Mandatory Greenhouse Gas Reporting Rule: EPA's Response to Public Comments

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Subpart HH—Landfills

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Subpart HH—Landfills

U. S. Environmental Protection Agency
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Climate Change Division
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FOREWORD

This document provides EPA's responses to public comments on EPA's Proposed Mandatory Greenhouse Gas Reporting Rule. EPA published a Notice of Proposed Rulemaking in the Federal Register on April 10, 2009 (74 FR 16448). EPA received comments on this proposed rule via mail, e-mail, facsimile, and at two public hearings held in Washington, DC and Sacramento, California in April 2009. Copies of all comments submitted are available at the EPA Docket Center Public Reading Room. Comments letters and transcripts of the public hearings are also available electronically through *http://www.regulations.gov* by searching Docket ID *EPA-HQ-OAR-2008-0508.*

Due to the size and scope of this rulemaking, EPA prepared this document in multiple volumes, with each volume focusing on a different broad subject area of the rule. This volume of the document provides EPA's responses to significant public comments received for 40 CFR Part 98, Subpart HH—Landfills.

Each volume provides the verbatim text of comments extracted from the original letter or public hearing transcript. For each comment, the name and affiliation of the commenter, the document control number (DCN) assigned to the comment letter, and the number of the comment excerpt is provided. In some cases the same comment excerpt was submitted by two or more commenters either by submittal of a form letter prepared by an organization or by the commenter incorporating by reference the comments in another comment letter. Rather than repeat these comment excerpts for each commenter, EPA has listed the comment excerpt only once and provided a list of all the commenters who submitted the same form letter or otherwise incorporated the comments by reference in table(s) at the end of each volume (as appropriate).

EPA's responses to comments are generally provided immediately following each comment excerpt. However, in instances where several commenters raised similar or related issues, EPA has grouped these comments together and provided a single response after the first comment excerpt in the group and referenced this response in the other comment excerpts. In some cases, EPA provided responses to specific comments or groups of similar comments in the preamble to the final rulemaking. Rather than repeating those responses in this document, EPA has referenced the preamble.

While every effort was made to include significant comments related to 40 CFR Part 98, Subpart HH—Landfills in this volume, some comments inevitably overlap multiple subject areas. For comments that overlapped two or more subject areas, EPA assigned the comment to a single subject category based on an assessment of the principle subject of the comment. For this reason, EPA encourages the public to read the other volumes of this document with subject areas that may be relevant to 40 CFR Part 98, Subpart HH—Landfills.

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1. DEFINITION OF SOURCE CATEGORY

Commenter Name: Chris Hobson
Commenter Affiliation: Southern Company
Document Control Number: EPA-HQ-OAR-2008-0508-1645.2
Comment Excerpt Number: 29

Comment: Subpart HH, §§ 98.340 thru 98.358, includes "industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)". Most of Southern Company's 77 power plants have, or have had, inorganic, construction and industrial landfills and disposal and holding areas. Some of the company's coal-fired plants have landfills which are classified as "industrial landfills" in their permits. Because the term "industrial landfill" is not defined in the GHG reporting rule, there does not appear to be any way to exempt these landfills from the reporting requirements under Subpart HH. However, previous testing at these landfills has shown that no methane is emitted and the state permit does not require that the landfills be monitored for CH_4, because these landfills do not contain organic wastes, such as food scraps and paper wastes. Thus, the reporting requirements, including calculations and recordkeeping, would be very burdensome for landfills that are known not to emit methane. Southern Company suggests that EPA clarify the definition of "industrial landfill" and add exemption from reporting requirements for those industrial landfills with inert waste streams, specifically, those that have state permits that do not require monitoring of CH_4.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 3
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0635
Comment Excerpt Number: 98

Comment: It is important for EPA to include landfills in the category of sources subject to mandatory greenhouse gas reporting. As EPA acknowledges, municipal solid waste landfills are a significant source of methane emissions, having emitted 111.2 million metric tons CO_2e of CH_4 in 2006.

Response: We agree that MSW landfills are an important source of methane emissions and are finalizing reporting requirements for MSW landfills in the final rule.

Commenter Name: Karl Pepple
Commenter Affiliation: City of Houston, Texas
Document Control Number: EPA-HQ-OAR-2008-0508-0699.1
Comment Excerpt Number: 4

Comment: The City has operated landfills in the past. Insofar as the rule would apply to closed landfills, these requirements would impose a significant burden on local government resources. It

is very difficult to identify old landfills. Therefore, the City is recommending that the USEPA limit this requirement to existing landfills.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 18

Comment: The Department recommends that the rule clearly and consistently specify that methane generation has to be calculated and summed for all landfills, closed as well as active, to determine if they meet the reporting threshold and thus start and continue reporting.

Response: See Section III.HH of the preamble for a response to this comment. In addition, we have reviewed the general provisions in subpart A and find that they specifically indicate that the rule is applicable to a facility, and that the cumulative emissions at the facility must be used to evaluate if the facility exceeds the reporting threshold. If a single facility contains multiple landfills, open or closed since 1980, then the sum of each landfill's emissions would be used to determine if the facility exceeds the 25,000 tCO_2e/yr threshold for reporting.

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 25

Comment: We recommend that a definition of land application unit be included in the Landfills Source Category (Subpart HH). A number of closed landfills (i.e., landfills that no longer receive waste and have been closed in accordance with state or local requirements) include units wherein leachate is collected and land applied as a leachate control or minimization strategy. On at least one closed landfill leachate pumped and is applied to fast-growing trees planted on the site in order to reduce the quantity of leachate transported off-site. Such facilities should be excluded from the proposed mandatory GHG reporting rule.

Response: The general provisions in subpart A provide a definition for landfills that specifically states that land application units are not landfills. In §257.2 , "Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for agricultural purposes or for treatment and disposal." As the definition of land application unit is provided in 40 CFR part 257, we did not see a need to repeat the definition in this part. The leachate applications described by the commenter appear to meet the definition of land application units and would be exempt from reporting under subpart HH. We do note that leachate recirculation or application to a closed landfill does not cause the landfill to be reclassified as a land application unit; emissions from closed landfills (except those closed prior to 1980) must be reported in subpart HH if the emissions exceed the reporting threshold. We have added a reporting requirement for landfill owners or operators to note whether or not they use leachate recirculation at the landfill.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 11

Comment: We request clarification of who is responsible for reporting greenhouse gas emissions when all or portions of the landfill gas collection, control and destruction equipment (e.g., flare, turbine, reciprocating internal combustion engine) are not owned by the same entity. If the landfill gas collection, control and destruction equipment are all owned by the landfill owner, then that entity should be the reporting entity. However, numerous other arrangements exist between landfill owners, landfill gas developers, and landfill gas users. Some potential examples include: 1. The landfill owner may own the landfill gas collection and control system but a gas developer may own the destruction equipment which is either located on leased on-site property or off-site property; 2. The landfill owner may own the landfill gas collection and control system and mayor may not own the distribution system to the off-site user; 3. The landfill owner does not own the landfill gas collection and control system, the distribution system, or destruction equipment; 4. The developer treats the landfill gas to pipeline quality that is then transported through existing gaseous fuel (natural gas) pipelines to an off-site, unknown user; and 5. The landfill owner may own the landfill gas collection and control system plus a piece of the destruction equipment (e.g., auxiliary flare, heaters for a greenhouse) and a developer may own the majority of the destruction equipment. These alternative operational and ownership systems are well recognized as part of a landfill gas recovery system that provides significant environmental benefit and contributes to alternative energy goals. NSWMA therefore requests that EPA allow the facility not to be responsible for reporting that portion of the CH_4 generation that is under the control of another party. As with other fuels, the greenhouse gas emissions from the combustion of this "off-site" landfill gas is accounted for through the emissions reporting by the end user of the gas, who generates power, heat, steam, or vehicle fuel and creates greenhouse gas emissions when the gas is used as a fuel source. These emissions are captured in other subparts of the proposed rule. We believe not adjusting the landfill's emissions accordingly will cause redundancy and inaccurate accounting of greenhouse gas emissions, in addition to overestimating the landfill's emissions.

Response: This reporting rule applies at the facility level, therefore, the definition of facility must be considered in determining the reporting responsibilities of the landfill owner and operator. Under the definition of "facility" in the rule, a facility would be required to report emissions only from equipment that they own or operate. Therefore, for example, if a facility purchases energy from a separately-owned enterprise that they do not own or operate and that is physically located within the same facility boundary, then the facility would be considered as two separate facilities. The rule applicability and reporting requirements would be applied separately to each facility. However, if any person shares any level of control over both enterprises, then the two enterprises would be considered to be a single facility.

Commenter Name: Steven J. Rowlan
Commenter Affiliation: Nucor Corporation (Nucor)
Document Control Number: EPA-HQ-OAR-2008-0508-0605.1
Comment Excerpt Number: 69

Comment: In 98.340(b), industrial landfills that contain only inorganic material (e.g., no

biological material to decompose and give rise to methane or other GHGs) should be excluded from coverage along with hazardous waste landfills and construction and demolition landfills.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 2
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0679.1
Comment Excerpt Number: 212

Comment: §98.340(a). Onsite industrial landfills that have been closed under the Resource Conservation and Recovery Act (RCRA) should be excluded from the source category. Landfills closed under RCRA have little to no potential for air emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael Garvin
Commenter Affiliation: Pharmaceutical Research and Manufacturers of America (PhRMA)
Document Control Number: EPA-HQ-OAR-2008-0508-0959.1
Comment Excerpt Number: 22

Comment: On-site industrial landfills that have been closed under RCRA should be excluded from the landfill source category. Landfills closed under RCRA have little or no potential for air emissions, and the burden associated with meeting the proposed requirements in the rule creates an unnecessary compliance burden.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 20

Comment: The Department recommends that the rule require reporting from closed MSW landfills that still have methane generation that exceeds 25,000 metric tons per year of CO_2, at the time the rule becomes effective. We see no reason to exclude such landfills from reporting.

Response: We agree that closed MSW landfills that have accepted waste since January 1980 and with emissions (not considering capture and control) that exceed 25,000 tCO_2e must report their emissions. In addition, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1

Comment Excerpt Number: 4

Comment: Republic is concerned that the proposed rule provides no direction on who should report GHG emissions when multiple parties own a portion of the landfill gas collection and control equipment (e.g., landfill gas well field, flare, reciprocating internal combustion engine, boiler, turbine). In an effort to provide alternative energy options, Republic has various operational and ownership arrangements with third parties. There are several scenarios regarding the arrangements between landfill owners, gas developers and end users of the landfill gas. Some examples of such arrangements include but are not limited to the following: 1. Landfill owner owns the landfill gas collection and control system but a gas developer may own the destruction equipment which is either located on leased on-site property or off-site property; 2. Landfill owner owns the landfill gas collection and control system and may or may not own the distribution system to the off-site user; 3. Landfill owner does not own the landfill gas collection and control system, the distribution system, or destruction equipment; 4. Gas developer treats the landfill gas to pipeline quality that is then transported through existing gaseous fuel (natural gas) pipelines to an off-site, unknown end user; 5. Landfill owner owns the landfill gas collection system plus a piece of the destruction (control) equipment (e.g., auxiliary flare, heaters for a greenhouse) and a developer may own the majority of the destruction equipment; or 6. Landfill owner owns a piece of destruction equipment which is only operated when the developer is not operating the gas collection system which developer may or may not own. We believe the party who has control of the GHG emissions generated should be required to report the emissions under their control. The end user of the landfill gas who is generating the GHG emissions for a fuel source should be responsible for reporting the emissions. These emissions are already captured in other subparts of the proposed rule. The landfill emissions will be overestimated and cause an inaccurate accounting if the landfill is required to report emissions created by a third party which is not in their control. Republic is also concerned about certifying emissions from a third party in which we have no control over the information provided to us. This will cause problems when the facility has to certify the data and could lead to unjustified enforcement issues for the landfill.

Response: See response to comment EPA-HQ-OAR-2008-0508-2126, excerpt number 11 on page 3 of this document.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 20

Comment: In the Proposed rule, the source category of landfills includes particular sources "at" MSW landfill facilities including landfills, landfill gas collection systems, and landfill gas combustion systems (including flares). Proposed 40 C.F.R. § 98.340. Municipal solid waste landfill or MSW landfill in turn contains a limited geographical construct defined in§ 98.6 as: [A]n entire disposal facility in a contiguous geographical space where household waste is placed in or on land. An MSW landfill may also receive other types of RCRA Subtitle D wastes (§ 257.2 of this chapter) such as commercial solid waste, nonhazardous sludge, conditionally exempt small quantity generator waste, and industrial solid waste. Portions of an MSW landfill may be separated by access roads. An MSW landfill may be publicly or privately owned. At the same time, the proposed rule indicates that the landfill source category must report: CH_4 generation and CH_4 emissions from landfills, CH_4 destruction resulting from landfill gas

collection and combustion systems, and CO_2. See Proposed Rule §93.342. The MMR as currently proposed does not provide clear guidance as to whether landfills must report on GHG emissions from independently owned and operated offsite renewable energy facilities (typically turbine or engine plant operations), nor does it provide clear guidance for delegating GHG reporting authority at facilities where multiple parties serve as owners and/or operators over different aspects of facility operations. Specifically, in the case of municipal solid waste landfills, it is quite common for the landfill, the collection system, and on-site combustion equipment to be owned and/or operated by different entities. Further, many landfill gas-to-energy projects direct pipe treated or untreated landfill gas to a separate industrial user who combusts the gas for heat and power at their site, which may not only be non-contiguous to the landfill, but may be a considerable distance away. Typically, the landfill is not dependent on these third party renewable energy facilities as the landfill maintains 100% flare backup capacity. Approximately a third of Waste Management's renewable energy projects involve piping landfill gas to an independent third-party. Illustrative examples include WM's Palmetto Landfill where landfill gas is sent through a 9.5 mile pipeline to help power generators at BMW's manufacturing plant in Spartanburg, South Carolina [see . e.g., http://www.thinkEireen.com/bmw-drives-forward] and the University of New Hampshire's EcoLine project, where Waste Management Turnkey Landfill will supply's the University of New Hampshire with treated landfill gas through a 12.7 mile pipeline for cogeneration purposes. [See See, e.g., http://www.sustainableunkunh.eduktimate ed/cozen.] Landfills, in particular, are in need of regulatory specificity and clarity in regard to GHG reporting and compliance obligations as other CAA rules associated with landfills also do not yet fully address the multi-party issue, and the currently proposed rule is unclear about whether emission reporting is restricted to sources "at" the landfill, or alternatively, whether landfills must include combustion of landfill gas that occur off-site by independent third parties. The appropriate form of GHG reporting for parties involved in these environmentally beneficial projects is difficult to determine; and, historically, some environmental regulatory agencies have attempted to simplify the issue by designating all landfill-associated activities to be "under common control", usually with the landfill owner or operator of record retaining all liability. This scenario is not only an overextension of the CAA doctrine of "common control," but it is more importantly a disincentive to both landfills and landfill-gas-to energy developers to engage in renewable energy projects. Any attempt to separate GHG emission reporting and rule compliance boundaries absent EPA guidance and corresponding enforcement protection would be a complex accounting and legal task with the potential to create compliance responsibilities and liabilities that would provide an even more profound disincentive to renewable energy project development. Waste Management recommends establishing a tiered system for determining the appropriate division of GHG reporting and compliance requirements at municipal solid waste landfills and potential downstream landfill gas combustion facilities owned and operated by multiple parties. Following is our recommended hierarchy, which is applicable to landfills at all stages of life from initial construction to post-closure management. Because this hierarchy is exclusively applicable to municipal solid waste landfills, we recommend that it be included in the "Definition of Source Category" in Subpart HH of the MMR, with a statement that it supplements and supersedes the definitions of "owner" and "operator" in subpart A of section 98.6 of the MMR. Permitting Authority: 1.GHG reporting and compliance responsibilities associated with methane collection, fugitive methane emissions and methane oxidation in the landfill cap should be assumed to rest with the party who holds the air operating permit for the landfill gas collection system. If an air operating permit; including, but not limited to a Title V permit issued pursuant to 40 CFR Part 70 or 71 or state Title V regulations, is not required or issued for the landfill gas collection system, these GHG reporting and compliance responsibilities should be assumed to rest with the holder of the solid waste permit for the landfill. 2.GHG reporting and compliance responsibilities

associated with landfill gas processing and landfill gas combustion should be assumed to rest with the party or parties who hold the air permit(s) for these units. 3.GHG reporting and compliance responsibilities associated with methane generation capacity and the right to report carbon sequestration should be assumed to rest with the party who holds the solid waste permit for the landfill. Ownership Status: 1.If GHG reporting and compliance responsibility associated with methane collection cannot be definitively determined based upon permitting authority, it should be assumed to rest with the owner of record of the landfill gas collection system. 2.If GHG reporting and compliance responsibility associated with landfill gas processing and landfill gas combustion cannot be definitively determined based upon permitting authority, it should be assumed to rest with the party or parties who own the respective operating units. 3.If GHG reporting and compliance responsibility associated with methane generation, methane oxidation in the landfill cap, and fugitive methane emissions cannot be definitively determined based upon permitting authority, it should be assumed to rest with the party who is the owner of record of the landfill. Further, the right to report carbon sequestration should be assumed to rest with the owner of record of the landfill. The fact that GHG reporting and compliance responsibilities for a single landfill operation may be reported by different "facilities" in different reports will make it difficult to review the comprehensive emissions profile of the landfill. To correct this situation, Waste Management recommends that EPA add to the end of each of the three types of emissions to be reported by municipal solid waste landfills, as listed in section §98.342 "GHGs to report," the following language: "If you do not have responsibility to determine and report these emissions, explain why, then provide the name, mailing address, and phone number of the party who has responsibility to determine and report these emissions." This construct will provide a means to compile and review the comprehensive GHG emissions of a single landfill operation, and will also provide support for compliance assurance with respect to recordkeeping and reporting obligations that are not met by the various participants in landfill operations.

