>short tons</i>

MODEL PARAMETERS

Methane Generation Rate, k	<b>0.034</b>	<i>year<sup>-1</sup></i>
Potential Methane Generation Capacity, L <sub>0</sub>	<b>100</b>	<i>m<sup>3</sup>/Mg</i>
NMOC Concentration	<b>600</b>	<i>ppmv as hexane</i>
Methane Content	<b>50</b>	<i>% by volume</i>

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	<b>Total landfill gas</b>
Gas / Pollutant #2:	<b>NMOC</b>
Gas / Pollutant #3:	
Gas / Pollutant #4:	

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
1986	24,882	27,370	0	0
1987	107,509	118,260	24,882	27,370
1988	170,891	187,980	132,391	145,630
1989	202,409	222,650	303,282	333,610
1990	203,073	223,380	505,691	556,260
1991	187,145	205,860	708,764	779,640
1992	261,473	287,620	895,909	985,500
1993	204,400	224,840	1,157,382	1,273,120
1994	237,245	260,970	1,361,782	1,497,960
1995	162,264	178,490	1,599,027	1,758,930
1996	208,555	229,410	1,761,291	1,937,420
1997	341,927	376,120	1,969,845	2,166,830
1998	443,164	487,480	2,311,773	2,542,950
1999	345,636	380,200	2,754,936	3,030,430
2000	346,218	380,840	3,100,573	3,410,630
2001	414,773	456,250	3,446,791	3,791,470
2002	684,545	753,000	3,861,564	4,247,720
2003	691,182	760,300	4,546,109	5,000,720
2004	705,009	775,510	5,237,291	5,761,020
2005	815,431	896,974	5,942,300	6,536,530
2006	824,243	906,667	6,757,731	7,433,504
2007	917,129	1,008,842	7,581,974	8,340,171
2008	872,688	959,957	8,499,103	9,349,013
2009	918,909	1,010,800	9,371,791	10,308,970
2010	918,909	1,010,800	10,290,700	11,319,770
2011	918,909	1,010,800	11,209,609	12,330,570
2012	598,755	658,630	12,128,518	13,341,370
2013	0	0	12,727,273	14,000,000
2014	0	0	12,727,273	14,000,000
2015	0	0	12,727,273	14,000,000
2016	0	0	12,727,273	14,000,000
2017	0	0	12,727,273	14,000,000
2018	0	0	12,727,273	14,000,000
2019	0	0	12,727,273	14,000,000
2020	0	0	12,727,273	14,000,000
2021	0	0	12,727,273	14,000,000
2022	0	0	12,727,273	14,000,000
2023	0	0	12,727,273	14,000,000
2024	0	0	12,727,273	14,000,000
2025	0	0	12,727,273	14,000,000

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2026	0	0	12,727,273	14,000,000
2027	0	0	12,727,273	14,000,000
2028	0	0	12,727,273	14,000,000
2029	0	0	12,727,273	14,000,000
2030	0	0	12,727,273	14,000,000
2031	0	0	12,727,273	14,000,000
2032	0	0	12,727,273	14,000,000
2033	0	0	12,727,273	14,000,000
2034	0	0	12,727,273	14,000,000
2035	0	0	12,727,273	14,000,000
2036	0	0	12,727,273	14,000,000
2037	0	0	12,727,273	14,000,000
2038	0	0	12,727,273	14,000,000
2039	0	0	12,727,273	14,000,000
2040	0	0	12,727,273	14,000,000
2041	0	0	12,727,273	14,000,000
2042	0	0	12,727,273	14,000,000
2043	0	0	12,727,273	14,000,000
2044	0	0	12,727,273	14,000,000
2045	0	0	12,727,273	14,000,000
2046	0	0	12,727,273	14,000,000
2047	0	0	12,727,273	14,000,000
2048	0	0	12,727,273	14,000,000
2049	0	0	12,727,273	14,000,000
2050	0	0	12,727,273	14,000,000
2051	0	0	12,727,273	14,000,000
2052	0	0	12,727,273	14,000,000
2053	0	0	12,727,273	14,000,000
2054	0	0	12,727,273	14,000,000
2055	0	0	12,727,273	14,000,000
2056	0	0	12,727,273	14,000,000
2057	0	0	12,727,273	14,000,000
2058	0	0	12,727,273	14,000,000
2059	0	0	12,727,273	14,000,000
2060	0	0	12,727,273	14,000,000
2061	0	0	12,727,273	14,000,000
2062	0	0	12,727,273	14,000,000
2063	0	0	12,727,273	14,000,000
2064	0	0	12,727,273	14,000,000
2065	0	0	12,727,273	14,000,000

