

Municipal Solid Waste Landfills



Final Rule: Mandatory Reporting of Greenhouse Gases

Under the Mandatory Reporting of Greenhouse Gases (GHGs) rule, owners or operators of municipal solid waste (MSW) landfills (as defined below) must report emissions from MSW landfills and all other source categories located at the landfill for which methods are defined in the rule. Owners or operators are required to collect emission data; calculate GHG emissions; and follow the specified procedures for quality assurance, missing data, recordkeeping, and reporting.

How Is This Source Category Defined?

The landfill source category consists of MSW landfills that accepted waste on or after January 1, 1980 and generate methane (CH₄) in amounts equivalent to 25,000 metric tons of carbon dioxide equivalent (CO₂e) or more per year. This definition is based on the amount of CH₄ generated (adjusted for soil oxidation, but not considering whether any gas is collected and destroyed) and not the amount of CH₄ actually emitted. The MSW landfill consists of the landfill, landfill gas collection systems, and landfill gas destruction devices (including flares).

This source category does not include industrial, hazardous waste, or construction and demolition landfills.

What GHGs Must Be Reported?

MSW landfill owners and operators must report:

- Annual modeled CH₄ generation and CH₄ emissions from the landfill.
- Annual CH₄ destruction (for landfills with gas collection and control systems).
- Annual CO₂, CH₄, and nitrous oxide (N₂O) emissions from stationary fuel combustion devices using the calculation methods specified in 40 CFR part 98, subpart C (General Stationary Combustion Sources). The information sheet on general stationary fuel combustion sources summarizes calculating and reporting emissions from these units.

How Must GHG Emissions Be Calculated?

MSW landfills must calculate modeled annual CH₄ generation based on:

- Measured or estimated values of historic annual waste disposal quantities; and
- Appropriate values for model inputs (i.e., degradable organic carbon fraction in the waste, CH₄ generation rate constant). Default parameter values are specified for bulk municipal waste and individual waste materials.

Landfills that do not collect and destroy landfill gas must adjust the modeled annual CH₄ generation to account for soil oxidation (CH₄ that is converted to CO₂ as it passes through the landfill cover before being emitted) using a default soil oxidation factor. The resulting value represents both CH₄ generation (adjusted for oxidation) and CH₄ emissions.

Facilities that collect and control landfill gas must calculate the annual quantity of CH₄ recovered and destroyed based on continuous monitoring of gas flow rate and continuous or weekly monitoring of CH₄ concentration, temperature, pressure, and moisture content of the collected gas prior to the destruction

device. CH₄ destruction efficiency must be based on the manufacturer's specified efficiency or 99 percent, whichever is less.

Those facilities that collect and control landfill gas must then calculate CH₄ emissions in two ways and report *both* results. Emissions must be calculated by:

1. Subtracting the measured amount of CH₄ recovered from the modeled annual CH₄ generation (with adjustments for soil oxidation and destruction efficiency of the destruction device).
2. Applying a gas collection efficiency to the measured amount of CH₄ recovered to account for CH₄ that is emitted through the landfill surface (adjusted for soil oxidation). Default collection efficiencies are specified that take into account collection system coverage and landfill cover materials.

A checklist for data that must be monitored is available at:

<http://www.epa.gov/climatechange/emissions/downloads/checklists/mswlandfills.pdf>

What Information Must Be Reported?

In addition to the information required by the General Provisions at 40 CFR 98.3(c), each facility must report the following landfill information:

- Information on the landfill's operating status, first and last year the landfill accepted waste, anticipated closure date, capacity, and whether leachate recirculation is used.
- Waste disposal quantity for each year of landfilling and description of how it was estimated.
- Waste composition data, if available, and how these data were estimated.
- Values of all parameters used in the methane generation calculations, including degradable organic carbon (DOC) and rate constant (k).
- Fraction of CH₄ in landfill gas and how this fraction was determined (measured or default values).
- Surface area of the landfill containing waste, cover type, and surface area and oxidation factor for each cover type used to calculate the average oxidation fraction, and the average oxidation fraction used.
- Annual CH₄ generation modeled.
- Annual CH₄ emissions adjusted for oxidation (for landfills without gas collection).
- Annual CH₄ emissions. (Facilities with landfill gas collection and control systems must report emissions using both of two estimation methodologies described above and must also report annual CH₄ destruction by the destruction device).

For landfills with gas collection systems, report:

- Total volumetric flow of landfill gas collected for destruction, measured CH₄ concentration, monthly average measured temperature and pressure, and annual quantity of CH₄ recovered.
- For landfill gas destruction devices, the destruction efficiency or whether gas was sent off-site for destruction. Indicate if a back-up destruction device is available, its associated destruction efficiency and the annual operating hours for primary destruction and back-up destruction devices.
- The gas collection efficiency used in emissions calculations.
- Descriptions of the gas collection system (manufacture, capacity, number of wells, etc.), surface area, waste depth and cover type for areas within the landfill.
- Annual operating hours of gas collection system.