Response: With regard to facilities where there are multiple parties owning and operating equipment, see response to comment EPA-HQ-OAR-2008-0508-2126, excerpt number 11 on page 3 of this document. Further, EPA reviewed this issue and determined that it is not appropriate to change the definition of facility to resolve complex owner and operator relationships. In fact, EPA does not take a position on those issues and provides reporters the flexibility to determine an appropriate relationship through the choice of a Designated Representative. The owners and operators themselves can determine who has relevant ownership and control, and is therefore accountable for meeting the requirements of the rule. This accountability is established through execution of the documents of agreement and the certificate of representation. For more information about the Designated Representative please see section V of the preamble, 98.4 of Part 98 and volume 11 of the response to comments document. For more information about EPA's decision to require facility level reporting please see section II of the preamble and the relevant response to comments document. With regard to the idea that the rule provides a disincentive for developers to engage in renewable energy projects, from the comment it is not clear how reporting on landfill gas will discourage LFGTE projects. In fact, it is our view that steps taken to quantify emissions are an important first step in identifying sites with potential for landfill gas recovery.

Commenter Name: Jeff A. Myrom
Commenter Affiliation: MidAmerican Energy Holdings Company
Document Control Number: EPA-HQ-OAR-2008-0508-0581.1
Comment Excerpt Number: 10

Comment: The methodology for subpart HH regarding landfills should clearly exempt coal combustion residue monofills and inorganic waste industrial landfills (e.g. geothermal filter cake waste landfills, waste rock landfills at coal mines), from reporting since the waste has zero or negligible CH_4 generation potential.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Robert Rouse
Commenter Affiliation: The Dow Chemical Company
Document Control Number: EPA-HQ-OAR-2008-0508-0533.1
Comment Excerpt Number: 38

Comment: In the preamble, EPA provides data on emissions from municipal solid waste (MSW) landfills and industrial landfills at pulp and paper facilities and food processing facilities. EPA estimates that emissions from MSW landfills are approximately 16 times that from industrial landfills at pulp and paper facilities and food processing facilities. Without any additional explanation, ethanol production facilities were later included (page 16558) in the grouping with pulp and paper facilities and food processing facilities. There is no discussion of potential emissions from other industrial landfills in the preamble. Section 98.340(a) provides a definition of this source category and indicates, "This source category includes industrial landfills (including, but not limited to landfills at food processing, pulp and paper and ethanol production facilities)." It seems that all industrial landfills have been included in this definition with out any justification given in the preamble. This could require that a facility producing plastics and disposing of only plastics in its landfill to meet all of the requirements listed in subpart HH. Since these plastics do not significantly degrade there would be little, if any emissions from the landfill. Although below the 25,000 MT CO_2e threshold for landfills, this facility would still have to comply with subpart HH if it had a process heater meeting the requirements of Subpart C. Table HH-1 also only provides industrial waste landfill factors for food processing and pulp and paper. Therefore, Dow recommends that 98.340(a) be revised to only include MSW landfills and industrial landfills associated with food processing and pulp and paper facilities. Suggested wording is below: 98.340(a) - ...This source category also includes industrial landfills (including, but not limited to landfills at food processing, pulp and paper and ethanol production facilities). Section 98.340(b) indicates hazardous waste landfills and construction and demolition landfills are not subject to this rule. Dow supports this decision by EPA as these types of landfills do not have appreciable GHG emissions. Dow suggests that EPA also include in this list landfills used for the disposal of soils. Some facilities dispose of on-site soils from construction and other site activities in an on-site non-hazardous landfill. There are little if any emissions from these units, and they should not be subject to GHG reporting.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Juanita M. Bursley
Commenter Affiliation: GrafTech International Holdings Inc. Company (GrafTech)
Document Control Number: EPA-HQ-OAR-2008-0508-0686.1
Comment Excerpt Number: 31

Comment: To keep the requirements simple and not overly burdensome, GrafTech strongly recommends that facilities that are not required to install and operate any methane control facilities under state permitting programs for an on-site landfill, e.g. gas vents, collection well

systems, and destruction and/or recovery systems, should be exempted from these GHG recordkeeping and reporting requirements, and specifically excluded from the landfill source definition along with hazardous waste landfills and construction and demolition landfills. Therefore, EPA should consider only including industrial landfills located at food processing, pulp and paper, and ethanol processing facilities, which are known for methane gas generation, under the provisions of Subpart HH, and either postpone the Final Rule until further information can be gathered or add additional industrial landfill source categories in future rule modifications as this information becomes available to EPA. GrafTech believes EPA has not sufficiently justified its decision to make all industrial landfills, regardless of typical byproduct waste characteristics, meet the proposed onerous provisions of Subpart HH.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kyle Pitsor
Commenter Affiliation: National Electrical Manufacturers Association (NEMA)
Document Control Number: EPA-HQ-OAR-2008-0508-0621.1
Comment Excerpt Number: 29

Comment: To keep the requirements simple and not overly burdensome, the NEMA Carbon/Manufactured Graphite EHS Committee strongly recommends that facilities that are not required to install and operate any methane control facilities under state permitting programs for an on-site landfill, e.g. gas vents, collection well systems, and destruction and/or recovery systems, should be exempted from these GHG recordkeeping and reporting requirements, and specifically excluded from the landfill source definition along with hazardous waste landfills and construction and demolition landfills. Therefore, EPA should consider only including industrial landfills located at food processing, pulp and paper, and ethanol processing facilities, which are known for methane gas generation, under the provisions of Subpart HH, and either postpone the Final Rule until further information can be gathered or add additional industrial landfill source categories in future rule modifications as this information becomes available to EPA. The NEMA Carbon/Manufactured Graphite EHS Committee believes EPA has not sufficiently justified its decision to make all industrial landfills, regardless of typical byproduct waste characteristics, meet the proposed onerous provisions of Subpart HH.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 1
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0433.2
Comment Excerpt Number: 28

Comment: The source category definition does not clearly exclude solid waste management units (SWMUs) and non-hazardous landfills located at refineries (refer to Section 98.340(a) and (b)). To avoid needless documentation and work on typically very small sources of GHGs, we believe that SWMUs and non-hazardous landfills located at refineries should be excluded under Section 98.340(b).

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Lorraine Krupa Gershman
Commenter Affiliation: American Chemistry Council (ACC)
Document Control Number: EPA-HQ-OAR-2008-0508-0423.2
Comment Excerpt Number: 142

Comment: As stated in §98.340(a), the source category consists of MSW landfills and industrial landfills including but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities. EPA states in the preamble in Section V.HH.1 (74 FR 16557) that the majority of methane emissions from onsite industrial landfills occur at pulp and paper facilities and food processing facilities and provides data on the emissions from these sources. EPA does not provide emissions data for other industry sectors‘ onsite landfills to demonstrate the emissions are significant enough to warrant reporting. Also, Table HH-1 on page 16703 only provides default values to be used for calculating landfill emissions for food processing facilities and pulp and paper facilities, confirming for industrial sources only emissions from pulp and paper facilities landfills and food processing facilities landfills are significant enough to warrant reporting. Therefore, the source category should be revised to include only MSW landfills and industrial landfills at pulp and paper facilities and food processing facilities and reference to ethanol production facilities should be deleted from the parenthetical phrase at the end of §98.340(a).

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Jeff A. Myrom
Commenter Affiliation: MidAmerican Energy Holdings Company
Document Control Number: EPA-HQ-OAR-2008-0508-0581.1
Comment Excerpt Number: 44

Comment: MidAmerican agrees that land application units should be excluded from the rule. Furthermore, other types of landfills beyond hazardous waste landfills and construction and demolition debris landfills should be excluded. For example, coal combustion residue monofills produce no CH_4, since they have no putrescible material, and should be excluded. Other types of industrial monofills also have no or negligible CH_4 emissions, such as geothermal filter cake landfills and waste rock landfills at coal mines. Thus, EPA's proposed definition of a landfill should exclude any landfill that does not accept putrescible material for disposal.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Linda Farrington
Commenter Affiliation: Eli Lilly and Company (Lilly)
Document Control Number: EPA-HQ-OAR-2008-0508-0680.1
Comment Excerpt Number: 32

Comment: Lilly recommends that the EPA limit the definition of this source category to MSW landfills and industrial landfills located at food processing, pulp and paper, and ethanol production facilities only. The EPA acknowledges that the majority of methane emissions from industrial landfills occur within these three industrial sectors, but did not provide data showing significant landfill emissions from other industries. Therefore, we urge the EPA to revise the

definition of this source category accordingly.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Rich Raiders
Commenter Affiliation: Arkema Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0511.1
Comment Excerpt Number: 61

Comment: EPA should clarify in proposed 40 CFR 98.340(a) of Subpart HH that industrial landfills under Resource Conservation and Recovery Act ("RCRA") or Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") regulatory oversight that are not required to manage landfill gas do not need to report GHG emissions. RCRA and CERCLA program managers assess each industrial landfill subject to their jurisdiction and make risk assessment guided determinations concerning the appropriate management system for each industrial landfill. EPA also regulates landfills under the NSPS program at 40 CFR 60 Subparts Cc and WWW. EPA should clarify that any landfill complying with these NSPS standards and meeting Part 98 applicability criteria complies with Part 98. EPA should rely on these determinations as a screening method to identify those industrial landfills exhibiting significant landfill gas generating potential, and should target GHG reporting requirements to those landfills that emit GHGs. Many industrial landfills do not contain materials subject to bacterial degradation and significant landfill gas emissions. Owners of such landfill cells should not be burdened attempting to quantify insignificant quantities of landfill gases that are not emitted from landfill cells incapable of significantly contributing to GHG emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Dean C. DeLorey
Commenter Affiliation: Beet Sugar Development Foundation (BSDF) Environmental Committee
Document Control Number: EPA-HQ-OAR-2008-0508-0559.1
Comment Excerpt Number: 10

Comment: Food processing sector reporters are referred to stationary fuel combustion, wastewater treatment and landfill sections that may apply to food processing operations. It is unclear what kinds of landfills and waste water treatment facilities may be subject to these sections.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 3
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0635
Comment Excerpt Number: 99

Comment: EPA's proposal requires reporting from open and closed municipal solid waste landfills and industrial landfills, such as food processing, pulp and paper, and ethanol production

facilities, meeting or exceeding the applicable thresholds.362 The rule excludes hazardous waste and construction and demolition landfills “as they are not considered significant sources of GHG emissions.”363 We are concerned that EPA may be overlooking an important source of methane emissions by excluding construction and demolition landfills as it seems possible that these landfills receive organic materials such as wood or yard waste that could degrade in an anaerobic environment. Accordingly, we request EPA provide information on the waste composition of construction and demolition landfills to explain more fully the basis for its decision to categorically exempt these sources from GHG reporting requirements.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Andrew C. Lawrence
Commenter Affiliation: Department of Energy (DOE)
Document Control Number: EPA-HQ-OAR-2008-0508-0612.1
Comment Excerpt Number: 9

Comment: The proposed rule language provides no definition for "Industrial Landfill" though the term is used at 98.2(a)(2)(xv). To determine potential applicability of the reporting rule to a source, each source category must be clearly defined. At 98.2(a)(2)(xv), Industrial Landfills are listed as a source category and yet no definition for this type of source is provided in 98.6 or in the Subpart HH. At 98.340, definition of the source category, EPA states, "(a) This source category consists of the following sources at municipal solid waste (MSW) landfill facilities: landfills, landfill gas collection systems, and landfill gas combustion systems (including flares). This source category also includes industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)." However, no complete definition of this subset of landfills is provided. DOE recommends that EPA specifically define, within this rule, the term "Industrial Landfill" in a manner consistent with EPA's intent to capture a significant fraction of the emissions produced by sources in this (sub-) category without imposing an undue reporting burden on small sources.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: William Paraskevas
Commenter Affiliation: Andrews Engineering
Document Control Number: EPA-HQ-OAR-2008-0508-0342
Comment Excerpt Number: 1

Comment: The proposed greenhouse gas (GHG) reporting rules for landfills under Subpart HH are designed primarily for municipal solid waste landfills. Industrial landfills are also included in the reporting requirements. However, the rules address in detail only those industrial landfills associated with the food processing, pulp and paper, and ethanol production facilities. The proposed rules are otherwise silent with regard to reporting requirements for industrial landfills that are not associated with food processing, pulp and paper or ethanol production facilities. For example, captive landfills that accept only wastes such as foundry sand or slag from industrial facilities. This creates some uncertainty as to whether these facilities are required to submit any reports or documentation about the emission potential of greenhouse gases and, if so, how this information should be documented. The proposed rules contain no default values for degradable organic carbon (DOC) or methane generation parameters for these landfills. 40 CFR 98.2(a)

states that a GHG emission report must be provided for any facility for which calculation methodologies are provided. Does the absence of default values in the rules mean that a calculation methodology is not provided? If not, how would these landfills demonstrate that their emissions are less than 25,000 metric tons CO_2e? We recommend one of two approaches to clarify the reporting rules for industrial landfills which accept only non-degradable industrial wastes, such as foundry sand. The first approach is that the rules explicitly exempt such landfills from the reporting rules. The second is that, if the Agency does want these landfills to report their emissions, then default values for DOC and methane generation parameters be provided for these landfills in the rules.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Robbie LaBorde
Commenter Affiliation: CLECO Corporation (CLECO)
Document Control Number: EPA-HQ-OAR-2008-0508-1566
Comment Excerpt Number: 9

Comment: Cleco believes that for those landfills that do not contain the materials listed in Table HH-1, a statement should be made in the Subpart that those type landfills are not considered to be sources that fall under the requirements of the Subpart.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Affiliation: Hunton & Williams LLP
Document Control Number: EPA-HQ-OAR-2008-0508-0493.1
Comment Excerpt Number: 23

Comment: A number of electric generating facilities, in particular coal-fired facilities, include landfills. The landfills often are used to store or dispose of inert material that do not produce CH_4, such as coal combustion byproducts or construction material. For this reason, in some cases, these landfills already have been exempted by state permit from CH_4 monitoring requirements. The Subpart HH source category includes "industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)." Proposed § 98.340(a) (emphasis added). Although the term, "industrial landfill," is not specifically defined in the proposed GHG reporting rule, Subpart A defines "landfill" broadly. Proposed § 98.6. Under proposed § 98.341, a facility must report under Subpart HH if it "contains a landfill process" and meets the requirements of either § 98.2(a)(1) or (2). Proposed § 98.2(a)(1) applies to "municipal landfills" that generate CH_4 in amounts equivalent to 25,000 metric tons of CO_2e per year. Proposed § 98.2(a)(2) applies to "any facility" that emits 25,000 metric tons of CO_2e per year in combined emissions from combustion and other sources. Subpart HH also contains methodologies for calculating CH_4 generation from various types of landfills, including "industrial landfills." Proposed § 98.343(a). UARG is concerned that these broad applicability provisions and the existence of broadly applicable methodologies could require electric generating facilities with landfills to either (1) comply with Subpart HH or (2) conduct annual modeling of the landfill under the Subpart HH methodologies as a result of applicability of Subpart D, even when no CH_4 is produced at the landfill. These requirements would be very burdensome and would serve no purpose for landfills that do not generate CH_4. To avoid these results, UARG requests that EPA clarify the terms "industrial landfill," "industrial waste

landfill," "municipal landfill," and "landfill process," and provide an exemption from Subpart HH and the Subpart HH methodologies for those landfills at electricity generating facilities that (1) only receive coal combustion byproducts or other inert waste streams, (2) have been exempted from an otherwise applicable CH_4 monitoring requirement in an a permit based on a finding that no CH_4 is generated, or (3) are shown with testing not to generate CH_4, whether or not they are subject to a permit.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0212.1g
Comment Excerpt Number: 4

Comment: As a final point, we would also request one note of clarification. U.S. EPA has noted that construction and demolition waste landfills are not significant sources of greenhouse gases, and, therefore, they are being excluded from the reporting. We would request clarification whether or not construction and demolition waste, as a waste type, should be excluded from the calculation for landfills, as well as other waste types which are not likely to produce a whole lot of greenhouse gas, such as contaminated soils that may be disposed of in the landfill.

Response: See Section III.HH of the preamble for a response to this comment. In addition, a landfill can characterize their wastes according to the waste categories provided in the rule. In such cases, inert components of C&D waste can be properly accounted for. However, the default Lo (or DOC) value for bulk MSW waste included consideration of all wastes disposed at the subject landfills, which often includes some C&D waste. Consequently, if distinct waste types are not employed and the bulk waste DOC value is used, the waste disposal quantity should include all types of waste being disposed in the landfill, including construction and demolition debris.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0482
Comment Excerpt Number: 1

Comment: Hazardous waste landfills and construction/demolition (C&D) landfills are not required to report. Can municipal solid waste (MSW) landfills deduct C&D and other non-degradable waste materials from their calculations?

Response: See response to comment EPA-HQ-OAR-2008-0508-0212.1g, excerpt number 4 on page 14 of this document.

Commenter Name: Paul R. Pike
Commenter Affiliation: Ameren Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0487.1

Comment Excerpt Number: 19

Comment: Ameren operates or is building a number of landfills that are used to store or dispose of inert material that do not produce CI-14, such as coal combustion byproducts or construction material. For this reason, in some cases, these landfills already have been exempted by state permit from CH_4 monitoring requirements. The Subpart HH source category includes "industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)." Although the term, "industrial landfill," is not defined in the GHG reporting rule, Subpart A defines "landfill" broadly. Under proposed § 98.341, a facility must report under Subpart HH if it "contains a landfill process" and meets the requirements of either § 98.2(a)(1) or (2)." Proposed § 98.2(x)(1) applies to "municipal landfills" that generate CH_4 in amounts equivalent to 25,000 metric tons of CO_2e per year. Proposed § 98.2(a)(2) applies to "any facility" that emits 25,000 metric tons of CO_2e per year in combined emissions from combustion and other sources. Subpart HH also contains methodologies for calculating CH_4 generation from various types of landfills, including "industrial landfills." Proposed § 98.343(a). Ameren believes that these broad applicability provisions and the existence of broadly applicable methodologies could require our electric generating facilities subject to Subpart D to (1) calculate annual modeled CH_4 to determine applicability of Subpart HH or (2) conduct annual modeling under the Subpart HH methodologies, even when no CH_4 is produced at the landfill. These requirements would be very burdensome and would serve no purpose for landfills that do not generate CH_4. Ameren requests that EPA clarify the definitions of "landfill" and "landfill process" and provide an exemption from Subpart HI-I and the Subpart HH methodologies for those landfills at electric generating facilities that (1) only receive coal combustion byproducts or other inert waste streams, (2) have been exempted from an otherwise applicable CI-I4 monitoring requirement in an existing permit based on a finding that no CH_4 is generated, or (3) are shown with testing not to generate CH_4, whether or not they are subject to a permit.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Gary Moore
Commenter Affiliation: Pensacola Plant of Ascend Performance Materials LLC
Document Control Number: EPA-HQ-OAR-2008-0508-0366.1
Comment Excerpt Number: 17

Comment: Do Solid Waste Management Units (SWMUs) that have been closed under a RCRA Post Closure Care of Hazardous Waste Surface Impoundments permit meet the hazardous waste landfill exemption? These SWMUs predate both RCRA and HSWA and do not emit any odors common to landfill gas. Does a closed TSCA landfill containing PCB wastes meet the hazardous waste landfill exemption?