**Pollutant Parameters**

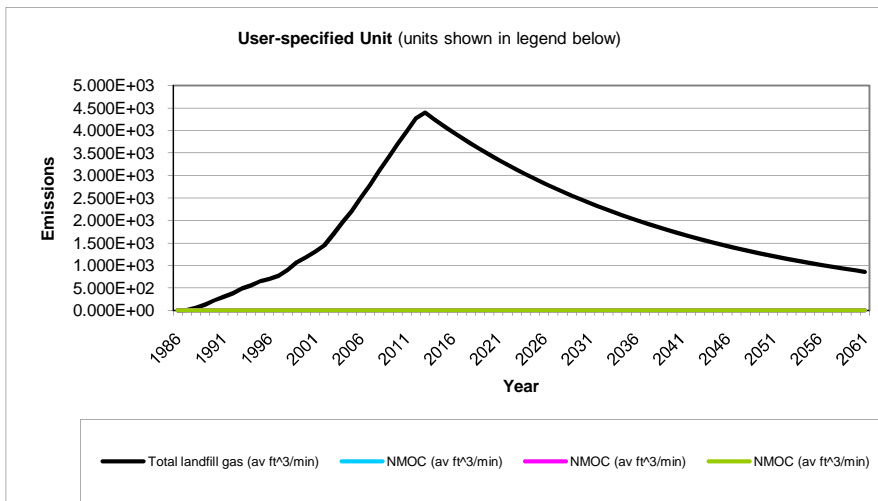
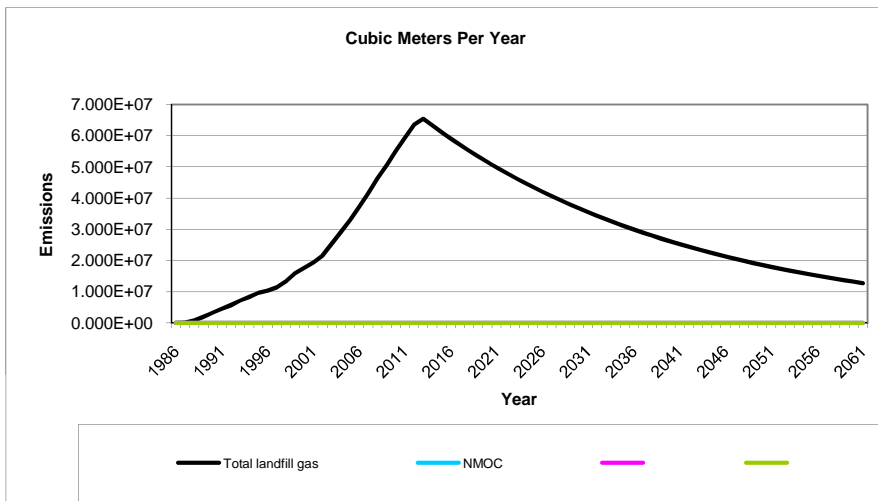
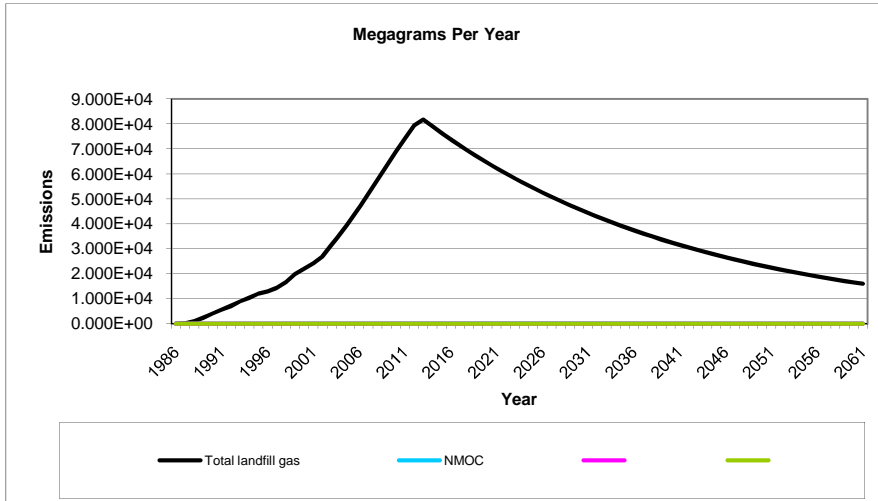
<i>Gas / Pollutant Default Parameters:</i>				<i>User-specified Pollutant Parameters:</i>	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
<b>Gases</b>	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
<b>Pollutants</b>	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,1,2-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		







**Graphs**



**Results**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
1986	0	0	0	0	0	0
1987	2.081E+02	1.666E+05	1.120E+01	3.584E-01	9.998E+01	6.718E-03
1988	1.100E+03	8.811E+05	5.920E+01	1.895E+00	5.286E+02	3.552E-02
1989	2.493E+03	1.996E+06	1.341E+02	4.293E+00	1.198E+03	8.047E-02
1990	4.102E+03	3.285E+06	2.207E+02	7.065E+00	1.971E+03	1.324E-01
1991	5.664E+03	4.535E+06	3.047E+02	9.754E+00	2.721E+03	1.828E-01
1992	7.039E+03	5.637E+06	3.787E+02	1.212E+01	3.382E+03	2.272E-01
1993	8.991E+03	7.199E+06	4.837E+02	1.548E+01	4.320E+03	2.902E-01
1994	1.040E+04	8.328E+06	5.595E+02	1.791E+01	4.997E+03	3.357E-01
1995	1.204E+04	9.638E+06	6.476E+02	2.073E+01	5.783E+03	3.886E-01
1996	1.299E+04	1.040E+07	6.990E+02	2.237E+01	6.242E+03	4.194E-01
1997	1.430E+04	1.145E+07	7.694E+02	2.463E+01	6.871E+03	4.617E-01
1998	1.668E+04	1.336E+07	8.976E+02	2.873E+01	8.015E+03	5.385E-01
1999	1.983E+04	1.588E+07	1.067E+03	3.415E+01	9.528E+03	6.402E-01
2000	2.206E+04	1.766E+07	1.187E+03	3.799E+01	1.060E+04	7.121E-01
2001	2.422E+04	1.939E+07	1.303E+03	4.171E+01	1.164E+04	7.818E-01
2002	2.688E+04	2.152E+07	1.446E+03	4.629E+01	1.291E+04	8.676E-01
2003	3.170E+04	2.539E+07	1.706E+03	5.460E+01	1.523E+04	1.023E+00
2004	3.642E+04	2.917E+07	1.960E+03	6.273E+01	1.750E+04	1.176E+00
2005	4.110E+04	3.291E+07	2.211E+03	7.079E+01	1.975E+04	1.327E+00
2006	4.655E+04	3.727E+07	2.504E+03	8.016E+01	2.236E+04	1.503E+00
2007	5.189E+04	4.155E+07	2.792E+03	8.936E+01	2.493E+04	1.675E+00
2008	5.782E+04	4.630E+07	3.111E+03	9.958E+01	2.778E+04	1.867E+00
2009	6.319E+04	5.060E+07	3.400E+03	1.088E+02	3.036E+04	2.040E+00
2010	6.876E+04	5.506E+07	3.700E+03	1.184E+02	3.304E+04	2.220E+00
2011	7.415E+04	5.937E+07	3.989E+03	1.277E+02	3.562E+04	2.394E+00
2012	7.935E+04	6.354E+07	4.269E+03	1.367E+02	3.813E+04	2.562E+00
2013	8.171E+04	6.543E+07	4.396E+03	1.407E+02	3.926E+04	2.638E+00
2014	7.898E+04	6.324E+07	4.249E+03	1.360E+02	3.795E+04	2.550E+00
2015	7.634E+04	6.113E+07	4.107E+03	1.315E+02	3.668E+04	2.464E+00
2016	7.379E+04	5.908E+07	3.970E+03	1.271E+02	3.545E+04	2.382E+00
2017	7.132E+04	5.711E+07	3.837E+03	1.228E+02	3.427E+04	2.302E+00
2018	6.894E+04	5.520E+07	3.709E+03	1.187E+02	3.312E+04	2.225E+00
2019	6.663E+04	5.335E+07	3.585E+03	1.147E+02	3.201E+04	2.151E+00
2020	6.440E+04	5.157E+07	3.465E+03	1.109E+02	3.094E+04	2.079E+00
2021	6.225E+04	4.985E+07	3.349E+03	1.072E+02	2.991E+04	2.010E+00
2022	6.017E+04	4.818E+07	3.237E+03	1.036E+02	2.891E+04	1.942E+00
2023	5.816E+04	4.657E+07	3.129E+03	1.002E+02	2.794E+04	1.877E+00
2024	5.621E+04	4.501E+07	3.024E+03	9.681E+01	2.701E+04	1.815E+00
2025	5.433E+04	4.351E+07	2.923E+03	9.357E+01	2.611E+04	1.754E+00
2026	5.252E+04	4.205E+07	2.826E+03	9.045E+01	2.523E+04	1.695E+00
2027	5.076E+04	4.065E+07	2.731E+03	8.742E+01	2.439E+04	1.639E+00
2028	4.907E+04	3.929E+07	2.640E+03	8.450E+01	2.357E+04	1.584E+00
2029	4.743E+04	3.798E+07	2.552E+03	8.168E+01	2.279E+04	1.531E+00
2030	4.584E+04	3.671E+07	2.466E+03	7.894E+01	2.202E+04	1.480E+00
2031	4.431E+04	3.548E+07	2.384E+03	7.631E+01	2.129E+04	1.430E+00
2032	4.283E+04	3.429E+07	2.304E+03	7.376E+01	2.058E+04	1.383E+00
2033	4.140E+04	3.315E+07	2.227E+03	7.129E+01	1.989E+04	1.336E+00
2034	4.001E+04	3.204E+07	2.153E+03	6.891E+01	1.922E+04	1.292E+00
2035	3.867E+04	3.097E+07	2.081E+03	6.660E+01	1.858E+04	1.248E+00

