

E11 - ENGINE, LANDFILL GAS FIRED

CALCULATION METHODS	Annual Emissions: $E_a = U_a \times EF$ (lbs/mmft ³)
	Hourly Emissions: $E_h = U_h$ (scfm) \times (60/1000000) \times EF (lbs/mmft ³)

NOTES:

- Control efficiencies must be included in emission factors since the calculation procedure will not refer to this data.
- No particulate speciation table exists for landfill gas combustion. The HCl factor was estimated using the chlorine content of raw gas (AP-42).
- Emission factors for NOx and CO are based on uncontrolled 2 cycle lean burn engine (AP-42) adjusted for BTU content of landfill gas as per AP-42 instructions (500 / 1000).
- The TOG factor is based on an average 40% methane content in the raw gas and an assumed 99.9% DRE.
- The ROG factor is based on the EPA AP-42 assumption of 595 ppmv NMHC as hexane in the raw gas and a 98% DRE.
- Individual pollutant factors are estimated using AP-42 raw gas speciation (9/97) and an assumed 98% destruction efficiency.

POLLUTANT	DISTRICT EMISSION FACTORS (lbs/ million ft ³ fuel burned)	EPA REFERENCE DOCUMENT	EPA-FACTOR	(UNITS)	COMMENTS
NOX	1350.00	AP-42, Sect.3.2,10/96, Table 3.2-1	2.7	lbs/million BTU	
CO	190.00	AP-42, Sect.3.2,10/96, Table 3.2-1	0.38	lbs/million BTU	
SOX	7.34	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw gas sulfur content with 98% conversion to SOx.
TOG	16.66	AP-42, Sect.2.4, 9/97, Table 2.4-1			Assumes 99.9% CH4 DRE and a 40% average methane concentration.
ROG	2.66	AP-42, Sect.2.4, 9/97, Table 2.4-1			Assumes 98% DRE of 595 ppmv NMHC as hexane.
TSP	23.00	AP-42, Sect.3.2,10/96, Table 3.2-2	0.046	lbs/million BTU	
PM10	23.00	AP-42, Sect.3.2,10/96, Table 3.2-2	100.00%	lbs/lb TSP	Assumes PM10 = TSP per EPA instructions..
ACETONE	0.0212	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
ACRYLONITRILE	0.0174	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
ARSENIC		District's Approved Emission Factors		lb/MMscf	Landfills Operations, Sec 3.3.1
BENZENE	0.0078	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
1,3-BUTADIENE					
CARBON DISULFIDE	0.0023	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
CARBONYL SULFIDE	0.0015	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.

POLLUTANT	DISTRICT EMISSION FACTORS (lbs/ million ft ³ fuel burned)	EPA REFERENCE DOCUMENT	EPA-FACTOR	(UNITS)	COMMENTS
CHLOROBENZENE	0.0015	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
CHLOROFORM	0.0002	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
CHLOROFLUORO-CARBONS	0.0074	AP-42, Sect.2.4, 9/97, Table 2.4-1			Listed on AP-42 as CHLORODIFLUORO-METHANE. Based on AP-42 raw landfill gas content with a 98% DRE.
DIMETHYL SULFIDE	0.0252	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
ETHYL BENZENE	0.0254	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
ETHYLENE DIBROMIDE					
ETHYLENE DICHLORIDE	0.0021	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
FORMALDEHYDE	0.135*	EPA VOC Speciation Profile # 1001 1/90.	0.81%	lbs/lb TOC	* When available, District's Approved Emission Factors will be used, Ref: Landfills Operations, Sec 3.3.2
HEXANE	0.0294	AP-42, Sect.2.4, 9/97, Table 2.4-1			
HYDROGEN CHLORIDE	7.43	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
HYDROGEN SULFIDE	0.0628	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
ISOPROPANOL					
METHANOL					
METHYLENE CHLORIDE	0.0631	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
METHYL ISOBUTYL KETONE	0.0097	AP-42, Sect.2.4, 9/97, Table 2.4-1			
METHYL ETHYL KETONE	0.0266	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
PERCHLOROETHYLENE	0.0321	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
PROPYLENE					
TOLUENE	0.1881	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
1,1,1-TRICHLOROETHANE	0.0033	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
TRICHLOROETHYLENE	0.0192	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
VINYL CHLORIDE	0.0238	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.
VINYLDIENE CHLORIDE	0.0010	AP-42, Sect.2.4, 9/97, Table 2.4-1			
XYLENES	0.0667	AP-42, Sect.2.4, 9/97, Table 2.4-1			Based on AP-42 raw landfill gas content with a 98% DRE.

Last Updated on 10/06/2021 By M. Abuelazaim