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Lisa D. Schmidt
Commenter Affiliation: Dow Corning Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0562
Comment Excerpt Number: 10

Comment: We have significant concerns over the treatment of industrial landfills in the

proposed rule. As written, the reporting requirements will apply to all industrial landfills, even if they are significantly different from those associated with Ethanol Production, Food Processing, Petroleum Refineries, and Pulp and Paper Manufacturing sectors, which have been specifically highlighted for reporting. Dow Corning operates industrial landfills for the storage of process waste from its silicone manufacturing operations. Due to the composition and inorganic makeup of the majority of our process waste, emissions of CH_4 (and GHGs overall) are negligible. In fact, studies conducted on capped phases at these industrial landfills suggest there is no settling occurring and GHGs are not being emitted in measurable quantities. Consequently, although our landfills emit no greenhouse gases, the rule as written would require us to expend significant resources measuring, recording and calculating, probably in excess of those required for our primary GHG sources. We would suggest that the rules for industrial landfills are either made specific to Ethanol Production, Food Processing, Petroleum Refineries, and Pulp and Paper Manufacturing sectors, or that there is a de-minimis threshold set for emissions from industrial landfills across all sector to avoid reporting applicability for insignificant sources of GHG emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Phillip McNeely
Commenter Affiliation: City of Phoenix, AZ
Document Control Number: EPA-HQ-OAR-2008-0508-0374.1
Comment Excerpt Number: 6

Comment: Recommend that the rule include an exemption for supplemental fuel used at landfills as a pilot gas for landfill flares. Under the proposed rule, Subpart 98.340, landfills must report emissions from the use of supplemental fuels, but there is no exemption or de minimus threshold for low quantities of these fuels. Landfills use small quantities of supplemental fuel as a pilot gas for gas flare operations. To minimize the reporting and documentation burden, reporting of supplemental fuel used as pilot gas should be exempt.

Response: The requirement to report emissions from the use of supplement fuels as pilot gas for flares has been removed from this subpart.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 1

Comment: Per Subpart 98.340, landfills must report CO_2, methane, and N_2O emissions resulting from the use of supplemental fuels. Many older landfills use supplemental fuels only as pilot gas for landfill gas flare operations. This pilot gas quantity is a very small amount when compared to the methane flared in the landfill gas. To minimize the reporting and documentation burden landfills only using supplemental fuel as a pilot gas for flare operations should be exempt from reporting or a “de minimus” reporting level of pilot gas should be allowed in the rule.

Response: See response to comment EPA-HQ-OAR-2008-0508-0374.1, excerpt number 6 on page 16 of this document.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 14

Comment: We recommend that the rule be revised to exclude as a "de minimus" closed landfills for which there is little or no available data concerning emissions, waste types, areal extent or depth, and are unlikely to be a significant source of CO_2e due to the landfills age, size, or probable waste characteristics. In many areas of the country the number of landfills that ceased operations over 30 years ago exceeds the number of landfills that are currently operating or were closed after 1980 under regulatory requirements that include post-closure monitoring and gas collection systems. These older landfills typically had local service areas that were much smaller than the service area of the modern regional municipal solid waste landfills, and consequently are relatively small in terms of waste volume. They often contain a mixture of inert material, construction debris and municipal solid wastes, but the organic wastes capable of decomposing to form CO_2e gases have had 30 or more years to do so. Today these older sites are often controlled by owners who have minimal knowledge of the characteristics of the wastes, and represent a variety of land uses, including vacant land, marginal industrial use such as open storage or auto salvage yards, park and recreational use, parking lots, and occasionally even redevelopment to commercial or residential use. It may be reasonable to assume that the majority of these smaller, older landfills are past their period of peak methane production and do not produce GHG emissions exceeding the proposed threshold of 25,000 metric tons of CO_2e. However, in the absence of actual monitoring data or reliable information about waste quantities from which to estimate the CO_2e produced from such a landfill, the site owner may be faced with significant expenditures for site investigation just to conclusively demonstrate the veracity of the assumption that their site is not subject to the proposed rule. By not including "de minimus" exclusion criteria, the proposed rule creates an unreasonable hardship on the current owners of many sites that clearly should be excluded, following the logic used to set the proposed threshold. We recommend that EPA develop such criteria, particularly landfill age and size, to exclude these older sites. For example, the CARB landfill methane rule excludes landfills older than 30 years since closure from compliance with the rule.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Lawrence W. Kavanagh
Commenter Affiliation: American Iron and Steel Institute (AISI)
Document Control Number: EPA-HQ-OAR-2008-0508-0695.1
Comment Excerpt Number: 24

Comment: Subpart HH proposes GHG reporting requirements for landfills. Although the requirement appears to be directed toward municipal landfills and other organic waste landfills that generate methane, § 98.340 states that the source category includes "industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)." Emphasis added. In addition, § 98.341 states that reporting is required for facilities listed in §§ 98.2(a) (1) and (2), the latter which includes the iron and steel source category. We interpret this cross-reference to relate only to the threshold reporting value for the listed source categories and not to imply that GHG reporting is required for landfills at iron and

steel facilities, which typically contain only inorganic materials. However, the use of the phrases "industrial landfills" and "not limited to" in § 98.340 may be misleading and subject to misinterpretation. We therefore respectfully request clarification and confirmation of our understanding that landfill reporting is only required for facilities where methane gas emissions are prevalent.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Donald R. Schregardus
Commenter Affiliation: Department of the Navy, Department of Defense (DoD)
Document Control Number: EPA-HQ-OAR-2008-0508-0381.1
Comment Excerpt Number: 13

Comment: The rule language provides no definition for "Industrial Landfill" though the term is used at 98.2(a)(2)(xv). To determine potential applicability of the reporting rule to a source, each source category must be clearly defined. At § 98.2(a)(2)(xv), Industrial Landfills are listed as a source category and yet no definition for this type of source is provided in § 98.6 or in the Landfill Subpart HH. At § 98.340, Definition of the source category, EPA states, "(a) This source category consists of the following sources at municipal solid waste (MSW) landfill facilities: landfills, landfill gas collection systems, and landfill gas combustion systems (including flares). This source category also includes industrial landfills (including, but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities)." However, no complete definition of this subset of landfills is provided. We recommend that EPA specifically define, within this rule, the term "Industrial Landfill." in a manner consistent with EPA's intent to capture a significant fraction of the emissions produced by sources in this (sub-)category without imposing an undue reporting burden on small sources.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Sean M, O'Keefe
Commenter Affiliation: Hawaiian Commercial and Sugar Company (HC&S)
Document Control Number: EPA-HQ-OAR-2008-0508-1138.1
Comment Excerpt Number: 13

Comment: As a food processing facility, the HC&S Puunene Sugar Mill would be required under the proposed rule to report GHG emissions from on-site stationary combustion, on-site landfills, and on-site wastewater treatment. Subpart HH of the proposed rule describes requirements applicable to the landfill source category, which includes "industrial landfills (including, but not limited to, landfills located at food processing, pulp and paper, and ethanol production facilities)". Because the proposed rule does not define the term "industrial landfill", it implies that any landfill located at a food processing plant is an "industrial landfill" that is subject to Subpart HH requirements. The proposed rule should include in Section HH a definition of industrial waste landfill and should exclude from the landfill source category any on-site landfill, including at food processing, pulp and paper, and ethanol production facilities, that does not receive industrial waste or municipal solid waste likely to generate methane emissions through the decomposition of organic matter. Landfills exclusively used to dispose of inert materials such as bricks, concrete, rocks, cured asphalt, and ash, and landfills used to dispose of soil, rocks, and similar materials, should be specifically excluded from the source

category because they will not generate significant emissions of methane. Rather than receiving food and other industrial wastes, sugar mill landfills are used exclusively for the disposal of mud, rocks, soil and other extraneous field materials that are carried into the mill with the harvested sugarcane crop. When sugarcane is harvested, the cane is pushed into windrows using large "rakes" (specially modified bulldozers) and is then is transferred into trucks using cranes equipped with grabs. As a result, significant quantities of soil and rocks become intermingled with the tangled cane stalks and are hauled to the sugar mill with the cane. Once at the mill, the cane is washed prior to milling to remove adhered soil and other extraneous material; these materials are separated from the cane in the cane cleaner and are typically hauled to a "mud dump" located in close proximity to the mill for disposal (in some cases these materials may be hauled back to the fields). These disposal sites are classified by the Hawaii Department of Health as "agricultural waste landfills" and are prohibited from accepting industrial or municipal solid waste of any kind. The vast majority of the material disposed in these agricultural waste landfills is soil and rocks from the field; although some crop residue (e.g., cane leaves and stalks) may also be present, it comprises a very small percentage of the waste disposed. Due to the very limited amount of organic matter disposed of in sugar mill landfills, emissions of significant amounts of methane from these landfills is unlikely. Agricultural waste landfills associated with sugar mills should therefore be excluded from the landfill source category under the proposed Subpart HH.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Keith Overcash
Commenter Affiliation: North Carolina Division of Air Quality (NCDAQ)
Document Control Number: EPA-HQ-OAR-2008-0508-0588
Comment Excerpt Number: 13

Comment: The rule needs to be clearer about landfill gas emissions combustion that occurs at a facility other than a landfill. It appears that the landfill is responsible for accounting for the emissions resulting from incomplete combustion (equation HH8) even if the combustion is occurring at a different facility. However, it is not clear whether the separate facility is responsible for calculating emissions associated with the combustion (i.e., the Subpart C emissions). If this is the intent, then it should be clearly stated, since there will be situations in which the landfill gas is sold to another facility at which the combustion of the landfill gas actually takes place.

Response: See response to comment EPA-HQ-OAR-2008-0508-0376.1, excerpt number 20 on page 5 of this document.

Commenter Name: Myron Hafele
Commenter Affiliation: Kohler Co.
Document Control Number: EPA-HQ-OAR-2008-0508-0761.1
Comment Excerpt Number: 8

Comment: Kohler Co. requests that the landfill source category definition be modified to exclude industrial landfills that do not accept organic wastes which may decompose and generate

GHG emissions. Our specific concern relates to landfills that are part of facilities that must report do to fuel combustion, but accept only waste materials from operations such as vitreous manufacturing (i.e. pottery cull, gypsum, clays) and foundries (i.e. green sand, resin sand, refractory, slag). These waste materials are similar to construction and demolition waste in that they will not decompose to generate GHG. It is our position that these type landfills should be excluded from the source category, rather than having the facility go through the reporting effort only to enter zero emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Juanita M. Bursley
Commenter Affiliation: GrafTech International Holdings Inc. Company (GrafTech)
Document Control Number: EPA-HQ-OAR-2008-0508-0686.1
Comment Excerpt Number: 28

Comment: GrafTech agrees with EPA that both hazardous waste landfills and construction and demolition landfills should not be included in the landfills source category. However, GrafTech also believes that EPA should do further research to provide some additional criteria to better define industrial landfills by source categories that generate significant quantities of GHGs, for the purpose of reducing the burden on the regulated community.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Sarah B. King
Commenter Affiliation: DuPont Company
Document Control Number: EPA-HQ-OAR-2008-0508-0604.1
Comment Excerpt Number: 54

Comment: §98.340(a) – This source category consists of MSW landfills and industrial landfills including but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities. EPA states in the preamble in Section V.HH.1 (page 16557) that the majority of methane emissions from onsite industrial landfills occur at pulp and paper facilities and food processing facilities and provides data on the emissions from these sources. EPA does not provide emissions data for other industry sectors' onsite landfills to demonstrate the emissions are significant to warrant reporting. Moreover, Table HH-1 only provides default values that can be used for calculating landfill emissions for food processing facilities and pulp and paper facilities. This further confirms that for industrial sources only emissions from landfills at pulp and paper facilities wastes and food processing wastes are significant enough to warrant reporting. [Footnote: The factors listed under the heading "Waste model – bulk waste option" are not sufficiently diverse to support the wide range of materials that have been placed into industrial landfills. For example, a landfill containing waste polymer plastic would not be represented by a DOC of 0.2028, since polymer plastic cannot be biologically degraded.] Therefore, the source category should be revised to include only MSW landfills andindustrial landfills at pulp and paper facilities and food processing facilities and reference to ethanol production facilities should be deleted from the parenthetical phrase at the end of §98.340(a).

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Chris Greissing
Commenter Affiliation: Industrial Minerals Association - North America (IMA-NA)
Document Control Number: EPA-HQ-OAR-2008-0508-0705.1
Comment Excerpt Number: 23

Comment: The source category for Landfills should not include landfills at inorganic chemical manufacturing facilities and mine sites where landfilled material contains only trivial amounts of organic matter. Making the change suggested above in the source category definition would make Subpart HH consistent with Subpart II Wastewater Treatment which addresses only pulp and paper mills, food processing plants, ethanol production plants, petrochemical facilities, and petroleum refining facilities. IMA-NA would like to request that §98.340 (b) be modified as follows: "This source category does not include hazardous waste landfills, inorganic chemical manufacturing facilities, mine sites, and construction and demolition landfills."

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 2
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0679.1
Comment Excerpt Number: 211

Comment: §98.340(a). As stated in §98.340(a), the source category consists of MSW landfills and industrial landfills including but not limited to landfills located at food processing, pulp and paper, and ethanol production facilities. EPA states in the preamble in Section V.HH.1 (page 16557) that the majority of CH_4 emissions from onsite industrial landfills occur at pulp and paper facilities and food processing facilities and provides data on the emissions from these sources. EPA does not provide emissions data for other industry sectors' onsite landfills to demonstrate the emissions are significant to warrant reporting. Also, Table HH-1 on page 16703 only provides default values to be used for calculating landfill emissions for food processing facilities and pulp and paper facilities confirming for industrial sources only emissions from pulp and paper facilities landfills and food processing facilities landfills are significant enough to warrant reporting. Therefore, the source category should be revised to include only MSW landfills and industrial landfills at pulp and paper facilities and food processing facilities.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 2
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0679.1
Comment Excerpt Number: 210

Comment: §98.340. EPA's language defining landfills is very general and could potentially pull in sources at the refineries – inactive, non-public areas where spent materials were buried. API will attempt to offer an amended definition. GHG emissions from these operations are extremely small, and do not justify the monitoring, reporting, and QA burden.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kyle Pitsor
Commenter Affiliation: National Electrical Manufacturers Association (NEMA)
Document Control Number: EPA-HQ-OAR-2008-0508-0621.1
Comment Excerpt Number: 26

Comment: The NEMA Carbon/Manufactured Graphite EHS Committee agrees with EPA that MSW landfills and industrial landfills at food processing, pulp and paper and ethanol production facilities have wastes characterized by methane generation and will likely exceed the 25,000 metric tons CO_2e/year reporting threshold. The NEMA Carbon/Manufactured Graphite EHS Committee also agrees with EPA that both hazardous waste landfills and construction and demolition landfills should not be included in the landfills source category. However, NEMA Carbon/Manufactured Graphite EHS Committee also believes that EPA should do further research to provide some additional criteria to better define industrial landfills by source categories that generate significant quantities of GHGs, for the purpose of reducing the burden on the regulated community.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 10

Comment: The Proposed Rule, at §98.342(c), specifically excludes emissions from the combustion of landfill gas. CO_2 emissions from flaring of LFG, CO_2 pass-though in LFG, and soil oxidation CO_2 must be included to be consistent with other biogenic emission reporting. As part of the normal carbon cycle, biogenic emissions are preferable to fossil emissions of CO_2. However, there is absolutely no distinction of the role biomass CO_2 plays in the global carbon cycle based on how it is generated. Regardless of if biomass is combusted, composted, processed in an anaerobic digester, or landfilled, the CO_2 generated is of the same origin and must be handled equally in any accounting methodology. Otherwise, the reporting of biomass CO_2 emissions based on the path to the atmosphere will distort comparison of the different mechanisms to recover energy from biomass and significantly understates biogenic CO_2 emissions from landfills. Landfill operators will be able to easily calculate their emissions of biogenic CO_2 using information already available as part of the methodologies presented in the regulation. Providing full biogenic CO_2 emissions from landfills will also an equitable comparison of the biogenic CO_2 emissions from all waste management practices. The Proposed Rule states that "biogenic CO_2 means carbon dioxide emissions generated as the result of biomass combustion," in contrast with the IPCC 2006 guidelines which recognizes the biogenic CO_2 generated by the decomposition of organic material in landfills. For consistency, we suggest the following definition of biogenic CO_2: Biogenic CO_2 means carbon dioxide emissions generated from biomass sources through chemical or biological processes, including but not limited to, combustion, anaerobic decomposition, and aerobic decomposition.

Response: We do not require landfill owners and operators to calculate CO_2 emissions from the decay of waste in landfills. We only require stationary combustion units to account for biogenic

CO_2 emissions from the combustion of biogas. Please see comment responses for Subpart C – Stationary Combustion, more information on the reporting of biogenic emissions from stationary combustion. As we are only accounting for biogenic emissions from stationary combustion units, the proposed definition of biogenic CO_2 is appropriate for the purposes of this final rule. We do note that the definition of biomass is broad and includes landfill gas: "Biomass means…non-fossilized and biodegradable organic fractions of industrial and municipal wastes, including gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material." As such, the combustion of landfill gas in stationary combustion units is reportable as biogenic CO_2 under subpart C.

Commenter Name: Marcelle Shoop
Commenter Affiliation: Rio Tinto Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0636.1
Comment Excerpt Number: 13

Comment: Rio Tinto supports EPA's exclusion of land application units from the definition of landfill.

Response: We appreciate the comment.

Commenter Name: See Table 2
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0679.1
Comment Excerpt Number: 209

Comment: EPA requests comment "on the exclusion of land application units." (p. 16558) API comments: API supports the exclusion of land application units from the reporting rule subpart HH. In addition, API requests exclusion of inactive industrial landfills that were never open to the public, such as exist at some refineries. Greenhouse gas emissions from these operations are extremely small, and do not justify the monitoring, reporting, and QA burden.