**Results (Continued)**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2036	3.738E+04	2.993E+07	2.011E+03	6.438E+01	1.796E+04	1.207E+00
2037	3.613E+04	2.893E+07	1.944E+03	6.222E+01	1.736E+04	1.166E+00
2038	3.492E+04	2.797E+07	1.879E+03	6.014E+01	1.678E+04	1.127E+00
2039	3.376E+04	2.703E+07	1.816E+03	5.813E+01	1.622E+04	1.090E+00
2040	3.263E+04	2.613E+07	1.755E+03	5.619E+01	1.568E+04	1.053E+00
2041	3.154E+04	2.525E+07	1.697E+03	5.431E+01	1.515E+04	1.018E+00
2042	3.048E+04	2.441E+07	1.640E+03	5.250E+01	1.465E+04	9.840E-01
2043	2.946E+04	2.359E+07	1.585E+03	5.074E+01	1.416E+04	9.511E-01
2044	2.848E+04	2.280E+07	1.532E+03	4.905E+01	1.368E+04	9.193E-01
2045	2.753E+04	2.204E+07	1.481E+03	4.741E+01	1.323E+04	8.886E-01
2046	2.661E+04	2.131E+07	1.432E+03	4.582E+01	1.278E+04	8.589E-01
2047	2.572E+04	2.059E+07	1.384E+03	4.429E+01	1.236E+04	8.302E-01
2048	2.486E+04	1.990E+07	1.337E+03	4.281E+01	1.194E+04	8.024E-01
2049	2.403E+04	1.924E+07	1.293E+03	4.138E+01	1.154E+04	7.756E-01
2050	2.322E+04	1.860E+07	1.249E+03	3.999E+01	1.116E+04	7.497E-01
2051	2.245E+04	1.797E+07	1.208E+03	3.866E+01	1.078E+04	7.246E-01
2052	2.170E+04	1.737E+07	1.167E+03	3.737E+01	1.042E+04	7.004E-01
2053	2.097E+04	1.679E+07	1.128E+03	3.612E+01	1.008E+04	6.770E-01
2054	2.027E+04	1.623E+07	1.091E+03	3.491E+01	9.739E+03	6.544E-01
2055	1.959E+04	1.569E+07	1.054E+03	3.374E+01	9.413E+03	6.325E-01
2056	1.894E+04	1.516E+07	1.019E+03	3.261E+01	9.099E+03	6.113E-01
2057	1.830E+04	1.466E+07	9.848E+02	3.152E+01	8.795E+03	5.909E-01
2058	1.769E+04	1.417E+07	9.519E+02	3.047E+01	8.501E+03	5.712E-01
2059	1.710E+04	1.369E+07	9.201E+02	2.945E+01	8.216E+03	5.521E-01
2060	1.653E+04	1.324E+07	8.893E+02	2.847E+01	7.942E+03	5.336E-01
2061	1.598E+04	1.279E+07	8.596E+02	2.752E+01	7.676E+03	5.158E-01
2062	1.544E+04	1.237E+07	8.309E+02	2.660E+01	7.420E+03	4.985E-01
2063	1.493E+04	1.195E+07	8.031E+02	2.571E+01	7.172E+03	4.819E-01
2064	1.443E+04	1.155E+07	7.763E+02	2.485E+01	6.932E+03	4.658E-01
2065	1.395E+04	1.117E+07	7.503E+02	2.402E+01	6.700E+03	4.502E-01
2066	1.348E+04	1.079E+07	7.252E+02	2.321E+01	6.476E+03	4.351E-01
2067	1.303E+04	1.043E+07	7.010E+02	2.244E+01	6.260E+03	4.206E-01
2068	1.259E+04	1.008E+07	6.776E+02	2.169E+01	6.050E+03	4.065E-01
2069	1.217E+04	9.747E+06	6.549E+02	2.096E+01	5.848E+03	3.929E-01
2070	1.177E+04	9.421E+06	6.330E+02	2.026E+01	5.653E+03	3.798E-01
2071	1.137E+04	9.106E+06	6.119E+02	1.958E+01	5.464E+03	3.671E-01
2072	1.099E+04	8.802E+06	5.914E+02	1.893E+01	5.281E+03	3.548E-01
2073	1.062E+04	8.508E+06	5.716E+02	1.830E+01	5.105E+03	3.430E-01
2074	1.027E+04	8.223E+06	5.525E+02	1.769E+01	4.934E+03	3.315E-01
2075	9.926E+03	7.948E+06	5.340E+02	1.709E+01	4.769E+03	3.204E-01
2076	9.594E+03	7.683E+06	5.162E+02	1.652E+01	4.610E+03	3.097E-01
2077	9.274E+03	7.426E+06	4.989E+02	1.597E+01	4.456E+03	2.994E-01
2078	8.964E+03	7.178E+06	4.823E+02	1.544E+01	4.307E+03	2.894E-01
2079	8.664E+03	6.938E+06	4.661E+02	1.492E+01	4.163E+03	2.797E-01
2080	8.374E+03	6.706E+06	4.506E+02	1.442E+01	4.023E+03	2.703E-01
2081	8.094E+03	6.482E+06	4.355E+02	1.394E+01	3.889E+03	2.613E-01
2082	7.824E+03	6.265E+06	4.209E+02	1.347E+01	3.759E+03	2.526E-01
2083	7.562E+03	6.055E+06	4.069E+02	1.302E+01	3.633E+03	2.441E-01
2084	7.309E+03	5.853E+06	3.933E+02	1.259E+01	3.512E+03	2.360E-01
2085	7.065E+03	5.657E+06	3.801E+02	1.217E+01	3.394E+03	2.281E-01
2086	6.829E+03	5.468E+06	3.674E+02	1.176E+01	3.281E+03	2.204E-01