For More Information

This document is provided solely for informational purposes. It does not provide legal advice, have legally binding effect, or expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits in regard to any person. The series of information sheets is intended to assist reporting facilities/owners in understanding key provisions of the final rule.

Visit EPA's Web site (www.epa.gov/climatechange/emissions/ghgrulemaking.html) for more information, including the final preamble and rule, additional information sheets on specific industries, the schedule for training sessions, and other documents and tools. For questions that cannot be answered through the Web site, please contact us at: ghgmrr@epa.gov.

Municipal Solid Waste Landfills

Monitoring Checklist



Final Rule: Mandatory Reporting of Greenhouse Gases

What Must Be Monitored for Each Landfill?

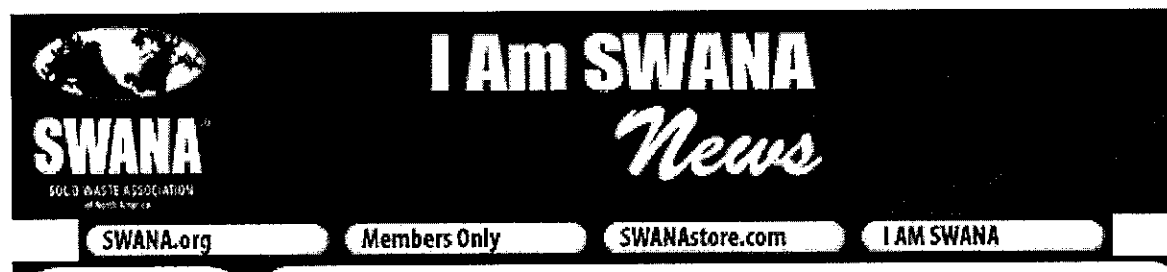
Each MSW landfill must monitor these parameters...

- | | |
|--|---|
| <input type="checkbox"/> Annual quantity of waste landfilled (W_x in Equation HH-1) | <input type="checkbox"/> Material-specific waste quantity or fraction, and their associated parameters used to calculate methane generation in Equation HH-1, including: DOC, k, MCF, and DOC_r |
|--|---|

Each MSW landfill using a gas collection system must also monitor these parameters...

- | | |
|--|---|
| <input type="checkbox"/> Flow rate of landfill gas before any treatment equipment (daily) | <input type="checkbox"/> Total annual CH_4 recovered prior to destruction |
| <input type="checkbox"/> CH_4 concentration of collected landfill gas (daily, if available, or weekly) | <input type="checkbox"/> Destruction device (and backup destruction device, if applicable) operating hours per year |
| <input type="checkbox"/> Temperature of landfill gas (daily, if available, or weekly) | <input type="checkbox"/> Gas collection system operating hours per year |
| <input type="checkbox"/> Pressure of landfill gas (daily, if available, or weekly) | <input type="checkbox"/> Area, average depth of waste, and associated estimated collection efficiencies of areas with the different soil type covers and gas collection system operation listed in Table HH-3 |
| <input type="checkbox"/> Moisture content of landfill gas (daily, if available, or weekly) | |

See also the information sheet for Municipal Solid Waste Landfills (EPA-430-F-09-009R) at: www.epa.gov/climatechange/emissions/downloads/infosheets/mswlandfills.pdf.



In this issue:

December 4, 2009

[CEO Report](#)

Mandated Monitoring of Greenhouse Gases to Begin January 1st *Shannon Crawford, Manager of Legislative and Regulatory Programs*

[Advocacy Update](#)

Beginning January 1, 2010, facilities covered by EPA's Mandatory Greenhouse Gas Reporting Rule are required to begin monitoring their emissions. In their ruling, signed in late September, EPA finalized reporting requirements for 31 different sectors, including both landfills and waste-to-energy plants. EPA was directed to develop the mandatory reporting rule, by Congress, as part of a 2008 Appropriations Bill. EPA plans on using the information they receive to better understand the sources of emissions and to develop future policies to reduce greenhouse gases. They have estimated that their ruling will cover 85% of all emissions in the US. SWANA commented on this ruling during the spring comment period and has consulted with EPA throughout the process in order to be able to provide better information to our members. If covered facilities would like to petition for a judicial review they have until December 29, 2009 to file.

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Both landfills and waste-to-energy facilities will be required to report their direct GHG emissions if above 25,000 tons of CO₂e annually. These facilities are mandated to report all six of the greenhouse gas emissions listed in the rule. Importantly, municipalities and waste management companies will not be required to report indirect emissions resulting from electricity use or direct fleet generated emissions. However, because the rule focuses only on reporting emissions, they will not be able to lower their emission number by accounting for offsets or carbon sequestration.