Response: We appreciate the comment on land application units. With regard to treatment of industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael S. Dae
Commenter Affiliation: Energy Developments, Inc. (EDI)
Document Control Number: EPA-HQ-OAR-2008-0508-0706.1
Comment Excerpt Number: 9

Comment: EDI believes that promulgation of the proposed rule could result in disincentive to business to utilize LFG as a fuel, thereby resulting in the destruction of LFG in flares with no resultant benefit. EPA should be promoting the use of LFG as a renewable energy and should consider this in the development of regulations applicable to this industry, Therefore, EDI believes that EPA should consider the impact to the LFGTE industry in development of this Rule.

Response: From the comment, it is not clear how reporting on landfill gas will discourage LFGTE projects. In fact, it is our view that steps taken to quantify emissions are an important first step to identifying sites with potential for landfill gas recovery. Please see this document and the preamble for our response to specific comments related to monitoring requirements.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 22

Comment: An industrial landfill may be located on the same property as an industrial wastewater treatment plant that serves the facility that generates the wastewater, but is not in the contiguous geographical space as the facility itself. The rule should be clear about having to calculate and report methane generation by the industrial landfill in this scenario.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 21

Comment: The Department recommends that industrial landfills be subject to the reporting rule whether or not they occupy the same property as the facility generating the landfilled waste.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 19

Comment: The definition of MSW landfill in s. 98.6 refers to a "contiguous geographical space". It notes that portions of an MSW landfill may be separated by access roads. The definition does not state that MSW landfills may be located on properties that are separated by the rights of way of public roads. This seems different from how MSW landfills are treated for applicability of the landfill gas NSPS. The rule should clarify if a contiguous geographical space is circumscribed by public roads.

Response: To address this comment, the definition of MSW landfill in § 98.6 has been revised to state that “Portions of an MSW landfill may be separated by access roads, public roadways, or other public right-of-ways.”

Commenter Name: Angela D. Marconi
Commenter Affiliation: Delaware Solid Waste Authority
Document Control Number: EPA-HQ-OAR-2008-0508-0472.1

Comment Excerpt Number: 5

Comment: In addition to generating methane through breakdown of waste in a landfill, a portion of the carbon is stored in the landfill. This is a sink of carbon and should be included in a comprehensive inventory.

Response: We are not requiring landfill owners or operators to calculate and report carbon storage quantities since this rule focuses on data reporting of emissions, and not on data reporting of sequestration. Further, attributing this carbon storage to landfills would be inconsistent with greenhouse gas accounting conventions. The U.S. and international greenhouse gas inventory accounting, carbon storage estimates are associated with particular land uses. For example, in the U.S. greenhouse gas inventory, harvested wood products are accounted for under Forest Land Remaining Forest Land because these wood products are a component of the forest ecosystem. The wood products serve as reservoirs to which carbon resulting from photosynthesis in trees in transferred, but the removals, in this case, occur in the forest.

While the final rule does not require reporting of carbon storage quantities, we do note that based on the waste quantity and composition data required to be reported, EPA can assess carbon sequestration and consider this factor in future policy analyses, as appropriate.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 13

Comment: EPA's mandatory reporting rule should recognize the important role of landfills in sequestering carbon. This carbon storage, or "sequestration," is important because it removes carbon from the natural carbon cycle indefinitely, reducing net emissions of GHG. The effect of this process on overall U.S. GHG emissions is very significant as it offsets over 50 percent of landfill methane emissions, and exceeds, in absolute magnitude, the emissions from 47 of the 54 source categories in the Agency's U.S. GHG Inventory. Both the IPCC guidelines for landfill emissions estimation and EPA's annual U.S. GHG Inventory recognize and account for carbon sequestration of undecomposed wood products, food scraps and yard trimmings disposed of in landfills. The IPCC guidelines and reporting tools include a spreadsheet for calculating carbon storage, which recognizes that organic matter that does not decompose as expressed in the default Lo, is permanently stored in the landfill. WM urges EPA likewise to incorporate carbon sequestration into the landfill reporting requirements it adopts for use. Just as methane oxidation in cover and methane collection and combustion are included in the estimation of landfill emissions, so too should carbon sequestration be an integral component of the landfill mass balance calculations. This will ensure completeness, transparency and consistency with the national inventory practices of both IPCC and the Agency. It will also ensure a complete characterization of all human-related GHG emissions and sinks for landfills and will augment EPA's national default estimations with enhanced site-specific estimates. [Footnote: Freed, R., Shapiro, S. and Hurley, B. ICF International, White Paper: Landfill Carbon Storage and Greenhouse Gas Inventories, October 10, 2007, Prepared for Waste Management .]

Response: See response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 18

Comment: Significant amounts of carbon are stored in landfills thereby being removed from the carbon cycle. SWANA believes that an accurate inventory should account for this carbon sink. We suggested using the following carbon storage values in inventory process. [See submittal for data table provided by commenter showing carbon storage values for different waste types.]

Response: See response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 19

Comment: We urge the EPA to rethink the requirement to report biogenic emissions from any source, but in particular, from combustion of landfill gas to produce renewable electricity or power. Waste Management submits the following language for inclusion in the reporting provision, § 98.342 (c), to remedy this concern: (c) You must report CO_2, CH_4, and N20 emissions from stationary fuel combustion devices. This includes emissions from the combustion of fuels used in flares (e.g., for pilot gas or to supplement the heating value of the landfill gas). Follow the requirements of subpart C of this part. Do not calculate CO_2 emissions resulting from the flaring of landfill gas or the combustion of landfill gas or other forms of biomass to produce renewable energy.

Response: EPA is requiring reporting of any CO_2 emissions from biomass combustion from facilities that otherwise meet the applicability thresholds, *including CO_2 emissions from combustion of landfill gas*. Biomass fuel combustion emissions are reported separately from fossil fuel combustion emissions.

The IPCC Guidelines for National Greenhouse Gas Inventories require that CO_2 emissions from biomass combustion be reported, and the GHG reporting rule is consistent with this accepted emissions inventory practice. Separate reporting of emissions from biomass combustion also matches some State and regional GHG programs, such as California's mandatory GHG reporting program, the Western Climate Initiative, and The Climate Registry, all of which require reporting of biogenic emissions from stationary fuel combustion sources. In the FY2008 Consolidated Appropriations Act that authorized funding for the GHG reporting rule, Congress asked for a reporting rule that covers all sectors of the economy. EPA determined that reporting CO_2 emissions from combustion of biomass is consistent with that request. Biomass fuels, including landfill gas, can be used as alternatives to fossil fuels, and while this reporting requirement does not imply whether emissions from combustion of biomass will or will not be regulated in the future, the reporting rule provides EPA with the opportunity to understand the extent of biomass combustion and the sectors of the economy where biomass fuels are used. It will also allow EPA to improve methods for quantifying emissions through testing of biomass fuels.

CO_2 emissions from biomass combustion are not considered in determining if a facility is subject to the reporting rule. For the purposes of determining if a facility with stationary fuel combustion sources exceeds a 25,000 metric ton CO_2e per year threshold, the rule excludes CO_2 emissions from biomass combustion as part of total facility emissions. For municipal solid waste landfills, applicability is determined based solely on whether methane generation, calculated according to the rule, exceeds the 25,000 metric ton CO_2e per year threshold. Therefore, reporting of biomass emissions is required only for facilities that otherwise are subject to the rule due to other sources of emissions.

Commenter Name: Michael S. Dae
Commenter Affiliation: Energy Developments, Inc. (EDI)
Document Control Number: EPA-HQ-OAR-2008-0508-0706.1
Comment Excerpt Number: 5

Comment: The proposed rules require that facilities emit anthropogenic and biogenic CO_2 calculate the percentage of emissions attributable to each category. LFGTE facilities such as those operated by EDI are designed to operate only on LFG and only operate when such fuel is available. EDT believes that additional reporting may act as a disincentive to the development of new renewable energy projects using biogenic fuels such as landfill gas. Biogenic GHGs are not considered to be a climate forcing form of GHG. This is supported by the fact that EPA's yearly estimate of greenhouse gas sinks and emissions, focuses on anthropogenic, not biogenic, emissions. EDI strongly believes that EPA should support the development of renewable energy projects and should consider such projects during regulatory development. As such, we believe that the proposed rule should exempt facilities that combust primarily or exclusively biomass fuels as the emissions associated with these fuels are also primarily or exclusively biogenic. In addition and as mentioned above, the production of the GHGs in LFG are already reported to EPA by the landfill in accordance with NSPS Subpart WWW.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael S. Dae
Commenter Affiliation: Energy Developments, Inc. (EDI)
Document Control Number: EPA-HQ-OAR-2008-0508-0706.1
Comment Excerpt Number: 1

Comment: In the case of many LFGTE facilities, LFG collection is performed by the landfill but the collected gas is then sold to a third-party for use as fuel. In these cases the landfill would report the amount of LFG collected but would not be destroying all the collected gas. In addition, the third-party LFGTE facility would be reporting emissions of GHGs from their operations as a result of destroying gas that was already accounted for in the landfill's report. This process has the potential for total reported GHGs from the two independent facilities to be inaccurately high. EDI requests that EPA consider revising the GHG calculation and reporting requirements for landfills and related, third-party LFGTE facilities in an effort to ensure that total GHG emissions from the facilities are not biased high due to duplicate reporting.

Response: See response to comment EPA-HQ-OAR-2008-0508-0376.1, excerpt number 20 on page 5 of this document.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 8

Comment: Veolia requests clarification of who is responsible for reporting greenhouse gas emissions when all or portions of the landfill gas collection, control and destruction equipment (e.g., flare, turbine, reciprocating internal combustion engine) are not owned by the same entity. If the landfill gas collection, control and destruction equipment are all owned by the landfill owner, then that entity should be the reporting entity. However, numerous other arrangements exist between Veolia, landfill gas developers, and landfill gas users. Examples of various ownership scenarios include: 1. Veolia owns the landfill gas collection and control system but a gas developer owns the destruction equipment which is either located on leased on-site property or off-site property; 2. Veolia owns the landfill gas collection and control system but not the distribution system to the off-site user; 3. Veolia does not own the landfill gas collection and control system, the distribution system, or destruction equipment; 4. The developer treats the landfill gas to pipeline quality that is then transported through existing gaseous fuel (natural gas) pipelines to an off-site, unknown user; and 5. Veolia owns the landfill gas collection and control system plus a piece of the destruction equipment (e.g., backup and auxiliary flare(s) and a developer owns the majority of the destruction equipment. These alternative operational and ownership scenarios are not unique to Veolia, but are a well recognized structure of landfill gas to energy (LFGTE) projects that provides significant environmental benefit and contributes to alternative energy goals. Therefore, Veolia requests that EPA allow the facility not to be responsible for reporting that portion of the CH4 generation that is under the control of another party. As with other fuels, the greenhouse gas emissions from the combustion of this “off-site” landfill gas is accounted for through the emissions reporting by the end user of the gas, who generates power, heat, steam, or vehicle fuel and creates greenhouse gas emissions when the gas is used as a fuel source. These emissions are captured in other subparts of the proposed rule. We believe not adjusting the landfill’s emissions accordingly will cause redundancy and inaccurate accounting of greenhouse gas emissions, in addition to overestimating the landfill’s emissions.

Response: See response to comment EPA-HQ-OAR-2008-0508-0376.1, excerpt number 20 on page 5 of this document.

Commmenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 17

Comment:
Carbon storage in landfills can significantly offset direct greenhouse gas emissions from landfills. The decision to include these factors and how they are utilized in a site-specific inventory will depend on the accounting protocol employed. A number of international and

domestic protocols including the IPeC, EPA, Oregon Climate Trust, and CARB recognize carbon storage in landfilled material as a sink in calculating carbon emissions inventories. These protocols recognize that when wastes of a biogenic origin are deposited in landfills and do not completely decompose, the carbon that remains is effectively removed from the global carbon cycle and sequestered. Perhaps the most relevant example is EPA"s annual inventory of greenhouse gas sinks and emissions. This publication routinely cites the amount of carbon stored in landfills. Facilities should be allowed to report their carbon storage, either through national estimates or Site-specific data. For example, EPA has published reports that evaluate carbon flows through landfills to estimate their net greenhouse gas emissions. The methodology the EPA employed recognizes carbon storage in landfills. In these studies of MSW landfilling, EPA summed the greenhouse gas emissions from CH4 generation and transportationrelated CO_2 emissions and then subtracted carbon sequestration (treated as negative emissions) (EPA, 2006). Furthermore, the 2006 greenhouse gas emissions inventory published by the CEC indicated that landfill disposal of urban wood waste and yard trimmings is a greenhouse gas sink. The report included only the categories of yard trimming and wood waste, and neglected sequestration from paper, boxes, yard waste, lumber, textiles, diapers, demolition, medical waste, sludge, and manure. In California, urban wood waste and yard trimmings represent only 16.4 percent of the total California waste stream and only 46 percent of sequestered carbon within landfills; therefore, restricting estimates of carbon storage to only these waste types produces an extremely low value of overall carbon storage for the total amount of waste disposed. The 2007 CARB landfill sequestration estimate includes sequestration from paper, boxes, yard waste, lumber, textiles, diapers, construction and demolition (C&O) waste, medical waste, sludge, and manure. CARB estimated the total carbon sequestration in landfill to be 4.94 million MTCE in 2005, which is 17.2 million metric tonnes of carbon dioxide equivalent (MMTC02E). CARB estimated that greenhouse gas emissions from landfills were 5.62 MMTC02E in 2004, much less than the value of the carbon stored in the landfill. In order to adequately calculate the net emissions from a landfill, all aspects of the carbon cycle as they relate to sequestration and emissions must be addressed. Therefore, the acceleration of carbon storage in all carbon sinks should be a part of any integrated greenhouse gas emissions plan to create an accurate greenhouse gas emissions inventory for landfills. In developing the approach to carbon sequestration, SWICS reviewed and summarized the positions of the EPA, IPCC, CEC, and CARB on carbon sequestration in landfills and other industries. An exhaustive review of the available technical literature was also conducted. Based on this review, SWICS proposed that the research by Dr. Morton Barlaz of North Carolina State University and the EPA be used to develop carbon storage values for organic wastes contained in the MSW stream. Clearly, carbon is being stored in landfills and removed from the carbon cycle, and inventory methods must account for this carbon sink. Therefore, NSWMA proposes that the following carbon storage values for refuse placed in landfills be used: [See DCN:EPA-HQ-OAR-0508-2126 for table showing the proposed carbon storage factors]. For purposes of computing the carbon footprint of a landfill, SWICS proposed that the carbon storage factor (CSF) values presented in the table above be used. The CSF should be applied to the tons of waste placed into each landfill by refuse type for each inventory year. If a site specific waste characterization is available, then waste composition data should be used to calculate carbon storage. If site specific data are not available, or the data are insufficient to calculate the carbon storage, regional, statewide, or national data can be used instead. The quantity of waste disposed of are typically on a wet-weight basis; therefore, the most appropriate CSF value should be selected based on the known or estimated moisture content. The final step is to convert tons of sequestered carbon equivalents to sequestered tons of CO_2 equivalents. This is done by multiplying by the molecular weight ratio of CO_2 to carbon (44/12 = 3.67 MTC02E/MTCE). Thus, to convert one short ton of material disposed to the relative greenhouse gas reduction factor, the following formula should be used: Short Wet Tons of Material x CSF

(MTCE/short wet ton) x (3.67 MTC02E/MTCE) = Sequestered Carbon in MTC02E. To calculate a composite CSF for a mixed waste stream, the carbon storage for each component should be calculated and summed. The final value for carbon sequestration for a landfill for a given inventory year should then be subtracted from its greenhouse gas emissions. Carbon Sequestration -for calculating amount of carbon sequestered: 1. Determine the weighted average computed CSF for the MSW in the landfill; 2. Determine the amount of MSW landfilled for the year (in short wet tons); 3. Multiply the weighted average computed CSF for the MSW in the landfill by the amount of MSW landfilled for the year (in short tons) to calculate the sequestered amount in metric tonnes carbon dioxide equivalent (MTC02E); and 4. Include as a separate line item in landfill inventory for avoided emissions by carbon sequestration and subtract from the direct CH4 emissions for that year.

Response: See response to comment EPA-HQ-OAR-2008-0508-0472.1, Excerpt number 5 on page 25 of this document.

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2. REPORTING THRESHOLD

Commenter Name: Roy Prescott and John Duffy
Commenter Affiliation: Local Government Advisory Committee (LGAC) and Climate Change
Document Control Number: EPA-HQ-OAR-2008-0508-2079
Comment Excerpt Number: 4

Comment: Landfills- The LGAC recommends EPA only require reporting under this proposed rule from landfills that are currently operating over a certain threshold. In order to assist small and disadvantaged communities, LGAC would support minimum criteria such as the size of the landfill or establishment of a simple calculation to eliminate the need for smaller landfills to have to bear the expense and time to calculate and determine whether they are required to report under the rule.

Response: Because of the many factors affecting CH4 generation at landfills, thresholds such as landfill dimension and capacity do not correlate well with emissions. Factors such as waste composition, climate, and the presence of a gas collection system greatly effect emissions from landfills. Therefore, we retain the 25,000 t CO_2e threshold for MSW landfills. We remain committed to providing additional outreach materials and we are developing guidance and screening tools to help landfill owners and operators determine whether they are required to report under the rule and to assist them in calculations required in this subpart.

Commenter Name: Roy Prescott and John Duffy
Commenter Affiliation: Local Government Advisory Committee (LGAC) and Climate Change
Document Control Number: EPA-HQ-OAR-2008-0508-2079
Comment Excerpt Number: 13

Comment: Local governments own and/or operate existing and formerly designated landfills. In some instances, local governments may have owned or operated landfills in the past no longer have this responsibility and disinvested responsibility through contracting mechanisms. Additionally, many local governments still struggle in identification of historic and/or illegal

landfills operated within the jurisdiction of the local government. Local governments work diligently to identify and assist with the appropriate closure of these landfills. Most local governments will not have access to 50 years of data related to the past operation of a landfill nor the personnel to undertake the necessary research work. If the data is available, the cost to a local government to retrieve the information would be extremely high. Additionally, the local government may not have access to the size of the population served over this period of time due to the lack of information available to the landfill. It is unclear and ambiguous what EPA will require from census data on a particular facility.