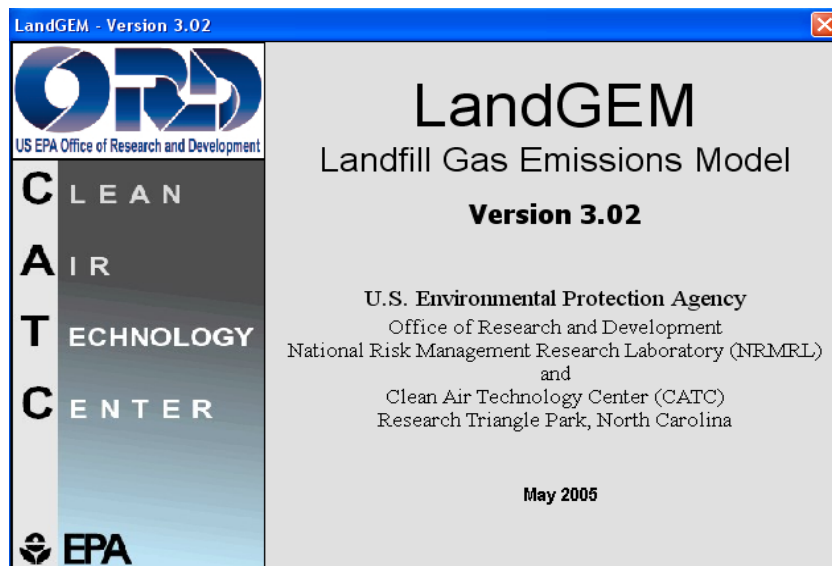
**Results (Continued)**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2087	6.601E+03	5.285E+06	3.551E+02	1.137E+01	3.171E+03	2.131E-01
2088	6.380E+03	5.109E+06	3.433E+02	1.099E+01	3.065E+03	2.060E-01
2089	6.167E+03	4.938E+06	3.318E+02	1.062E+01	2.963E+03	1.991E-01
2090	5.961E+03	4.773E+06	3.207E+02	1.027E+01	2.864E+03	1.924E-01
2091	5.761E+03	4.613E+06	3.100E+02	9.922E+00	2.768E+03	1.860E-01
2092	5.569E+03	4.459E+06	2.996E+02	9.590E+00	2.676E+03	1.798E-01
2093	5.383E+03	4.310E+06	2.896E+02	9.270E+00	2.586E+03	1.738E-01
2094	5.203E+03	4.166E+06	2.799E+02	8.960E+00	2.500E+03	1.679E-01
2095	5.029E+03	4.027E+06	2.706E+02	8.660E+00	2.416E+03	1.623E-01
2096	4.861E+03	3.892E+06	2.615E+02	8.371E+00	2.335E+03	1.569E-01
2097	4.698E+03	3.762E+06	2.528E+02	8.091E+00	2.257E+03	1.517E-01
2098	4.541E+03	3.636E+06	2.443E+02	7.821E+00	2.182E+03	1.466E-01
2099	4.389E+03	3.515E+06	2.362E+02	7.559E+00	2.109E+03	1.417E-01
2100	4.243E+03	3.397E+06	2.283E+02	7.306E+00	2.038E+03	1.370E-01
2101	4.101E+03	3.284E+06	2.206E+02	7.062E+00	1.970E+03	1.324E-01
2102	3.964E+03	3.174E+06	2.133E+02	6.826E+00	1.904E+03	1.280E-01
2103	3.831E+03	3.068E+06	2.061E+02	6.598E+00	1.841E+03	1.237E-01
2104	3.703E+03	2.965E+06	1.992E+02	6.377E+00	1.779E+03	1.195E-01
2105	3.579E+03	2.866E+06	1.926E+02	6.164E+00	1.720E+03	1.155E-01
2106	3.460E+03	2.770E+06	1.861E+02	5.958E+00	1.662E+03	1.117E-01
2107	3.344E+03	2.678E+06	1.799E+02	5.759E+00	1.607E+03	1.079E-01
2108	3.232E+03	2.588E+06	1.739E+02	5.566E+00	1.553E+03	1.043E-01
2109	3.124E+03	2.502E+06	1.681E+02	5.380E+00	1.501E+03	1.009E-01
2110	3.020E+03	2.418E+06	1.625E+02	5.200E+00	1.451E+03	9.748E-02
2111	2.919E+03	2.337E+06	1.570E+02	5.027E+00	1.402E+03	9.422E-02
2112	2.821E+03	2.259E+06	1.518E+02	4.859E+00	1.355E+03	9.107E-02
2113	2.727E+03	2.184E+06	1.467E+02	4.696E+00	1.310E+03	8.803E-02
2114	2.636E+03	2.111E+06	1.418E+02	4.539E+00	1.266E+03	8.509E-02
2115	2.548E+03	2.040E+06	1.371E+02	4.387E+00	1.224E+03	8.224E-02
2116	2.462E+03	1.972E+06	1.325E+02	4.241E+00	1.183E+03	7.949E-02
2117	2.380E+03	1.906E+06	1.281E+02	4.099E+00	1.144E+03	7.684E-02
2118	2.301E+03	1.842E+06	1.238E+02	3.962E+00	1.105E+03	7.427E-02
2119	2.224E+03	1.781E+06	1.196E+02	3.830E+00	1.068E+03	7.178E-02
2120	2.149E+03	1.721E+06	1.156E+02	3.702E+00	1.033E+03	6.938E-02
2121	2.078E+03	1.664E+06	1.118E+02	3.578E+00	9.981E+02	6.706E-02
2122	2.008E+03	1.608E+06	1.080E+02	3.458E+00	9.648E+02	6.482E-02
2123	1.941E+03	1.554E+06	1.044E+02	3.343E+00	9.325E+02	6.266E-02
2124	1.876E+03	1.502E+06	1.009E+02	3.231E+00	9.014E+02	6.056E-02
2125	1.813E+03	1.452E+06	9.756E+01	3.123E+00	8.712E+02	5.854E-02
2126	1.753E+03	1.403E+06	9.430E+01	3.018E+00	8.421E+02	5.658E-02