[Training and Certification](#)

EPA is currently developing an electronic reporting system to help ease the burden on regulators as well as reporters. It will be web-based and designed to guide reporters through data entry and submission. This system will include built-in calculations and completeness checks and will allow self-verification with EPA verification of reporting.

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One of SWANA's primary concerns with the proposal was the early start date to begin reporting and the lack of lead time to prepare for GHG emissions data collection. In our comments we requested a one year grace period similar to what was done in California when the Air Resource Board implemented reporting of GHGs. Instead of a one-year grace period, EPA offered a transition period during the first quarter of 2010. During this period, reporters may use "best available monitoring methods" to estimate their GHG emissions. This could include using emissions estimates in the rule itself or information obtained from current monitoring methods or calculations. If facilities would like to extend their use of best available data, they must request an extension by January 28, 2010. No extensions will be granted past December 31, 2010.

Failure to comply with this rulemaking could result in enforcement action under the Clean Air Act. These penalties are severe ranging up to \$37,500 per day per violation. Potential violations include:

- Failure to report GHGs
- Failure to collect data needed to calculate GHGs
- Failure to monitor continuously as required by the ruling
- Falsification of reports

EPA has indicated they intend to evaluate each violation individually. The final rule allows them the flexibility to exhaust less punitive actions before taking a more severe step. This, they believe, is consistent with other programs under the Clean Air Act.

Another concern SWANA raised regarding the proposed rule was the lack of a mechanism to exit the program should emissions fall below the reporting threshold. This is especially important in the landfill industry where emissions for closed sites dissipate over time. To address this issue EPA added a provision for facilities to cease reporting if they meet one of the following criteria:

- Five consecutive years below 25,000 tons of CO₂e
- Three consecutive years below 15,000 tons of CO₂e
- If GHG-emitting processes or operations shut down

The first emissions report is due March 31, 2011 and will cover 2010 emissions.

Landfills and waste-to-energy plants are both specifically addressed in the ruling.

- To understand what emissions WTE plants must report to comply please [click here](#).
- To understand what emissions landfills must report please [click here](#).

Please contact me directly with any questions.

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[Back to Top](#)

Questions? Visit www.SWANA.org or call 1-800-GO-SWANA. (467-9262).

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Landfills

Subpart HH specifies the reporting requirements for MSW landfills, which would include the emissions from the landfill itself, LFG collection systems and LFG destruction devices. Not included in this provision are hazardous waste landfills, C&D landfills and industrial landfills. MSW Landfills that generate more than 25,000 tons of CO₂e of methane would be required to report their GHG emissions, regardless of whether or not the methane is destroyed. This is a very low threshold for landfills and according to estimates could include landfills with as little as 350,000 metric tons of waste in place or landfill gas recovery of about 900 metric tons per year of methane. To help landfills determine if they will need to report EPA has developed an online [applicability tool](#).

Landfills without gas collection systems must model their generation rate and subtract the default soil oxidation rate of 10% to must calculate their total emissions. Landfills that control their methane emissions must calculate their methane emissions in two ways and report both results. The first method is to subtract the amount of methane recovered from the modeled generation rate (with adjustments for soil oxidation and the destruction efficiency of the control device); the second method is to apply a gas collection efficiency to the measured amount of CH₄ recovered to calculate CH₄ generation, then subtracting the measured amount of CH₄ recovered (with adjustments for soil oxidation using the default value and destruction efficiency of the destruction device) using the equations provided.

In order to complete these calculations landfills must monitor the following either continuously or weekly:

- Amount of waste coming in
- Concentration of methane in collected LFG using a gas composition monitor
- LFG flow rate with gas flow meter (for landfills with collection systems)

The rule specifies six different methods for monitoring methane concentration: five using gas chromatography and one using total organic carbon. EPA has also confirmed that landfills may use portable methane composition analyzers such as Landtec GEM and Envision as well as gas composition meters using nondispersive infrared technology (NDIR). The rule specifies eight different methods for determining gas flow rate. EPA has indicated that in addition to these methods landfills may use thermal mass flow meters to calculate this figure. Talks with EPA clarifying acceptable techniques for monitoring methane concentrations and measuring flow rates, are likely to continue.

Landfills that currently continuously monitor flow rate, CH₄ concentration, temperature, pressure and moisture content using a meter specifically for CH₄ must use this system for emissions reporting. Landfill gas to energy projects would also report their emissions of CO₂, methane and nitrous oxide

using stationary combustion source provisions if the landfill is subject to Subpart HH.

To understand what emissions WTE plants must report to comply [click here](#).
To return to the main article [click here](#).

[Back to Top](#)

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