Response: See Section III.HH of the preamble for a response to this comment. Landfill owners or operators should select a projection method for historic waste quantities they believe is most accurate. If the population served by the landfill is difficult to assess and subject to unsubstantiated assumptions, the alternative projection methods that are now provided in the final rule are likely to be more accurate. If population data are used, there are no prescriptive methods on how these estimates are made or documented. Generally, an MSW landfill will serve a certain municipality and the population of that municipality can be used directly. In other locations, where multiple landfills may serve a metropolitan area, the landfill owner or operator simply needs to document the basis for the population estimate (e.g., there are 3 landfills in the City A, so we used one-third the population of City A).

Commenter Name: Juanita M. Bursley
Commenter Affiliation: GrafTech International Holdings Inc. Company (GrafTech)
Document Control Number: EPA-HQ-OAR-2008-0508-0686.1
Comment Excerpt Number: 27

Comment: GrafTech agrees with EPA that MSW landfills and industrial landfills at food processing, pulp and paper and ethanol production facilities have wastes characterized by methane generation and will likely exceed the 25,000 metric tons CO_2e/year reporting threshold.

Response: We appreciate the comment. The final rule requires reporting at MSW landfills. For our response to the many comments received on industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Linda L. Koop
Commenter Affiliation: Texas Clean Air Cities Coalition (TCACC)
Document Control Number: EPA-HQ-OAR-2008-0508-1037.1
Comment Excerpt Number: 5

Comment: TCACC would recommend that EPA only require reporting from existing landfills and EPA establish a minimum threshold for landfills required to report based on the size of the landfill in order to eliminate the need for small local governments to incur the expense of data collection and estimating of emissions.

Response: We have not used the term "existing" landfills in the rule because it is ambiguous. Instead we refer to closed and active landfills. We have added new applicability requirements for closed landfills as described in the response to comment EPA-HQ-OAR-2008-0508-0699.1, excerpt number 4 on page 2. With regard to the request that EPA establish a minimum threshold

based on size, see response to comment EPA-HQ-OAR-2008-0508-2079, excerpt 4 on page 30 of this document. We recognize the value of providing additional outreach materials, and we are developing guidance and screening tools to help landfill owners and operators determine applicability with this subpart.

Commenter Name: Donald R. Schregardus
Commenter Affiliation: Department of the Navy, Department of Defense (DoD)
Document Control Number: EPA-HQ-OAR-2008-0508-0381.1
Comment Excerpt Number: 1

Comment: Subpart HH for landfills does not clearly specify the reporting thresholds that are described in the preamble and Technical Support Documents. The preamble and Technical Support Document for this source category state that the threshold for reporting emissions from municipal solid waste landfills is a generation threshold of 25,000 metric tons CO_2 equivalent (CO_2e) in an effort to capture a significant fraction of the emissions produced by sources in this category without an undue reporting burden on small sources. However, Subpart HH not only expands the areas covered to include industrial landfills, but also requires reporting of GHG from all landfills otherwise subject to the rule, regardless of size. We recommend to EPA to modify the following paragraph in the rule language: § 98.341 Reporting threshold. You must report GHG emissions under this subpart if your facility contains a municipal landfill that generates CH_4 in amounts equivalent to 25,000 metric tons CO_2e or more per year or an industrial landfill and the facility meets the requirements of § 98.2 (a)(1) or (2).

Response: The appropriate reporting thresholds are specified in § 98.2 (a)(1) or (2) and are not repeated within each subpart. With regard to the coverage of industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Kyle Pitsor
Commenter Affiliation: National Electrical Manufacturers Association (NEMA)
Document Control Number: EPA-HQ-OAR-2008-0508-0621.1
Comment Excerpt Number: 28

Comment: The NEMA Carbon/Manufactured Graphite EHS Committee knows that there are certain industrial sectors that, because of the nature of the byproduct materials generated and disposed in a permitted on-site landfill facility, do not generate any or only insignificant quantities of methane gas. In many cases, the methane gas generation is likely less than typical hazardous waste landfills and construction and demolition landfills, which can contain significant quantities of wastes that decay/decompose. Regardless, under the proposed rule, owners or operators of industrial landfills that do not contain significant quantities of wastes that decay/ decompose, i.e., have negligible concentrations of degradable organic carbon, such as typical carbon and graphite manufacturing byproducts, would still have to go through the arduous procedures to quantify and classify wastes disposed for every year of past operation, and model for methane emissions to determine applicability. Furthermore, Table HH-1 of Subpart HH –Emissions Factors, Oxidation Factors and Methods of the Proposed Rule does not include a default value for these types of inert or inorganic wastes. As a minimum, a facility should be able to model with user defined values for DOC and k, rather than using the DOC and k values currently listed for food processing and pulp and paper, which will significantly over-estimate

the methane gas emissions. Therefore, the NEMA Carbon/Manufactured Graphite EHS Committee believes that owners or operators of such industrial landfills containing wastes with negligible concentrations of degradable organic carbon should not be burdened with the requirements to model to determine applicability, and then measure every load of waste disposed and model their methane gas emissions on an annual basis, just to be able to document every year that they do not exceed the reporting threshold.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kyle Pitsor
Commenter Affiliation: National Electrical Manufacturers Association (NEMA)
Document Control Number: EPA-HQ-OAR-2008-0508-0621.1
Comment Excerpt Number: 27

Comment: The NEMA Carbon/Manufactured Graphite EHS Committee is very concerned that, as proposed, this rule will be nearly as burdensome on facilities that do not have to report, as on those that must report in that virtually every industrial facility will be required to collect data and perform relatively complex calculations, and very burdensome modeling if it has an industrial landfill, in strict accordance with the prescribed emissions estimating procedures, just to determine if it is subject to this rule. In many cases, the owner or operator will just be documenting that the estimated GHG emissions from the facility do not exceed the reporting threshold. Collection of historical disposal data on all past wastes at all industrial landfills will be particularly difficult in many cases and will likely be inherently imprecise because of missing records due to the fact that landfill operators or owners were not required by permits or past regulations to maintain such detailed waste records. Furthermore, the modeling process to estimate methane emissions is particularly onerous, even with accurate input data, and will have to be contracted in most cases to professional environmental consulting firms rather than calculated by in-house resources using relatively simple formulas. Therefore, the NEMA Carbon/Manufactured Graphite EHS Committee has recommended that EPA provide simpler source category thresholds to determine applicability, like the one provided for stationary fuel combustion units, to reduce the burden on the majority of facilities making applicability determinations. For facilities that have fuel combustion units and operate an on-site industrial landfill (but, that either fall under no other GHG source categories or have negligible GHG emissions from those operations), the conservative 30 mmBtu/hr. aggregate maximum rated heat input capacity threshold cannot be used to determine if the facility is subject to the reporting requirements.

Response: At this time EPA is not going final with the portion of 40 CFR part 98, subpart HH (Landfills) that addresses industrial landfills. As we consider next steps, we will be reviewing the public comments and other relevant information. Thus, we are not responding to comments on industrial landfills under subpart HH at this time.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0212.1g
Comment Excerpt Number: 1

Comment: U.S. EPA has estimated that based on the 25,000 metric ton of CO_2 equivalent

generation threshold, that 63 percent of active municipal solid waste landfills would be covered by this threshold. Based on our analysis of U.S. EPA's proposed methodology, we believe the fraction of facilities to be covered is, in fact, going to be much higher.

Response: Our analysis is based on the default degradable organic carbon (DOC) value used in the U.S. GHG inventory and included as a default in subpart HH (DOC = 0.20). For a significantly higher percentage of facilities to exceed the 25,000 metric ton of CO_2 equivalent potential emissions threshold, the effective DOC value would have to be much higher than the default used. While we recognize that some assumptions were required, we did not identify any errors in the analysis and the values in the US GHG inventory have been thoroughly reviewed on multiple occasions and are well founded. The commenter did not provide any supporting information or details that we could use to change our assumptions, and we conclude that our estimate of coverage is valid. Part of the reason for this rule is to improve our estimates of the number of landfills and their emissions.

Commenter Name: Phillip McNeely
Commenter Affiliation: City of Phoenix, AZ
Document Control Number: EPA-HQ-OAR-2008-0508-0374.1
Comment Excerpt Number: 14

Comment: Recommend revising the rule to clarify how the reporting requirements apply to a single landfill that has been subdivided into real estate parcels that are owned by multiple individuals. Old landfills are sometimes subdivided and sold to several different owners. This creates regulatory challenges in assigning responsibility for emissions reporting. For landfills with multiple owners, the rule should address whether each owner is responsible for evaluating only their parcel against the threshold reporting limit, or whether the emissions from the entire site should be reported, and by whom. The issue of multiple owners is complicated even more, if adequate data is not available to determine if the emissions exceed the threshold.

Response: Reporting is required by "facility" owner or operators. If the landfill has been subdivided into parcels, one can argue that the "facility" is each parcel. Such a construct could possibly circumvent reporting of GHG emissions if a landfill that exceeds the 25,000 t CO_2e reporting threshold, but is subsequently subdivided into parcels that are each less than 25,000 t CO_2e. While we recognize that landfills may eventually be sold and subdivided, we do not think that this generally occurs until many years after closure based on the closure and post-closure requirements for MSW landfills provided in 40 CFR part 258 subpart F which generally require post-closure care for 30 years after closure (unless approved otherwise by the applicable State). In addition, in the final rule, we provide an applicability date (1980) for closed landfills. This applicability date should help to reduce the number of subdivided landfills to which the rule is applicable. For closed landfills that have already been subdivided as of the effective date of the rule, each parcel owner would need to estimate the emissions from their "facility" for the reporting rule. After the effective date of this rule, EPA will have the data needed to estimate emissions from the closed landfills with no gas collection, and it is unlikely that landfills with gas collection systems would be subdivided.

Commenter Name: Phillip McNeely
Commenter Affiliation: City of Phoenix, AZ
Document Control Number: EPA-HQ-OAR-2008-0508-0374.1
Comment Excerpt Number: 13

Comment: Recommend that the rule include screening criteria for old closed landfills where there is inadequate data to accurately estimate GHG emissions. Many older landfills do not have adequate records to accurately estimate emissions. For landfills that ceased operations before modern regulatory programs, data is often not available because record keeping was not required. In addition, ownership has often changed and the current owners have no knowledge of the operation of the landfill. In the absence of information, the site owner may be faced with significant expenditures for site investigation to demonstrate the site is not subject to the proposed rule. A screening tool would help alleviate this issue. For these landfills, EPA should develop screening criteria that could be used to identify those that are a likely to have emissions below the reporting threshold. For example, the proposed rule allows that stationary fuel combustion sources with less than 30 million BTU would generally fall below the threshold of 25,000 tons of CO_2e per year. Similar guidance for old closed landfills would be very helpful.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 9

Comment: Given the extreme variability in landfill gas methane generation and collection efficiencies, the EPA should consider using potential to emit (PTE) calculations, consistent with existing landfill NSPS, as a regulatory threshold for landfills. Under the current proposed rule, methane generation is calculated based on the first order decay model. Although the efficacy of the model has been widely accepted, the predicted methane generation represents an average, subject to wide variation. Relatively small variations in two of the model's key parameters, the rate constant k and the methane generation potential LO, can have large impacts on the methane generation predicted. In the NSPS regulatory scheme, this resulting uncertainty is managed by requiring landfill operators to use a default potential to emit methane generation potential, LO, of 170 m3 CH_4 / Mg MSW and a rate constant, k, of 0.05 / year for non-arid areas.

Response: We recognize that there is significant variability between landfills based on the types of waste accepted. This is why we recommend that landfills use waste-specific values for DOC and k. This will help to account for some of this variability. While high DOC defaults may cause more landfills to have to report and will help to ensure no individual landfill under-reports their emissions, it will also cause a bias in the reported emissions. As we do not want to bias the reported emissions, we provide central-tendency default values for DOC and k rather than high-end default values.

Commenter Name: See Table 3
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0635
Comment Excerpt Number: 100

Comment: We strongly support EPA's use of a threshold based on greenhouse gas generation. A threshold based on the amount of methane generated at the facility, minus the oxidation in the landfill cover soils, is a more accurate representation of a facility's CH_4 emissions than a threshold that is based on the amount of CH_4 that remains after destruction at a combustion device and effectively encompasses landfills that have similar emissions generating activities: In this case, a GHG generation threshold is more appropriate because some landfills have installed CH_4 gas recovery systems. A gas recovery system collects a percentage of the generated CH_4 and destroys it, through flaring or use in energy recovery equipment. The use of a threshold based on GHG generation prior to recovery is proposed because it ensures reporting from landfills that have similar CH_4 generating activities (e.g., ensures that landfills of similar size and management practices are reporting). Consistent with our comments on other parts of this rule, while we support EPA's proposed 25,000 metric tons of CO_2e per year generation threshold level for landfills as an initial reporting applicability threshold, we also encourage the Agency to consider the merits of a lower generation threshold for the landfill category in a near-term evaluation of the efficacy of the nation's overall reporting system. Here, for example, the current proposal only applies to a third of the landfills covered by the current proposal, and of that one-third, encompasses 82% of emissions. Lowering the threshold to 10,000 metric tons of CO_2e/year would result in reporting of 94% of emissions and would still only apply to well under half of the landfills within the source category (45%).

Response: We agree with the commenter that the reporting threshold should be based on its unabated methane emissions (i.e., methane generation less soil oxidation). However, we maintain that the 25,000 tCO_2e/yr threshold level for MSW landfills is appropriate. See Section II.E. of the preamble and separate comment response document volume for the response on selection of the threshold.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 2

Comment: EPA's proposal applies to all municipal and industrial landfills based on whether the landfill actually generates enough CH_4 to match the equivalent global warming potential of 25,000 metric tons of CO_2. As proposed, the program would cover 82% of landfill emissions and 33% of all landfills, but excludes all hazardous waste and construction / demolition landfills based on the fact that such landfills emit an insignificant amount of GHGs. Republic appreciates EPA's effort to minimize the burden on the industry by balancing the impact to small sources with the need for comprehensive emissions information. Specifically, Republic supports EPA's decision to exclude certain landfill types that do not generate significant GHGs. However, EPA's decision to base its applicability threshold for municipal and industrial landfills on "generation" of GHGs rather than actual GHG "emissions" is unjustified. EPA explains in the preamble that, by focusing on GHG generation rather than GHG emissions, the program will apply equally to landfills regardless of whether the landfill has a gas collection and destruction system that reduces its CH_4 emissions. In other words, EPA appears interested in obtaining reports from all landfills of a certain size, regardless of the level of GHGs they emit. Yet EPA fails to explain why it is necessary for the program to apply equally to a landfill that actually emits lower than the threshold proposed due to the effectiveness of its gas collection and destruction system

simply because it is the same size as one that, because it does not control its emissions, exceeds the threshold. Focusing on generation also overestimates GHGs from landfills by nearly two and half times – in 2006, landfills generated 246.8 million tons of CO_2 equivalent emissions, but only actually released 111.2 million of those tons according to the 2008 U.S. Inventory. This approach directly conflicts with EPA's stated purpose of measuring "actual emissions." EPA should instead allow landfill owners the benefit of their efforts to reduce GHGs – the reporting program should not apply to any landfills that do not emit more than the threshold proposed. Every other source that EPA proposes to regulate will be able to benefit from efforts to reduce GHGs by receiving credit for any reductions achieved in determining whether reporting obligations apply. Although landfills are certainly unique in many respects, there appears no logical reason why a landfill should not receive the same credit for its GHG reductions. Republic also recommends that EPA exclude from the applicability determination any biogenic GHG emissions as well.

Response: We agree with the commenter that methane destruction at landfills is a significant GHG emission reduction measure. As such, it is vital that we obtain the best information available about these practices for future policy analysis. EPA needs information on the methane collection efficiency for various sized landfills. If we exclude facilities from reporting based on their actual emissions, we will lose valuable information on the typical collection efficiency of these smaller landfills. We also note that landfills with gas collection systems have an internal validation method by which they can assess their methane generation. As such, data for landfills with gas collection systems is also vitally important to better understand and improve our estimates of methane emissions from landfills in general. Finally, as noted by other commenters, gas collection systems are not always operated over the extended period from which landfill methane emissions occur. Waste disposal quantities are needed for these landfills to evaluate policies concerning the timeframe over which gas collection systems need to be operated.

With regard to landfills' ability to take into account GHG emissions reductions, we have added provisions to the final rule to allow facilities to stop submitting annual reports under certain conditions as follows: 1) if a facility's annual reports demonstrate emissions of less than 25,000 tCO_2e per year for five consecutive years or 2) if a facility's annual reports demonstrate emissions of less than 15,000 tCO_2e per year for three consecutive years. See section II.H of the preamble for more information about these provisions.

With respect to the applicability determination, we agree with the commenter that biogenic GHG emissions are not included in the 25,000 tCO_2e threshold level.

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3. GHGS TO REPORT

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 24

Comment: If CO_2 generated from waste decaying in a sanitary landfill is not considered an anthropogenic emission (16557), then methane generated from waste decomposition in a sanitary

landfill should not be considered an anthropogenic emission.