## Summary Report

**Landfill Name or Identifier:** POTRERO HILLS LANDFILL

**Date:** Monday, December 21, 2009

**Description/Comments:**

**About LandGEM:**

First-Order Decomposition Rate Equation:

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

Where,

$Q_{CH_4}$  = 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 ( $m^3/Ma$ )

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

$t_{ij}$  = 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 conventional 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	<b>2012</b>	
Landfill Closure Year (with 80-year limit)	<b>2069</b>	
Actual Closure Year (without limit)	<b>2069</b>	
Have Model Calculate Closure Year?	<b>No</b>	
Waste Design Capacity	<b>3,000,000</b>	<i>short tons</i>

MODEL PARAMETERS

Methane Generation Rate, k	<b>0.034</b>	<i>year<sup>-1</sup></i>
Potential Methane Generation Capacity, L <sub>0</sub>	<b>100</b>	<i>m<sup>3</sup>/Mg</i>
NMOC Concentration	<b>600</b>	<i>ppmv as hexane</i>
Methane Content	<b>50</b>	<i>% by volume</i>

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	<b>Total landfill gas</b>
Gas / Pollutant #2:	<b>NMOC</b>
Gas / Pollutant #3:	
Gas / Pollutant #4:	

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2012	320,155	352,170	0	0
2013	918,909	1,010,800	320,155	352,170
2014	918,909	1,010,800	1,239,064	1,362,970
2015	918,909	1,010,800	2,157,973	2,373,770
2016	918,909	1,010,800	3,076,882	3,384,570
2017	918,909	1,010,800	3,995,791	4,395,370
2018	918,909	1,010,800	4,914,700	5,406,170
2019	918,909	1,010,800	5,833,609	6,416,970
2020	918,909	1,010,800	6,752,518	7,427,770
2021	918,909	1,010,800	7,671,427	8,438,570
2022	918,909	1,010,800	8,590,336	9,449,370
2023	918,909	1,010,800	9,509,245	10,460,170
2024	918,909	1,010,800	10,428,155	11,470,970
2025	918,909	1,010,800	11,347,064	12,481,770
2026	918,909	1,010,800	12,265,973	13,492,570
2027	918,909	1,010,800	13,184,882	14,503,370
2028	918,909	1,010,800	14,103,791	15,514,170
2029	918,909	1,010,800	15,022,700	16,524,970
2030	918,909	1,010,800	15,941,609	17,535,770
2031	918,909	1,010,800	16,860,518	18,546,570
2032	918,909	1,010,800	17,779,427	19,557,370
2033	918,909	1,010,800	18,698,336	20,568,170
2034	918,909	1,010,800	19,617,245	21,578,970
2035	918,909	1,010,800	20,536,155	22,589,770
2036	918,909	1,010,800	21,455,064	23,600,570
2037	918,909	1,010,800	22,373,973	24,611,370
2038	918,909	1,010,800	23,292,882	25,622,170
2039	918,909	1,010,800	24,211,791	26,632,970
2040	918,909	1,010,800	25,130,700	27,643,770
2041	918,909	1,010,800	26,049,609	28,654,570
2042	918,909	1,010,800	26,968,518	29,665,370
2043	918,909	1,010,800	27,887,427	30,676,170
2044	918,909	1,010,800	28,806,336	31,686,970
2045	918,909	1,010,800	29,725,245	32,697,770
2046	918,909	1,010,800	30,644,155	33,708,570
2047	918,909	1,010,800	31,563,064	34,719,370
2048	918,909	1,010,800	32,481,973	35,730,170
2049	918,909	1,010,800	33,400,882	36,740,970
2050	918,909	1,010,800	34,319,791	37,751,770
2051	918,909	1,010,800	35,238,700	38,762,570

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2052	918,909	1,010,800	36,157,609	39,773,370
2053	918,909	1,010,800	37,076,518	40,784,170
2054	918,909	1,010,800	37,995,427	41,794,970
2055	918,909	1,010,800	38,914,336	42,805,770
2056	918,909	1,010,800	39,833,245	43,816,570
2057	918,909	1,010,800	40,752,155	44,827,370
2058	918,909	1,010,800	41,671,064	45,838,170
2059	918,909	1,010,800	42,589,973	46,848,970
2060	918,909	1,010,800	43,508,882	47,859,770
2061	918,909	1,010,800	44,427,791	48,870,570
2062	918,909	1,010,800	45,346,700	49,881,370
2063	918,909	1,010,800	46,265,609	50,892,170
2064	918,909	1,010,800	47,184,518	51,902,970
2065	918,909	1,010,800	48,103,427	52,913,770
2066	918,909	1,010,800	49,022,336	53,924,570
2067	918,909	1,010,800	49,941,245	54,935,370
2068	48,936	53,830	50,860,155	55,946,170
2069	0	0	50,909,091	56,000,000
2070	0	0	50,909,091	56,000,000
2071	0	0	50,909,091	56,000,000
2072	0	0	50,909,091	56,000,000
2073	0	0	50,909,091	56,000,000
2074	0	0	50,909,091	56,000,000
2075	0	0	50,909,091	56,000,000
2076	0	0	50,909,091	56,000,000
2077	0	0	50,909,091	56,000,000
2078	0	0	50,909,091	56,000,000
2079	0	0	50,909,091	56,000,000
2080	0	0	50,909,091	56,000,000
2081	0	0	50,909,091	56,000,000
2082	0	0	50,909,091	56,000,000
2083	0	0	50,909,091	56,000,000
2084	0	0	50,909,091	56,000,000
2085	0	0	50,909,091	56,000,000
2086	0	0	50,909,091	56,000,000
2087	0	0	50,909,091	56,000,000
2088	0	0	50,909,091	56,000,000
2089	0	0	50,909,091	56,000,000
2090	0	0	50,909,091	56,000,000
2091	0	0	50,909,091	56,000,000

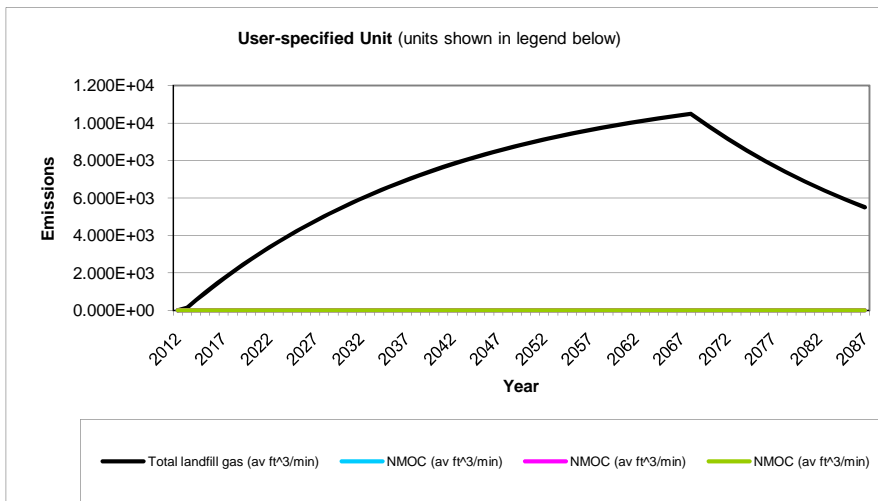
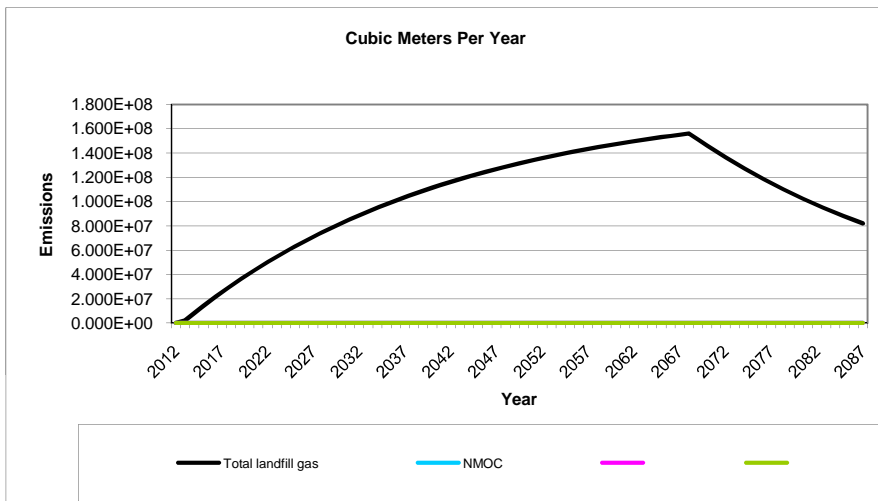
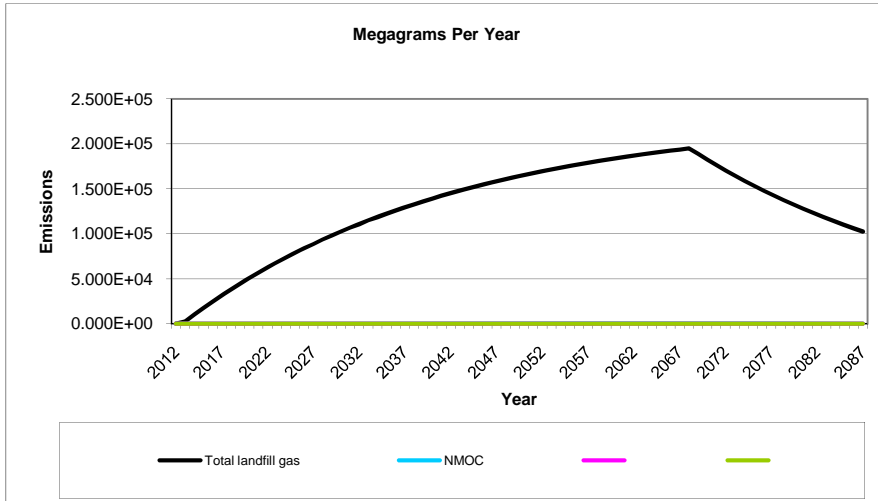
**Pollutant Parameters**

<i>Gas / Pollutant Default Parameters:</i>				<i>User-specified Pollutant Parameters:</i>	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
<b>Gases</b>	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
<b>Pollutants</b>	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,1,2-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		