Response: In the absence of human activity, waste material would decompose aerobically so that all of the DOC would be converted to CO_2. The design and operation of MSW landfills leads to CH_4 generation. Consequently, the management of waste in landfills leads to anthropogenic emissions of methane, but the CO_2 generated in the sanitary landfill are not considered anthropogenic because they would have occurred anyway. The approach we have taken in this rule with regard to CO_2 and CH_4 is consistent with the US GHG inventory, the IRCC GHG Guidelines, and many other reporting programs.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 2

Comment: EPA states on page 16454 that it only wants reporting of anthropogenic emissions, the proposed rule requires facilities to report biogenic CO_2 emissions from stationary combustion sources. While we appreciate the Agency's proposal to exclude reporting of biogenic emissions from landfill gas flares, we are puzzled that Subpart C – General Stationary Fuel Combustion Sources would require facilities to report biogenic CO_2 emissions from the combustion of landfill gas (LFG) in the engines, turbines and/or boilers that produce energy from a renewable source, namely landfill gas. By doing so, the Agency will increase the cost of creating a renewable energy and appear to prefer flaring LFG instead of recovering it as an energy source. Carbon dioxide (CO_2) emissions from landfills are biogenic and should not be subject to emissions reporting. Landfills are held accountable for non-CO_2 greenhouse gas emissions such as methane (CH_4) from anaerobic decomposition and nitrous oxide (N_2O) from combustion of landfill gas. However, neither the CO_2 that is inherently generated by the biological decomposition of biogenic materials in the landfill (~50% of the landfill gas is CO_2), nor the CO_2 generated from the combustion of CH_4 should be included as emissions subject to the reporting requirement. These biogenic emissions are not part of the national carbon balance and should not be part of any greenhouse gas reporting system. We note that the following groups have taken the same position: 1. Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3, Solid Waste Disposal (page 3.6): "Decomposition of organic material derived from biomass sources (e.g., crops, wood) is the primary source of CO_2 released from waste. These CO_2 emissions are not included in national totals, because the carbon is of biogenic origin and net emissions are accounted for under the AFOLU Sector. Methodologies for NMVOCs, NOx and CO are covered in guidelines under other conventions such as the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP). Links to these methodologies are provided in Chapter 1 of this volume, and additional information in Chapter 7 of Volume 1." 2. IPCC Fourth Assessment Report, Mitigation of Climate Change, Chapter 10, Waste Management (page 589) – Note that similar consistent language is in 2nd and 3rd Assessment Reports as well: "The CO_2 emissions from biomass sources – including the CO_2 in landfill gas, the CO_2 from composting, and CO_2 from incineration of waste biomass – are not taken into account in GHG inventories as these are covered by changes in biomass stocks in the land-use, land-use change and forestry sectors." 3. U.S. EPA Climate Leaders Greenhouse Gas Inventory Protocol, Direct Emissions from Municipal Solid Waste Landfilling, October 2004 (page 1): "The CO_2 produced through the anaerobic biodegradation of MSW (CO_2 fraction of LFG) is not reported. It is assumed that

waste decomposition does not contribute to the net addition of CO_2 to the atmosphere. This exclusion is consistent with Intergovernmental Panel on Climate Change (IPCC) guidance." 4. U.S. EPA Solid Waste Management and Greenhouse Gases, A Life-Cycle Assessment of Sources and Sinks, Chapter 6, Landfilling (page 79): "The CO_2 is not counted as a GHG in this context because if it were not emitted from landfills, it would be produced through natural decomposition." For the above reasons articulated by various IPCC and EPA documents, we request that biogenic CO_2 not be counted as a reportable greenhouse gas emission. If facilities are required to report biogenic emissions, they expend time and resources tracking data that will not be useful in meeting the Agency's goal of finding the best ways to lower America's anthropogenic emissions and will not help achieve climate change objectives. These emissions should not be reportable under a mandatory reporting program for the reasons stated. CO_2 from the combustion of landfill CH_4 is biogenic in nature and should not be reportable.

Response: We agree that CO_2 emissions from landfills should not be considered anthropogenic and therefore, we do not require landfill owners and operators to calculate CO_2 emissions from the decay of waste in landfills. However, we do require stationary combustion units to account for biogenic CO_2 emissions from the combustion of biogas and report these emissions separately under subpart C. Including reporting of biogenic CO_2 at facilities that are already reporting for stationary combustion provides EPA with information on the use of biofuels as they relate to reductions of fossil CO_2 emissions over time. This reporting requirement also provides additional data for verification. EPA believes that it is clear in §98.2, however, that CO_2 emissions from biogenic fuels do not count toward the 25,000 metric ton threshold for reporting for stationary combustion units, although CH_4 and N_2O emissions from biogenic fuels must be considered when calculating the threshold and determining applicability.

With regard to the idea that the rule will appear to prefer flaring over recovering landfill gas as an energy source, it is not clear how reporting on landfill gas will discourage LFGTE projects. In fact, it is our view that steps taken to quantify emissions are an important first step to identifying sites with potential for landfill gas recovery.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 11

Comment: EPA's proposal would require landfills to report the following information every year: (1) CH_4 generation, (2) CH_4 oxidation, (3) CH_4 destruction (if applicable), (4) net CH_4 emissions (using both the IPCC Model and the Engineering Method for landfills will gas collection systems, as noted above), and (5) the input data necessary to make the calculations. Notably, this list does not include CO_2 emissions or any indication of electricity usage and Republic supports EPA's decision not to require such reporting. CO_2 emissions from landfills should not be considered the type of anthropogenic emissions that raise climate change concerns, and reporting electricity usage would unnecessarily seek to attribute emissions from electricity generation to landfills, thus double-counting such emissions in a way that would not provide useful information to the Agency.

Response: We agree that CO_2 emissions from landfills should not be considered anthropogenic and do not need to be reported. The final reporting rule does not require reporting of electricity purchases.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 3

Comment: Carbon dioxide (CO_2) emissions from landfills are biogenic and should not be subject to emissions reporting. Landfills are held accountable for non-$C0_2$ greenhouse gas emissions such as methane (CH_4) from anaerobic decomposition and nitrous oxide (N_20) from combustion of landfill gas. However, neither the CO_2 that is inherently generated by the biological decomposition of biogenic materials in the landfill (-50% of the landfill gas is CO_2), nor the CO_2 generated from the combustion of CH_4 should be included as emissions subject to the reporting requirement. These biogenic emissions are not part of the national carbon balance and should not be part of any greenhouse gas reporting system. We note that the following groups have taken the same position: 1. Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3, Solid Waste Disposal (page 3.6): "Decomposition of organic material derived from biomass sources (e.g., crops, wood) is the primary source of CO_2 released from waste. These CO_2 emissions are not included in national totals, because the carbon is of biogenic origin and net emissions are accounted for under the AFOLU Sector. Methodologies for NMVOCs, NOx and CO are covered in guidelines under other conventions such as the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP). Links to these methodologies are provided in Chapter 1 of this volume, and additional information in Chapter 7 of Volume 1." 2. IPCC Fourth Assessment Report, Mitigation of Climate Change, Chapter 10, Waste Management (page 589) -Note that similar consistent language is in second and third Assessment Reports as well: "The CO_2 emissions from biomass sources -including the CO_2 in landfill gas, the CO_2 from composting, and CO_2 from incineration of waste biomass -are not taken into account in GHG inventories as these are covered by changes in biomass stocks in the land-use, land-use change and forestry sectors." 3. U.S. EPA Climate Leaders Greenhouse Gas Inventory Protocol, Direct Emissions from Municipal Solid Waste Landfilling, October 2004 (page 1): "The CO_2 produced through the anaerobic biodegradation of MSW ($C0_2$ fraction of LFG) is not reported. It is assumed that waste decomposition does not contribute to the net addition of CO_2 to the atmosphere. This exclusion is consistent with Intergovernmental Panel on Climate Change (IPCC) guidance." 4. U.S. EPA Solid Waste Management and Greenhouse Gases, A Life-Cycle Assessment of Sources and Sinks, Chapter 6, Landfilling (page 79): "The CO_2 is not counted as a GHG in this context because if it were not emitted from landfills, it would be produced through natural decomposition." For the above reasons articulated by various IPCC and EPA documents, we request that biogenic CO_2 not be counted as a reportable greenhouse gas emission. If facilities are required to report biogenic emissions, they expend time and resources tracking data that will not be useful in meeting the Agency's goal of finding the best ways to lower America's anthropogenic emissions and will not help achieve climate change objectives. Data on anthropogenic sources will enable EPA and other policy makers to create effective strategies to combat climate change based on relevant data while also allowing facilities to most cost-effectively and efficiently report their true greenhouse gas emissions. Landfills and other solid waste facilities emit biogenic CO_2 as part of the waste management. These emissions should not be reportable under a mandatory reporting program for the reasons stated. CO_2 from the combustion of landfill CH_4 is biogenic in nature and should not be reportable.

Response: See response to comment EPA-HQ-OAR-2008-0508-0690.1, excerpt number 2 on page 38 of this document

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 1

Comment: Generally, Republic supports EPA's decision to carefully tailor its program to match the unique characteristics of landfill GHG emissions. Unlike most GHG emitters, landfills are merely repositories for materials that would emit the same GHGs regardless of where they came to rest. On the other hand, by collecting decomposing materials into a single, consolidated location, landfills provide an opportunity to capture and manage GHG emissions. In addition, not all of the carbon in the waste decomposes into GHGs, some remains stored in the waste remaining below the surface of the landfill. This carbon storage effect also helps mitigate GHG emissions that would otherwise naturally occur. By collecting and oxidizing GHG emissions from decomposing material, landfills have achieved significant GHG reductions in recent years, even as GHG emissions from other sectors of the economy have steadily increased. This reduction amounts to a decrease in emissions for municipal solid waste landfills by 11 percent since 1990 according to the U.S. Environmental Protection Agency's (EPA) Inventory of Greenhouse Gas Sinks and Emissions, 1990 – 2007 (EPA 2009). In addition, landfills, and the gas they collect, can also provide important opportunities for alternative energy production to help reduce the reliance on fossil fuels that generates the vast majority of GHG emissions in the United States. EPA's proposal attempts to account for these differences by only requiring landfills to report CH_4, not CO_2. As such, EPA rightfully treats landfills somewhat similar to biomass combustion sources by excluding the CO_2 emissions that do not represent the type of GHG emissions that concern policy makers. Such emissions are merely part of the natural carbon cycle and do not increase the amount of global warming gases already in circulation. However, we are concerned that while the biogenic emissions from landfill flares is excluded, the proposed rule would still require the reporting of biogenic CO_2 emissions from the combustion of landfill gas, a renewable energy, in engines and turbines under the proposed rule Subpart C – General Stationary Fuel Combustion Sources. We believe EPA should not require biogenic CO_2 emissions as a reportable greenhouse gas emission when generated by landfill gas. There are several inventories and reports that support not including biogenic emissions from landfill gas such as the Intergovernmental Panel on Climate Change (IPCC) Guidelines for Nation Greenhouse Gas Inventories, U.S. EPA Climate Leaders Greenhouse Gas Inventory Protocol and U.S. EPA Solid Waste Management and Greenhouse Gases, A Life Cycle Assessment of sources and Sinks. Specifically, the IPCC Fourth Assessment Report, Mitigation of Climate Change, Chapter 10, Waste Management (page 589) states: "The CO_2 emissions from biomass sources – including the CO_2 in landfill gas, the CO_2 from composting, and CO_2 from incineration of waste biomass – are not taken into account in GHG inventories as these are covered by changes in biomass stocks in the land-use, land-use change and forestry sectors." Therefore, Republic recommends that EPA account for only anthropogenic emissions in any attempt to calculate the GHG contribution of landfills. Failure to do so would conflict with the purpose of EPA's proposal - i.e., to require reporting of anthropogenic GHG emissions from U.S. sources to aid policy makers in developing a program for reducing emissions that have the potential to result in climate change. No Act of EPA or Congress will be able prevent waste from decomposing into CH_4, whether in a landfill or not, and EPA's reporting program should reflect that reality.

Response: See response to comment EPA-HQ-OAR-2008-0508-0690.1, excerpt number 2 on

page 38 of this document.

4. SELECTION OF PROPOSED GHG EMISSIONS CALCULATION AND MONITORING METHODS

Commenter Name: Laurie Burt
Commenter Affiliation: Massachusetts Department of Environmental Protection
Document Control Number: EPA-HQ-OAR-2008-0508-0453.1
Comment Excerpt Number: 15

Comment: Under Section V, H.H. of the Preamble and in 98.340 Section H.H. of the proposed rule, EPA addresses GHG emissions from landfills. EPA proposes to specify a default CH_4 collection efficiency of 75% to account for CH_4 that is emitted through the landfill surface. The most recent IPCC report suggests that the best number to use for capture rates in climate change projections is based upon average lifetime performance of "as low as 20%." [IPCC, Fourth Assessment Report, p.600.] An average of 40% has been a widely applied CH_4 instantaneous capture rate and is used in Europe. [European Commission, A Study on the Economic Valuation of Environmental Externalities from Landfill Disposal and Incineration of Waste – FINAL APPENDIX REPORT (October 2000), p. 144.] Massachusetts therefore suggests that EPA specify the average CH_4 collection efficiency rate of 40% as a default and continue to work to develop better estimation methodologies for this source category.

Response: See Section III.HH of the preamble for a response to this comment. In addition, it is expected that the low "lifetime" performance level suggested by the commenter accounts for periods when the collection system is no longer used. However, when the systems are actively collecting gas, available data such as surface monitoring under the NSPS, suggest that the gas collection efficiencies range from 60 to 95 percent and that 75% is a reasonable central-tendency default. As a result, we also clarified in the final rule that the default gas collection efficiency only applies to areas that have active landfill gas collection. For areas of the landfill that do not have gas collection systems or that have gas collection systems that are no longer operating, the gas collection efficiency for these areas must be assigned a 0% collection efficiency and an area-weighted gas collection efficiency must be calculated. For landfills that only have a gas collection systems on a portion of the landfill, the area-weighted average gas collection efficiency across the entire landfill will be less than 75% even though the 75% default value is used.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 14

Comment: The following text describes how to use the SWICS Protocol to replace the national default values for collection efficiency (e.g., 75%), CH_4 oxidation (e.g., 10%) with values that better reflect site-specific conditions at a landfill, and how to calculate annual carbon storage as a separate informational item that completes the mass balance of carbon flows in the landfill. Collection Efficiency : (1) Obtain actual landfill gas recovery data (flow and CH_4 content) for

the landfill gas collection system; (2) determine and evaluate the design, operation, performance, and the type of landfill gas collection system in place (NSPS, air quality compliance or other); (3) determine the percent of landfill surface under each cover type (daily, intermediate, final, or geomembrane) during the reporting year; (4) calculate a weighted average collection efficiency based on cover type and other factors; and (5) divide the actual recovery data by a calculated, average collection efficiency value based on a weighted average of land surface area by cover type. CH_4 Oxidation: (1) Determine the percent of landfill surface area under each cover type (e.g., organic, clay, sand, or other) for the reporting year; (2) if oxidation rates are used, apply the CH_4 oxidation rate factor for each cover type to calculate the additional CH_4 emission reduction; or (3) if percent oxidation is used, calculate an average oxidation percentage based on a weighted average of land surface area by cover type. (4) Apply this factor to the amount of C1-14 not collected by the landfill gas system, or if there is not a gas system, this factor can be applied to the entire amount of estimated gas generation. Carbon Sequestration – for Active Landfills Receiving Waste: (1) Determine the weighted average computed CSF for the MSW in the landfill; (2) determine the amount of MSW landfilled for the year (in short wet tons); (3) multiply the weighted average computed CSF for the MSW in the landfill by the amount of MSW landfilled for the year (in short tons) to calculate the sequestered amount in metric tons carbon dioxide equivalent (MT CO_2E); and (4) include carbon storage as a separate line item in the landfill inventory to show avoided emissions, and subtract from the direct C1-14 emissions for that year to show the carbon mass balance in the landfill.

Response: See Section III.HH of the preamble for a response to this comment. With regard to the suggested carbon sequestration factors, see response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 8

Comment: Under the Proposed Rule, landfills must report GHG emissions based on an estimated collection efficiency at the landfill. In lieu of this calculation, large landfills with potential to generate methane greater than 100,000 metric tons of CO_2e per year should be required to directly measure their methane emissions using Optical Remote Sensing and OTM-10, as described above. We propose that smaller landfills subject to the reporting methods still be able to report GHG emissions based on an estimated collection efficiency at the landfill; however, application of the 75% collection efficiency without condition is a potential source of misuse and bias. For example, a review of case study data in EPA's Landfill Methane Outreach Program (LMOP) shows that virtually all reports assumed 75% to 85 % collection efficiency even though no data is provided to support these efficiencies. For the few landfills that included test data results were in the 30% to 40% range. Under the proposed approach, operators of landfills with reason to believe that the collection efficiency was below 75% (poor system coverage, equipment malfunctions, incomplete covers) can rely on the 75% default. Operators with subjective opinions on the performance of their system would presumably be able to select greater efficiencies. The Proposed Rule's current language could create a situation where many landfills are "assuming" the default and as a result, nationwide reporting of methane emissions from landfills would be skewed without there being any scientific basis. The consequence would be sector reporting that underestimates actual emissions, making assessment of policy initiatives aimed at reducing landfill emissions nearly impossible. To ensure adequate inventory quality, the