**Graphs**



**Results**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2012	0	0	0	0	0	0
2013	2.678E+03	2.144E+06	1.441E+02	4.611E+00	1.286E+03	8.644E-02
2014	1.027E+04	8.226E+06	5.527E+02	1.769E+01	4.936E+03	3.316E-01
2015	1.762E+04	1.411E+07	9.477E+02	3.034E+01	8.463E+03	5.686E-01
2016	2.471E+04	1.979E+07	1.330E+03	4.256E+01	1.187E+04	7.977E-01
2017	3.157E+04	2.528E+07	1.699E+03	5.437E+01	1.517E+04	1.019E+00
2018	3.820E+04	3.059E+07	2.055E+03	6.579E+01	1.835E+04	1.233E+00
2019	4.461E+04	3.572E+07	2.400E+03	7.682E+01	2.143E+04	1.440E+00
2020	5.080E+04	4.068E+07	2.733E+03	8.749E+01	2.441E+04	1.640E+00
2021	5.679E+04	4.547E+07	3.055E+03	9.780E+01	2.728E+04	1.833E+00
2022	6.258E+04	5.011E+07	3.367E+03	1.078E+02	3.007E+04	2.020E+00
2023	6.817E+04	5.459E+07	3.668E+03	1.174E+02	3.275E+04	2.201E+00
2024	7.358E+04	5.892E+07	3.959E+03	1.267E+02	3.535E+04	2.375E+00
2025	7.880E+04	6.310E+07	4.240E+03	1.357E+02	3.786E+04	2.544E+00
2026	8.385E+04	6.715E+07	4.512E+03	1.444E+02	4.029E+04	2.707E+00
2027	8.874E+04	7.106E+07	4.774E+03	1.528E+02	4.263E+04	2.865E+00
2028	9.345E+04	7.483E+07	5.028E+03	1.609E+02	4.490E+04	3.017E+00
2029	9.802E+04	7.849E+07	5.273E+03	1.688E+02	4.709E+04	3.164E+00
2030	1.024E+05	8.202E+07	5.511E+03	1.764E+02	4.921E+04	3.306E+00
2031	1.067E+05	8.543E+07	5.740E+03	1.837E+02	5.126E+04	3.444E+00
2032	1.108E+05	8.873E+07	5.962E+03	1.908E+02	5.324E+04	3.577E+00
2033	1.148E+05	9.192E+07	6.176E+03	1.977E+02	5.515E+04	3.705E+00
2034	1.186E+05	9.500E+07	6.383E+03	2.043E+02	5.700E+04	3.830E+00
2035	1.224E+05	9.798E+07	6.583E+03	2.107E+02	5.879E+04	3.950E+00
2036	1.259E+05	1.009E+08	6.776E+03	2.169E+02	6.051E+04	4.066E+00
2037	1.294E+05	1.036E+08	6.963E+03	2.229E+02	6.218E+04	4.178E+00
2038	1.328E+05	1.063E+08	7.144E+03	2.287E+02	6.380E+04	4.286E+00
2039	1.360E+05	1.089E+08	7.319E+03	2.343E+02	6.536E+04	4.391E+00
2040	1.392E+05	1.114E+08	7.488E+03	2.397E+02	6.686E+04	4.493E+00
2041	1.422E+05	1.139E+08	7.651E+03	2.449E+02	6.832E+04	4.590E+00
2042	1.451E+05	1.162E+08	7.808E+03	2.499E+02	6.973E+04	4.685E+00
2043	1.480E+05	1.185E+08	7.961E+03	2.548E+02	7.109E+04	4.777E+00
2044	1.507E+05	1.207E+08	8.108E+03	2.595E+02	7.241E+04	4.865E+00
2045	1.534E+05	1.228E+08	8.251E+03	2.641E+02	7.368E+04	4.950E+00
2046	1.559E+05	1.248E+08	8.388E+03	2.685E+02	7.491E+04	5.033E+00
2047	1.584E+05	1.268E+08	8.521E+03	2.728E+02	7.610E+04	5.113E+00
2048	1.608E+05	1.287E+08	8.650E+03	2.769E+02	7.724E+04	5.190E+00
2049	1.631E+05	1.306E+08	8.774E+03	2.809E+02	7.835E+04	5.265E+00
2050	1.653E+05	1.324E+08	8.895E+03	2.847E+02	7.943E+04	5.337E+00
2051	1.675E+05	1.341E+08	9.011E+03	2.884E+02	8.047E+04	5.406E+00
2052	1.696E+05	1.358E+08	9.123E+03	2.920E+02	8.147E+04	5.474E+00
2053	1.716E+05	1.374E+08	9.232E+03	2.955E+02	8.244E+04	5.539E+00
2054	1.735E+05	1.390E+08	9.336E+03	2.988E+02	8.337E+04	5.602E+00
2055	1.754E+05	1.405E+08	9.438E+03	3.021E+02	8.428E+04	5.663E+00
2056	1.772E+05	1.419E+08	9.536E+03	3.052E+02	8.515E+04	5.721E+00
2057	1.790E+05	1.433E+08	9.631E+03	3.083E+02	8.600E+04	5.778E+00
2058	1.807E+05	1.447E+08	9.722E+03	3.112E+02	8.682E+04	5.833E+00
2059	1.823E+05	1.460E+08	9.811E+03	3.140E+02	8.761E+04	5.886E+00
2060	1.839E+05	1.473E+08	9.896E+03	3.168E+02	8.837E+04	5.938E+00
2061	1.855E+05	1.485E+08	9.979E+03	3.194E+02	8.911E+04	5.987E+00

**Results (Continued)**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2062	1.870E+05	1.497E+08	1.006E+04	3.220E+02	8.982E+04	6.035E+00
2063	1.884E+05	1.509E+08	1.014E+04	3.244E+02	9.051E+04	6.082E+00
2064	1.898E+05	1.520E+08	1.021E+04	3.268E+02	9.118E+04	6.126E+00
2065	1.911E+05	1.530E+08	1.028E+04	3.291E+02	9.182E+04	6.170E+00
2066	1.924E+05	1.541E+08	1.035E+04	3.314E+02	9.245E+04	6.212E+00
2067	1.937E+05	1.551E+08	1.042E+04	3.335E+02	9.305E+04	6.252E+00
2068	1.949E+05	1.561E+08	1.049E+04	3.356E+02	9.363E+04	6.291E+00
2069	1.888E+05	1.512E+08	1.016E+04	3.251E+02	9.070E+04	6.094E+00
2070	1.825E+05	1.461E+08	9.817E+03	3.142E+02	8.767E+04	5.890E+00
2071	1.764E+05	1.412E+08	9.489E+03	3.037E+02	8.474E+04	5.693E+00
2072	1.705E+05	1.365E+08	9.172E+03	2.936E+02	8.190E+04	5.503E+00
2073	1.648E+05	1.319E+08	8.865E+03	2.838E+02	7.916E+04	5.319E+00
2074	1.593E+05	1.275E+08	8.569E+03	2.743E+02	7.652E+04	5.141E+00
2075	1.539E+05	1.233E+08	8.282E+03	2.651E+02	7.396E+04	4.969E+00
2076	1.488E+05	1.191E+08	8.005E+03	2.562E+02	7.149E+04	4.803E+00
2077	1.438E+05	1.152E+08	7.738E+03	2.477E+02	6.910E+04	4.643E+00
2078	1.390E+05	1.113E+08	7.479E+03	2.394E+02	6.679E+04	4.488E+00
2079	1.344E+05	1.076E+08	7.229E+03	2.314E+02	6.456E+04	4.338E+00
2080	1.299E+05	1.040E+08	6.988E+03	2.237E+02	6.240E+04	4.193E+00
2081	1.255E+05	1.005E+08	6.754E+03	2.162E+02	6.031E+04	4.052E+00
2082	1.213E+05	9.716E+07	6.528E+03	2.090E+02	5.830E+04	3.917E+00
2083	1.173E+05	9.391E+07	6.310E+03	2.020E+02	5.635E+04	3.786E+00
2084	1.134E+05	9.077E+07	6.099E+03	1.952E+02	5.446E+04	3.659E+00
2085	1.096E+05	8.774E+07	5.895E+03	1.887E+02	5.264E+04	3.537E+00
2086	1.059E+05	8.481E+07	5.698E+03	1.824E+02	5.088E+04	3.419E+00
2087	1.024E+05	8.197E+07	5.508E+03	1.763E+02	4.918E+04	3.305E+00
2088	9.894E+04	7.923E+07	5.323E+03	1.704E+02	4.754E+04	3.194E+00
2089	9.564E+04	7.658E+07	5.146E+03	1.647E+02	4.595E+04	3.087E+00
2090	9.244E+04	7.402E+07	4.974E+03	1.592E+02	4.441E+04	2.984E+00
2091	8.935E+04	7.155E+07	4.807E+03	1.539E+02	4.293E+04	2.884E+00
2092	8.636E+04	6.916E+07	4.647E+03	1.487E+02	4.149E+04	2.788E+00
2093	8.348E+04	6.684E+07	4.491E+03	1.438E+02	4.011E+04	2.695E+00
2094	8.069E+04	6.461E+07	4.341E+03	1.390E+02	3.877E+04	2.605E+00
2095	7.799E+04	6.245E+07	4.196E+03	1.343E+02	3.747E+04	2.518E+00
2096	7.538E+04	6.036E+07	4.056E+03	1.298E+02	3.622E+04	2.433E+00
2097	7.286E+04	5.834E+07	3.920E+03	1.255E+02	3.501E+04	2.352E+00
2098	7.043E+04	5.639E+07	3.789E+03	1.213E+02	3.384E+04	2.273E+00
2099	6.807E+04	5.451E+07	3.662E+03	1.172E+02	3.271E+04	2.197E+00
2100	6.580E+04	5.269E+07	3.540E+03	1.133E+02	3.161E+04	2.124E+00
2101	6.360E+04	5.093E+07	3.422E+03	1.095E+02	3.056E+04	2.053E+00
2102	6.147E+04	4.922E+07	3.307E+03	1.059E+02	2.953E+04	1.984E+00
2103	5.942E+04	4.758E+07	3.197E+03	1.023E+02	2.855E+04	1.918E+00
2104	5.743E+04	4.599E+07	3.090E+03	9.890E+01	2.759E+04	1.854E+00
2105	5.551E+04	4.445E+07	2.987E+03	9.560E+01	2.667E+04	1.792E+00
2106	5.365E+04	4.296E+07	2.887E+03	9.240E+01	2.578E+04	1.732E+00
2107	5.186E+04	4.153E+07	2.790E+03	8.931E+01	2.492E+04	1.674E+00
2108	5.013E+04	4.014E+07	2.697E+03	8.633E+01	2.408E+04	1.618E+00
2109	4.845E+04	3.880E+07	2.607E+03	8.344E+01	2.328E+04	1.564E+00
2110	4.683E+04	3.750E+07	2.520E+03	8.065E+01	2.250E+04	1.512E+00
2111	4.527E+04	3.625E+07	2.435E+03	7.796E+01	2.175E+04	1.461E+00
2112	4.375E+04	3.504E+07	2.354E+03	7.535E+01	2.102E+04	1.412E+00