EPA should adopt a methodology where: 1. Landfills must account for those areas of the landfill not under collection, as well as areas under interim collection, by applying an appropriate collection efficiency recognizing the diminished performance of interim systems; 2. A default collection efficiency of 75% may only be applied for landfills, or portions thereof, with a permanent cap and full LFG collection system coverage; and 3. Landfills may exceed the 75% default for portions of a landfill only if OTM-10 test data is available that substantiates the assumption and the operator keeps records that demonstrate the landfill was operated consistent with the test periods during the entire year. In order to accurately apply this methodology, the landfill operator will need to assign a distinct collection efficiency to each landfill stage described earlier in these comments and use these distinct efficiencies along with the first order decay model to calculate emissions from each operating stage separately. The Solid Waste Industry for Climate Solutions (SWICS) has released several iterations of an industry position paper that addresses soil oxidation and other landfill greenhouse gas issues, the most recent of which was issued in January 2009. [Footnote: "Current MSW Industry Position and State-of-the Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills", prepared for SWICS, presented SCS Engineers, Version 2.2, Revised January 2009]. The SWICS position paper has suggested that a composite collection efficiency can be determined by evaluating the amount of landfill area under each cover type; however, this approach ignores differences in methane generation rates. The method described above is preferable to an area based approach because methane production per unit area of the landfill is not constant. Methane generation rates are highest for new waste, which is generally in areas without LFG collection. For example, using the FOD model and AP-42 default k value = 0.04 / year for landfills with moderate rainfall, 33% of the methane is generated in the first ten years, during which time only an interim LFG collection system may be in place, with significantly lower gas collection efficiencies. Over the next ten years, only 22% of the methane is predicted to be generated. Consequently, non-existent or interim landfill gas collection systems, common in the early stages of waste placement in a landfill, have a disproportionate impact on the methane emissions from the landfill. Therefore, any methodology that accounts for those areas of the landfill without methane collection and/or permanent caps must recognize the higher rates of methane generation in the typically newer areas of the landfill without collection and/or caps. An area based approach, where an average collection efficiency is calculated based on the areas in each stage, ignores the higher rate of methane generation from newer areas of the landfill. To facilitate use of the method, the EPA should develop a series of default collection efficiencies that can be applied to each Stage. To recognize those landfills that may perform better than average as well as accurately characterize landfills with below average performance, the EPA could establish levels of performance. The EPA could designate the landfill operator responsible for selecting the appropriate defaults based on information available regarding the construction, operation, and maintenance of the landfill under consideration; however, the EPA should provide guidance on the selection criteria. The applicable default collection efficiencies may differ from area to area. For example, a landfill could have very good data available on a closed section, but limited data for an area with temporary collection. The selection criteria could be modeled around the following: Landfills, or portions thereof, with low collection efficiencies typically exhibit one or more of the following conditions: 1. A passive collection system or active system without any field measurements that demonstrate the landfill gas collection efficiency of the system. 2. Landfill installed with a relatively permeable cap to favor water infiltration (i.e. certain designs of bioreactors) 3. No regular surface methane monitoring or system operation monitoring records. 4. Landfill has instances of violation of federal requirements, including, but not limited to, surface methane concentration, landfill gas temperature, cover maintenance violations. 5. History of fires, collection system pressurization, or other operational issues. 6. History of odor or vector (rodent) complaints. Landfills, or portions thereof, with mid-range

collection efficiencies typically exhibit the following characteristics: 1. Active landfill gas collection system with some field measurements that demonstrate the effectiveness of the system. 2. Fully compliant landfills built to common industry practice designed to meet federal NSPS standards 3. Records available of representative surface monitoring and system operation monitoring Landfills or portions thereof, with high collection efficiencies exhibit the following characteristics. 1. Landfill collection system representing best practices relative to standard designs to specifically achieve higher landfill gas collection efficiencies. 2. Quarterly surface monitoring conducted with a maximum 25-foot grid spacing over the entire landfill surface yields the following results: A. No instantaneous surface methane reading of 200 parts per million by volume (ppmv) or greater; and B. An integrated surface average methane concentration less than 25 ppmv. 3. No violations of any federal or applicable state regulation related to landfill gas emissions or maintenance. 4. OTM-10 data supporting higher than mid-range default collection efficiencies sustained over time, considering seasonal variation. [See Table 3 in DCN:EPA-HQ-OAR-2008-0508-0548.1 for proposed standardized LFG collection efficiencies for the five LFG collection stages]. A lack of data, operational history, or construction information, including as-built drawings, shall generally necessitate the use of lower default collection efficiencies. Conversely, only those superior landfills with actual ORS test data should be eligible to use the high default. The most recent SWICS position paper claims that currently-accepted emission inventory methodologies overstate greenhouse gas emissions from MSW landfills. Anticipating that the SWICS paper will likely be used to substantiate estimated landfill gas collection efficiencies, we wanted to offer our perspectives on the paper and its recommendations. Relative to LFG collection efficiency, the SWICS proposes three ranges of efficiency based on the type of cover, as follows: 1) 50-70% (mid-range default = 60%) for a landfill or portions of a landfill that are under daily soil cover with an active LFG collection system installed (note that due to limited test data on daily soil covers, the selected range is based on the opinion of experts involved with the creation and review of this document); 2) 54-95% (mid-range default = 75%) for a landfill or portions of a landfill that contain an intermediate soil cover with an active LFG collection system; 3) 90-99% (mid-range default = 95%) for landfills that contain a final soil and/or geomembrane cover systems with an active LFG collection system. SWICS justifies these collection efficiencies based on its review of landfill test results found in the literature. However, our review of the cited literature and other documents revealed that SWICS' findings are tenuous, as follows: 1) The limited LFG collection efficiency database presented in the SWICS paper is clearly insufficient for predicting collection efficiencies at operating U.S. landfills. The entire SWICS LFG collection analysis is based on relatively brief periods of testing at only 11 landfills, eight of which are foreign. Of the landfills cited, none appear to be representative of daily cover materials used in the U.S., perhaps one or two are representative of U.S. intermediate cover, and six are representative of final cover. None of the landfills with intermediate cover were in the U.S. and only three of the landfills with final cover were in the U.S. Some of the cited studies focused on testing method demonstration and validity; the authors themselves acknowledged problems and errors associated with LFG measurement technologies. In addition, many studies did not test collection efficiency in isolation but reported the combined effect of collection efficiency and methane oxidation, further clouding the true collection efficiency. Only two of the cited studies (one Swedish, one French) separately tested collection efficiency. Given these significant testing limitations and the number of field variables that can affect landfill gas collection efficiency the limited database does not justify SWICS' proposed collection efficiency values. SWICS' values should not be used predict collection efficiencies for either specific landfills or for the 1600 U.S. landfills as a group. 2) SWICS does not fully describe how it managed the database in order to determine its proposed LFG collection efficiency values. Referring to the SWICS paper, several questions arise: a. Why did SWICS exclude the Visby site data reported by Borjesson et a! since the authors did not state that the

LFG collection system was malfunctioning as SWICS claims? b. Why did SWICS exclude seemingly applicable data from Mosher et a!. PVLC landfill? c. SWICS admits that no LFG collection data were available for daily cover conditions and that it relied on expert opinion, but on what basis was the expert opinion given? d. What is the explanation for the large disparity between summer and winter collection efficiency (54% versus 98%) at one of the tested French landfills? e. Why did SWICS ignore exclude tracer method data from the French landfill study, as reported by Morcet et a!? f. What is the justification for a larger LFG default value than recommended by Spokas et al. for every landfill operating mode? [See DCN:EPA-HQ-OAR-2008-0508-0548.1 for references] It is also unclear whether the landfills were being operated under normal, representative conditions at the time of testing. Given the frequency with which landfill O&M problems are reported in order to reject or qualify data (e.g., landscaper severing a pipe, LFG collection system malfunctioning) one has to wonder if such problems are representative of actual day-to-day conditions. In addition, any field test cells constructed for testing are not representative if soil layer uniformity or other conditions do not mimic operating landfill conditions. 3) No attempt is made to correlate landfill design and operation to short-term landfill gas measurements yet the results are recommended as applicable to all 1,800 landfills in the U.S. SWICS' proposed methodology to calculate composite LFG collection efficiency for specific landfills is also questionable. SWICS' proposed methodology mistakenly presumes that the amount of methane generated by decomposing MSW does not change with its age; this mistake likely results in understated methane emissions. As landfills are developed they go through several phases of active operation and closure in which landfill areas have different combinations of LFG collection and cover material conditions. Each of these areas will therefore have distinct methane collection efficiency and soil oxidation characteristics. In it proposed methodology SWICS seeks to integrate the effects of these various LFG collection and cover scenarios using a method that presumes the amount of methane generated per unit area (the methane flux) is constant over the entire landfill. Contrary to this presumption, it is widely accepted that methane generation is a strong function of MSW age, following the first order decay relationship. In short, after an initial few months lag period, fresh MSW produces more methane per unit time than aged MSW. Ignoring this fact, the SWICS methodology biases the calculated emissions to the low side by understating the amount of methane that generated during the first few years following disposal, when LFG collection is non-existent or less effective as compared to older areas that have been closed. SWICS does not present any evidence or analysis to defend this presumption. The SWICS methodology also ignores the federal landfill regulations (Subpart WWW) which allow LFG collection to be conditionally shut off after as little as 15 years. SWICS' cited collection efficiencies for interim and final cover situations also ignore lateral migration of methane from areas under final cover that are still open to adjacent active areas, where the methane is less-effectively controlled.

Response: The commenter provides several good critiques on the SWICS recommended values. One main advantage of the SWICS method is to account for areas with no active methane collection as well as areas with different types of soil covers. Unless the landfill has a geomembrane cover, the SWICS method will actually provide lower recovery efficiencies than the 75% default. Thus, despite its short-comings, we see the use of cover-specific recovery rates to be an improvement over the flat 75% default as discussed in Section III.HH of the preamble of this document. Consequently, we allow use of the SWICS protocol method as an alternative to the 75% default value for collection efficiency. We note that the presence of gas collection piping does not equate to gas collection. If a landfill ceases to operate the gas collection system, this information will be evident in the data required to be reported. We have clarified this point in the rule be specifying that 0% gas collection is to be used for areas that do not have active gas collection for both the SWICS and default methodologies. We also require the estimation of

landfill gas generation independent of the collection efficiency to better assess the appropriateness of the assumed collection efficiency. Even though we recognize the uncertainties associated with the final reporting requirements, these uncertainties do not justify the high costs currently associated with the use of optical remote sensing methods. We are however, very interested in these remote sensing methods and believe that they are likely to be applicable for sources such as landfills as these technologies continue to advance and become more reasonably priced.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 13

Comment: NSWMA appreciates EPA's discussion of the advantages and disadvantages of the most appropriate method (modeling, engineering, or direct measurement) to use when reporting landfill CH_4 emissions. We agree with EPA's assessment regarding the use of "direct measurement' methods such as optical remote sensing and flux chambers. EPA notes that these methods are currently being used for research purposes but are "complex and costly, their application to landfills is still under investigation and they may not produce accurate results if the measuring system has incomplete coverage." EPA's assessment is accurate. EPA made the right decision to reject the use of this methodology at this time.

Response: We appreciate the comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 14

Comment: EPA specifically requested comment on the use of models to determine a landfill's greenhouse gas emissions. National models used to calculate CH_4 and other pollutant emissions from landfills have been the subject of intense scrutiny. One major concern about a national model is that it uses generic default data that does not consider local conditions that can influence individual landfill site emissions as they would be reported under the proposed rule. A number of scientific advances have been published in the last ten years that require the updating of these default values. Issues that need to be addressed include collection efficiencies for landfill gas systems, CH_4 oxidation in cover soils, and the importance of carbon sequestration in landfills. Currently, the solid waste industry is evaluating various methods to more accurately determine CH_4 emissions from landfills. Because of the high spatial variability of CH_4 emissions, this determination has proven to be difficult, although a number of possible approaches are on the horizon. Until a better landfill emission measurement method can be developed and proven accurate, the Solid Waste Industry for Climate Solution (SWICS) developed a guidance on the best available method for estimating greenhouse gas emissions from landfills [see DCN:EPA-HQ-OAR-0508-2126 for the following attached documents: Attachment One, Current MSW Industry Position and State of the Practice on LFG Destruction Efficiency in Flares, Turbines, and Engines, SCS Engineers, July 2007; Attachment Two, Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills, SCS Engineers, Version 2.2, January 2009; Attachment

Three, Landfill GHG Template, SCS Engineers, Revised 9-16-08; Attachment Four, Final Methane DRE% White Paper Tables, SCS Engineers.] The objective of the SWICS methodology was to present a state-of-the-practice on landfill gas collection efficiency, CH_4 oxidation, and carbon sequestration in landfills based upon reviewed literature. Literature was reviewed to: 1. Compile and critically analyze published information on landfill gas collection efficiencies; 2. Compile and critically analyze published information on CH_4 oxidation in different types of landfill cover soils; 3. Evaluate carbon storage factors (CSF) calculated for different types of MSW; and 4. Evaluate the impact of landfill carbon sequestration on greenhouse gas emissions accounting and development of reduction strategies and policies. SWICS released an early version of the paper titled, Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills (July 2007) that detailed this methodology. The most recent revision (Version 2.2, January 2009) to the SWICS methodology is based on additional literature review that includes the IPCC Fourth Assessment Report and revisions to the 2007 California Air Resource Board (CARB) Greenhouse Gas inventory [see Attachment One in DCN:EPA-HQ-OAR-0508-2126]. In addition, the January 2009 revision is based on a critical review of the previous version by academic experts in the waste management field. These experts re-reviewed literature sources, added literature sources, and completed a thorough evaluation of the research data to arrive at the most scientifically supportable conclusions regarding appropriate default values.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 15

Comment: According to EPA's Compilation of Air Pollutant Emission Factors (AP-42) (EPA, 1997), researchers and practitioners estimated collection efficiencies that typically ranged from 60 to 85 percent at landfills with landfill gas collection installed. The most commonly assumed default efficiency has been 75 percent although higher efficiencies have been demonstrated at some sites, particularly those engineered to control emissions. A review of available data and industry information regarding collection efficiency was conducted by the EPA in 2002. Eastem Research Group, Inc. (ERG), an EPA contractor, conducted this review. In an internal memorandum dated October 24, 2002, the EPA recommended 75 percent default gas collection efficiency (Leatherwood, 2002). Other key points from EPA's review included:

1. Overall, minimal data on landfill gas collection efficiency existed. Industry contacts cited the difficulty in documenting uncontrolled landfill gas emissions as the primary reason.

2. Documenting uncontrolled landfill gas emissions was problematic because: the high spatial variability of landfill gas emissions makes it very difficult to accurately quantify these emissions; and landfill gas generation rates are highly variable because of the heterogeneity of MSW and variations in rainfall and landfill temperature.

3. Landfill gas emission levels were site-specific and varied over time and spatially, therefore, representative collection of samples was difficult. Most of the published sources cited by the memorandum were from 1993 or earlier and thus were at least 15 years old.

Consequently, these sources did not reflect system operational experience after implementation of EPA's New Source Performance Standards (NSPS), (40 CFR Part 60, Subpart WWW), that was promulgated in 1996. By December 1998, higher efficiencies were necessary for NSPS Subpart WWW compliance. Most of the collection efficiency estimates in the Leatherwood memorandum were based on speculation, not on field studies. Furthermore, the default 75 percent collection efficiency does not take into account the different landfill gas collection systems that are used at landfills. For example, a collection system designed for NSPS compliance is far more capable of higher collection efficiencies than a migration control system. Using a default value of 75 percent for both of these systems is invalid. To avoid the use of default values that do not have a bearing on site-specific conditions, it is critical to develop a methodology where new values can be calculated for system collection efficiencies in order to more accurately determine emissions from landfills with different types of cover and collection systems. To this end, a detailed review of recent publications and available literature regarding landfill gas collection efficiency was conducted to ascertain the collection efficiency values from actual field tests (emphasis added) where landfill gas emissions were measured and numeric collection efficiencies were calculated. These data were used to establish collection efficiency percentages relative to landfill cover types. These new values are presented below and represent a summary of the SWICS guidance on determining landfill gas collection efficiency:

1. 50-70 percent (mid-range default = 60%) for a landfill or portions of a landfill that are under daily soil cover with an active landfill gas collection system installed (note that because of limited test data on daily soil covers, the selected range is based on the opinion of experts involved with the creation and review of this document);

2. 54-95 percent (mid-range default =75%) for a landfill or portions of a landfill that contain an intermediate soil cover with an active landfill gas collection system; and

3. 90-99 percent (mid-range default =95%) for landfills that contain final soil and geomembrane cover systems with an active landfill gas collection system.

Specific details on how to apply these collection efficiency values on a Site-specific basis are contained within the SWICS guidance document. The following text describes how these proposed values for collection efficiency, could be used to replace the current CARB default values for collection efficiency (e.g., 75%) as well as similar default values used by EPA, IPCC, etc.

Collection Efficiency -for each year:

1. Obtain actual landfill gas recovery data (flow and CH_4 content) for the landfill gas collection system;

2. Determine and evaluate the design, operation, performance, and the type of landfill gas collection system (NSPS, air quality compliance or other);

3. Determine the percent of landfill surface under each cover type (daily, intermediate, final, or geomembrane) during the year;

4. Calculate a weighted average collection efficiency based on cover type and other factors; and

5. Divide the actual recovery data by a calculated average collection efficiency value based on a weighted average of land surface area by cover type.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 16

Comment: Methane Oxidation in Landfill Cover Soils: EPA's AP-42 document categorizes emission sources at landfills as uncontrolled emissions or controlled emissions. Controlled emissions are defined as emissions that are typically controlled by collection of gas through a gas collection system and destruction of the gas through combustion, typically a flare. As stated in the previous section, uncontrolled emissions from landfills are difficult to estimate. EPA's AP-42 document uses a theoretical, first-order CH_4 production model as the basis of the uncontrolled emissions estimate. Equation 5 of Section 2.4 of AP-42 shows the formula used to calculate the uncontrolled emissions rate. This equation assumes all of the gas that is not collected by the landfill gas collection and control system is emitted into the atmosphere. This equation does not take into account CH_4 oxidation in the landfill cover soils that can dramatically reduce CH_4 releases. Furthermore, AP-42 states that "average oxidation of methane (on a volumetric basis) in some laboratory and case studies on landfill covers have indicated ranges from 10 percent to over 25 percent with the lower portion of the range being found in clay soils and higher in topsoils." Because of the uncertainty involved and the lack of a standard method to determine oxidation rate, EPA recommends the default factor of 10 percent by volume CH_4 oxidation for landfills with low permeability cover systems. This is termed a "conservative approach" by EPA. This default CH4oxidation rate is outdated and needs to be updated based on current engineering technologies of landfill cover soils and more recent research on this topic as detailed in the SWICS methodology. In developing the SWICS approach to CH_4 oxidation, the SWICS team summarized literature from 47 determinations of the fraction of CH_4 oxidized and 30 determinations of CH4oxidation rate in a variety of soil types and landfill covers. Both column measurements and in-situ field measurements are included. For differing soil covers, the mean values for percent oxidation ranged from 22 to 55 percent from clay to sand. Mean values for oxidation rate ranged from 3.72 to 6.43 mol/m^2/ d (52 to 102 g/m^2/d) across the different soils. The overall mean percent oxidation across all studies was 35 percent with a standard error of 4 percent (se = standard deviation). The overall mean oxidation rate across all studies was 4.5 mol/m^2/ d with a standard error of 1.0 (72 ± 16 g/m^2/d). As is discussed in the SWICS guidance, many of the in-situ determinations employed the stable isotope approach that is known to yield conservative lower limit values. Therefore the values listed in the table are conservative [See DCN:EPA-HQ-OAR-0508-2126 for table showing the summary of methane oxidation rates]. Clearly, the fraction of CH_4 oxidized in landfill cover soils is much greater than the default value of 10 percent commonly used by EPA and others. Of the 47 determinations of CH_4 oxidation reported in the SWICS study, only 4 report values less than 10 percent. The default value of 10 percent should be updated based on technological advancements in measurement approaches, soil engineering and state of-the-practice applications in cover design. The mean CH_4 oxidation rate and percent oxidized values proposed for use in-lieu of current default values are summarized in the table [See DCN:EPA-HQ-OAR-0508-2126 for table showing the summary of methane oxidation rates]. Specific details on how these collection efficiency values on a site-specific basis are contained within the SWICS guidance document. Finally, a current project for

the California Energy Commission (CEC) is developing a field-validated landfill CH_4 emissions tool for annual site-specific emissions inclusive of seasonal CH_4 oxidation. This 3-year project (2007-2010) was initiated by the CEC in cooperation with the California Integrated Waste Management Board and the Air Resources Board to develop improved methods for landfill CH_4 emissions in the context of the California greenhouse gas inventory. Project methods are based on expansion of previously published field-validated modeling and measurement approaches, integration of regional soils and climatic databases into improved models, and field validation at multiple sites, including intensive field validation over 2 annual cycles at the coastal Marina Landfill (Monterey, CA) and the Scholl Canyon Landfill in the Los Angeles area. In general, this project shifts the historic focus for greenhouse gas inventory methods from landfill CH_4 generation modeling to a more realistic emphasis on landfill CH_4 emissions which vary spatially and temporally through daily, intermediate, and final cover materials. The final method will be a freely-available web based JAVA application that includes a template for site-specific data on areas and types of cover materials, integration of USDA climate and soil temperature/moisture models, and a 1 D model for annual emissions inclusive of seasonal trends for CH_4 oxidation. Additional field validation is being provided by site-specific emissions data from several Waste Management sites in California. (See Bogner, J., Spokas, K., Chanton, J., Franco, G., and Young, S., 2009, A new field-validated inventory methodology for landfill CH_4 emissions, Solid Waste Assn. of North America (SWANA) Landfill Gas Symposium, Atlanta, GA, March 2009, published by SWANA, Silver Spring, MD).