**Results (Continued)**

Year	Total landfill gas			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2113	4.229E+04	3.386E+07	2.275E+03	7.283E+01	2.032E+04	1.365E+00
2114	4.088E+04	3.273E+07	2.199E+03	7.040E+01	1.964E+04	1.320E+00
2115	3.951E+04	3.164E+07	2.126E+03	6.804E+01	1.898E+04	1.275E+00
2116	3.819E+04	3.058E+07	2.055E+03	6.577E+01	1.835E+04	1.233E+00
2117	3.691E+04	2.956E+07	1.986E+03	6.357E+01	1.773E+04	1.192E+00
2118	3.568E+04	2.857E+07	1.920E+03	6.144E+01	1.714E+04	1.152E+00
2119	3.449E+04	2.761E+07	1.855E+03	5.939E+01	1.657E+04	1.113E+00
2120	3.333E+04	2.669E+07	1.793E+03	5.741E+01	1.602E+04	1.076E+00
2121	3.222E+04	2.580E+07	1.733E+03	5.549E+01	1.548E+04	1.040E+00
2122	3.114E+04	2.494E+07	1.676E+03	5.363E+01	1.496E+04	1.005E+00
2123	3.010E+04	2.410E+07	1.620E+03	5.184E+01	1.446E+04	9.717E-01
2124	2.909E+04	2.330E+07	1.565E+03	5.011E+01	1.398E+04	9.392E-01
2125	2.812E+04	2.252E+07	1.513E+03	4.843E+01	1.351E+04	9.078E-01
2126	2.718E+04	2.177E+07	1.462E+03	4.681E+01	1.306E+04	8.775E-01
2127	2.627E+04	2.104E+07	1.414E+03	4.525E+01	1.262E+04	8.481E-01
2128	2.540E+04	2.034E+07	1.366E+03	4.373E+01	1.220E+04	8.198E-01
2129	2.455E+04	1.966E+07	1.321E+03	4.227E+01	1.179E+04	7.924E-01
2130	2.373E+04	1.900E+07	1.277E+03	4.086E+01	1.140E+04	7.659E-01
2131	2.293E+04	1.836E+07	1.234E+03	3.949E+01	1.102E+04	7.403E-01
2132	2.217E+04	1.775E+07	1.193E+03	3.817E+01	1.065E+04	7.156E-01
2133	2.143E+04	1.716E+07	1.153E+03	3.690E+01	1.029E+04	6.916E-01
2134	2.071E+04	1.658E+07	1.114E+03	3.566E+01	9.950E+03	6.685E-01
2135	2.002E+04	1.603E+07	1.077E+03	3.447E+01	9.617E+03	6.462E-01
2136	1.935E+04	1.549E+07	1.041E+03	3.332E+01	9.296E+03	6.246E-01
2137	1.870E+04	1.497E+07	1.006E+03	3.221E+01	8.985E+03	6.037E-01
2138	1.808E+04	1.447E+07	9.725E+02	3.113E+01	8.684E+03	5.835E-01
2139	1.747E+04	1.399E+07	9.400E+02	3.009E+01	8.394E+03	5.640E-01
2140	1.689E+04	1.352E+07	9.086E+02	2.908E+01	8.114E+03	5.451E-01
2141	1.632E+04	1.307E+07	8.782E+02	2.811E+01	7.842E+03	5.269E-01
2142	1.578E+04	1.263E+07	8.488E+02	2.717E+01	7.580E+03	5.093E-01
2143	1.525E+04	1.221E+07	8.205E+02	2.626E+01	7.327E+03	4.923E-01
2144	1.474E+04	1.180E+07	7.930E+02	2.538E+01	7.082E+03	4.758E-01
2145	1.425E+04	1.141E+07	7.665E+02	2.454E+01	6.845E+03	4.599E-01
2146	1.377E+04	1.103E+07	7.409E+02	2.372E+01	6.616E+03	4.445E-01
2147	1.331E+04	1.066E+07	7.161E+02	2.292E+01	6.395E+03	4.297E-01
2148	1.287E+04	1.030E+07	6.922E+02	2.216E+01	6.181E+03	4.153E-01
2149	1.244E+04	9.958E+06	6.691E+02	2.142E+01	5.975E+03	4.014E-01
2150	1.202E+04	9.625E+06	6.467E+02	2.070E+01	5.775E+03	3.880E-01
2151	1.162E+04	9.303E+06	6.251E+02	2.001E+01	5.582E+03	3.750E-01
2152	1.123E+04	8.992E+06	6.042E+02	1.934E+01	5.395E+03	3.625E-01