The following text describes how these proposed values for CH_4 oxidation could be used to replace the current CARB default values for CH_4 oxidation (e.g., 10%) as well as similar default values used by EPA, IPCC, etc.

CH_4 Oxidation -for calculating the CH_4 oxidation potential for each year:

1. Determine the percent of landfill surface area under each cover type (e.g., organic, clay, sand, or other) during the year;

2. If oxidation rates are used, apply the CH_4 oxidation rate factor for each cover type to calculate the additional CH_4 emission reduction; or

3. If percent oxidation is used, calculate an average oxidation percentage based on a weighted average of land surface area by cover type. Apply this factor to the amount of CH_4 not collected by the landfill gas system, or if there is not a gas system, this factor can be applied to the entire amount of estimated gas generation.

We strongly urge EPA to give facilities the flexibility to use either a national default, if the facility wishes, or to use a more site-specific estimate such as the peer reviewed SWICS methodology.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 10

Comment: The MRR proposed rule language in § 98.343 (c) (3) (ii) makes clear that reporters may use the default landfill gas collection efficiency value of seventy-five percent or estimate collection system efficiency using site-specific information to account for system coverage, operation, and cover system materials. The preamble, rule and Technical Support Document for the Landfill Sector, OAR, February 4, 2009, p. 6 incorporate language that we presume allows reporters to use site-specific information to estimate methane oxidation rather than using the national default of ten percent. Fed. Reg. 74, p 16559 and 16700-16701 However, we recommend that the Agency clarify this point and encourage the use of site-specific information about cover type and materials to estimate a more accurate methane oxidation value. EPA should be well aware of the technical literature and on-going research on methane oxidation in landfill cover. Numerous studies have been conducted worldwide and referenced in the scientific literature that address and document methane oxidation in cover soils, as well as gas collection efficiency. The Journal of Environmental Quality published earlier this year, a comprehensive literature review. [Footnote: Chanton, J.P, D.K. Powelson, and R. Green. 2009. Methane Oxidation in Landfill Cover Soils, is a 10% Default Value Reasonable?. Journal of Environmental Quality, 38:654-663.] The paper references over 60 technical documents dating from 1960 to the present, with the majority of the papers being published in the 1990s and 2000s. Overall, based on review of 42 determinations of the fraction of methane oxidized in a variety of soil types and landfill covers, the means fraction of methane oxidized across all studies was 36 percent with a standard error of 6 percent. For a subset of 15 studies conducted over an annual cycle, the fraction of methane oxidized ranged from 11 percent to 89 percent with a mean value of 35 percent + 6 percent, nearly identical to the overall mean. Clearly, the EPA default of 10 percent, which was based on one study, Czepiel et al., [footnote: Czepiel, P.M., B. Mosher, P.M Crill, and R.0 Harriss. 1996. Quantifying the effect of oxidation on landfill methane emissions. J. Geophys. Res. 101:16711-16719] was at the low end of this overall range and underestimates typical methane oxidation.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 14

Comment: EPA's AP-42 document categorizes emission sources at landfills as uncontrolled emissions or controlled emissions. Controlled emissions are defined as emissions that are typically controlled by collection of gas through a gas collection system and destruction of the gas through combustion, typically a flare. As stated in the previous section, uncontrolled emissions from landfills are difficult to estimate. EPA's AP-42 document uses a theoretical, first-order CH_4 production model as the basis of the uncontrolled emissions estimate. Equation 5 of Section 2.4 of AP-42 shows the formula used to calculate the uncontrolled emissions rate [See DCN:EPA-HQ-OAR-2008-0508-0690.1 for equation provided by commenter.] The equation assumes all of the gas that is not collected by the landfill gas collection and control system is emitted into the atmosphere. This equation does not take into account CH_4 oxidation in the landfill cover soils that can dramatically reduce CH_4 releases. Furthermore, AP-42 states that "average oxidation of methane (on a volumetric basis) in some laboratory and case studies on landfill covers have indicated ranges from 10 percent to over 25 percent with the lower portion of the range being found in clay soils and higher in topsoils." Because of the uncertainty involved and the lack of a standard method to determine oxidation rate, EPA recommends the

default factor of 10 percent by volume CH_4 oxidation for landfills with low permeability cover systems. This is termed a "conservative approach" by EPA. This default CH_4 oxidation rate is outdated and needs to be updated based on current engineering technologies of landfill cover soils and more recent research on this topic as detailed in the SWICS methodology. In developing the SWICS approach to CH_4 oxidation, the SWICS team summarized literature from 47 determinations of the fraction of CH_4 oxidized and 30 determinations of CH_4 oxidation rate in a variety of soil types and landfill covers. Both column measurements and in-situ field measurements are included. For differing soil covers, the mean values for percent oxidation ranged from 22 to 55 percent from clay to sand. Mean values for oxidation rate ranged from 3.72 to 6.43 mol m-2 d-1 (52 to 102 g m-2d-1) across the different soils. The overall mean percent oxidation across all studies was 35 percent with a standard error of 4 percent (se = standard deviation/(n1/2)). The overall mean oxidation rate across all studies was 4.5 mol m-2 d-1 with a standard error of 1.0 (72 ± 16 g m-2d-1). As is discussed in the SWICS guidance, many of the in-situ determinations employed the stable isotope approach that is known to yield conservative lower limit values. Therefore the values listed below are conservative. Clearly, the fraction of CH_4 oxidized in landfill cover soils is much greater than the default value of 10 percent commonly used by EPA and others. Of the 47 determinations of CH_4 oxidation reported in the SWICS study, only 4 report values less than 10 percent. The default value of 10 percent should be updated based on technological advancements in measurement approaches, soil engineering and state-of-the-practice applications in cover design. The mean CH_4 oxidation rate and percent oxidized values proposed for use in-lieu of current default values are summarized [See DCN:EPA-HQ-OAR-2008-0508-0690.1 for table provided by commenter.] Specific details on how to apply these collection efficiency values on a site-specific basis are contained within the SWICS guidance document. Finally, a current project for the California Energy Commission (CEC) is developing a field-validated landfill CH_4 emissions tool for annual site-specific emissions inclusive of seasonal CH_4 oxidation. This 3-year project (2007-20 10) was initiated by the CEC in cooperation with the California Integrated Waste Management Board and the Air Resources Board to develop improved methods for landfill CH_4 emissions in the context of the California greenhouse gas inventory. Project methods are based on expansion of previously published field-validated modeling and measurement approaches, integration of regional soils and climatic databases into improved models, and field validation at multiple sites, including intensive field validation over 2 annual cycles at the coastal Marina Landfill (Monterey, CA) and the Scholl Canyon Landfill in the Los Angeles area. In general, this project shifts the historic focus for greenhouse gas inventory methods from landfill CH_4 generation modeling to a more realistic emphasis on landfill CH_4 emissions which vary spatially and temporally through daily, intermediate, and final cover materials. The final method will be a freely-available web-based JAVA application that includes a template for site-specific data on areas and types of cover materials, integration of USDA climate and soil temperature/moisture models, and a 1D model for annual emissions inclusive of seasonal trends for CH_4 oxidation. Additional field validation is being provided by site-specific emissions data from several Waste Management sites in California. (See Bogner, J., Spokas, K., Chanton, J., Franco, G., and Young, S., 2009, A new field-validated inventory methodology for landfill CH_4 emissions, Solid Waste Assn. of North America (SWANA) Landfill Gas Symposium, Atlanta, GA, March 2009, published by SWANA, Silver Spring, MD)

Response: See Section III.HH of the preamble for a response to this comment. We recognize the value of providing additional outreach materials and we are developing guidance and screening tools to help landfill owners and operators to comply with this subpart. We will review the appropriateness of the California study and modeling tool once they are completed and made publically available.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 13

Comment: According to EPA's Compilation of Air Pollutant Emission Factors (AP-42) (EPA, 1997), researchers and practitioners estimated collection efficiencies that typically ranged from 60 to 85 percent at landfills with landfill gas collection installed. The most commonly assumed default efficiency has been 75 percent although higher efficiencies have been demonstrated at some sites, particularly those engineered to control emissions. A review of available data and industry information regarding collection efficiency was conducted by the EPA in 2002. Eastern Research Group, Inc. (ERG), an EPA contractor, conducted this review. In an internal memorandum dated October 24, 2002, the EPA recommended 75 percent default gas collection efficiency (Leatherwood, 2002). Other key points from EPA's review included: 1. Overall, minimal data on landfill gas collection efficiency existed. Industry contacts cited the difficulty in documenting uncontrolled landfill gas emissions as the primary reason. 2. Documenting uncontrolled landfill gas emissions was problematic because: a. The high spatial variability of landfill gas emissions makes it very difficult to accurately quantify these emissions; and b. Landfill gas generation rates are highly variable because of the heterogeneity of MSW and variations in rainfall and landfill temperature. 3. Landfill gas emission levels were site-specific and varied over time and spatially, therefore, representative collection of samples was difficult. Most of the published sources cited by the memorandum were from 1993 or earlier and thus were at least 15 years old. Consequently, these sources did not reflect system operational experience after implementation of EPA's NSPS, promulgated in 1996. By December 1998, higher efficiencies were necessary for NSPS Subpart WWW compliance. Most of the collection efficiency estimates in the Leatherwood memorandum were based on speculation, not on field studies. Furthermore, the default 75 percent collection efficiency does not take into account the different landfill gas collection systems that are used at landfills. For example, a collection system designed for NSPS compliance is far more capable of higher collection efficiencies than a migration control system. Using a default value of 75 percent for both of these systems is invalid. To avoid the use of default values that do not have a bearing on site-specific conditions, it is critical to develop a methodology where new values can be calculated for system collection efficiencies in order to more accurately determine emissions from landfills with different types of cover and collection systems. To this end, a detailed review of recent publications and available literature regarding landfill gas collection efficiency was conducted to ascertain the collection efficiency values from actual field tests where landfill gas emissions were measured and numeric collection efficiencies were calculated. These data were used to establish collection efficiency percentages relative to landfill cover types. These new values are presented below and represent a summary of the SWICS guidance on determining landfill gas collection efficiency: 1. 50-70 percent (mid-range default = 60%) for a landfill or portions of a landfill that are under daily soil cover with an active landfill gas collection system installed (note that because of limited test data on daily soil covers, the selected range is based on the opinion of experts involved with the creation and review of this document); 2. 54-95 percent (mid-range default = 75%) for a landfill or portions of a landfill that contain an intermediate soil cover with an active landfill gas collection system; and 3. 90-99 percent (mid-range default = 95%) for landfills that contain final soil and geomembrane cover systems with an active landfill gas collection system.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 29

Comment: The agency in its proposed Landfill Source Category mistakenly equates gas recovery with gas destruction, or rather mistakenly assumes that both activities necessarily occur at the same site (16559).

Response: See response to comment EPA-HQ-OAR-2008-0508-0376.1, excerpt number 20 on page 5 of this document.

Commenter Name: Phillip McNeely
Commenter Affiliation: City of Phoenix, AZ
Document Control Number: EPA-HQ-OAR-2008-0508-0374.1
Comment Excerpt Number: 11

Comment: The final rule should recognize existing landfill reporting requirements and ensure better integration with the current monitoring methods. A standardized method for calculating and reporting emissions from landfills would reduce the regulatory burden and provide more consistent results. The standardized methods should be based upon the AP-42 protocols and the New Source Performance Standards (NSPS) regulation for methane generation calculations.

Response: The landfill NSPS monitoring and reporting requirements are generally not appropriate for this rule, because the NSPS focuses on non-methane organics. The NSPS as well as the AP-42 protocols predict gas generation using the first-order decay model. The equations and methodologies provided in the proposed and final rule are based on the first-order decay model and are consistent with AP-42 and NSPS methods for estimating gas generation as well as other standardized methods as provided in the Climate Leaders Protocol for landfills.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 15

Comment: Carbon storage in landfills can significantly offset direct greenhouse gas emissions from landfills. The decision to include these factors and how they are utilized in a site-specific inventory will depend on the accounting protocol employed. A number of international and domestic protocols including the IPCC, EPA, Oregon Climate Trust, and CARB recognize carbon storage in landfilled material as a sink in calculating carbon emissions inventories. These protocols recognize that when wastes of a biogenic origin are deposited in landfills and do not completely decompose, the carbon that remains is effectively removed from the global carbon cycle and sequestered. Perhaps the most relevant example is EPA's annual inventory of greenhouse gas sinks and emissions. This publication routinely cites the amount of carbon stored in landfills. Facilities should be allowed to report their carbon storage, either through national estimates or site-specific data. For example, EPA has published reports that evaluate carbon

flows through landfills to estimate their net greenhouse gas emissions. The methodology the EPA employed recognizes carbon storage in landfills. In these studies of MSW landfilling, EPA summed the greenhouse gas emissions from CH_4 generation and transportation-related CO_2 emissions and then subtracted carbon sequestration (treated as negative emissions) (EPA, 2006). Furthermore, the 2006 greenhouse gas emissions inventory published by the CEC indicated that landfill disposal of urban wood waste and yard trimmings is a greenhouse gas sink. The report included only the categories of yard trimming and wood waste, and neglected sequestration from paper, boxes, yard waste, lumber, textiles, diapers, demolition, medical waste, sludge, and manure. In California, urban wood waste and yard trimmings represent only 16.4 percent of the total California waste stream and only 46 percent of sequestered carbon within landfills; therefore, restricting estimates of carbon storage to only these waste types produces an extremely low value of overall carbon storage for the total amount of waste disposed. The 2007 CARB landfill sequestration estimate includes sequestration from paper, boxes, yard waste, lumber, textiles, diapers, construction and demolition (C&D) waste, medical waste, sludge, and manure. CARB estimated the total carbon sequestration in landfill to be 4.94 million MTCE in 2005, which is 17.2 million metric tonnes of carbon dioxide equivalent ($MMTCO_2E$). CARB estimated that greenhouse gas emissions from landfills were 5.62 $MMTCO_2E$ in 2004, much less than the value of the carbon stored in the landfill. In order to adequately calculate the net emissions from a landfill, all aspects of the carbon cycle as they relate to sequestration and emissions must be addressed. Therefore, the acceleration of carbon storage in all carbon sinks should be a part of any integrated greenhouse gas emissions plan to create an accurate greenhouse gas emissions inventory for landfills. In developing the approach to carbon sequestration, SWICS reviewed and summarized the positions of the EPA, IPCC, CEC, and CARB on carbon sequestration in landfills and other industries. An exhaustive review of the available technical literature was also conducted. Based on this review, SWICS proposed that the research by Dr. Morton Barlaz of North Carolina State University and the EPA be used to develop carbon storage values for organic wastes contained in the MSW stream. Clearly, carbon is being stored in landfills and removed from the carbon cycle, and inventory methods must account for this carbon sink. Therefore, Veolia proposes that the following carbon storage values for refuse placed in landfills be used [See DCN:EPA-HQ-OAR-2008-0508-0690.1 for table provided by commenter.] For purposes of computing the carbon footprint of a landfill, SWICS proposed that the carbon storage factor (CSF) values presented in the table above be used. The CSF should be applied to the tons of waste placed into each landfill by refuse type for each inventory year. If a site specific waste characterization is available, then waste composition data should be used to calculate carbon storage. If site specific data are not available, or the data are insufficient to calculate the carbon storage, regional, statewide, or national data can be used instead. The quantity of waste disposed of are typically on a wet-weight basis; therefore, the most appropriate CSF value should be selected based on the known or estimated moisture content. The final step is to convert tons of sequestered carbon equivalents to sequestered tons of CO_2 equivalents. This is done by multiplying by the molecular weight ratio of CO_2 to carbon (44/12 = 3.67 $MTCO_2E$/MTCE). Thus, to convert one short ton of material disposed to the relative greenhouse gas reduction factor, the following formula should be used: Short Wet Tons of Material x CSF (MTCE/short wet ton) x (3.67 MT CO_2E/MTCE) = Sequestered Carbon in MT CO_2E. To calculate a composite CSF for a mixed waste stream, the carbon storage for each component should be calculated and summed. The final value for carbon sequestration for a landfill for a given inventory year should then be subtracted from its greenhouse gas emissions.

Response: With regard to carbon storage in landfills, see response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document. We do note that based on the waste quantity and composition data required to be reported, EPA can assess the amount of

carbon "stored" within landfills and consider this factor in future policy analyses, as appropriate.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 12

Comment: The proposal to use a multi-component first-order decay (FOD) model as outlined in the rule is an improvement over the LandGEM model used in the AP-42. Allowing the use of site-specific waste characterization data and IPCC default values for degradable organic content (DOC) is useful in that it may improve the accuracy of the model prediction by better reflecting the methane generation potential of waste disposed. It also provides a mechanism for tracking the changing composition of waste being disposed. However, we note that while Table HH-1 provides default IPCC DOC values for individual components of waste (e.g. food waste, paper, etc.), the bulk waste Lo value listed of 0.067 tons CH_4/ton of waste (equivalent to a DOC of 0.2028 when MCF=1, DOCF=0.5, and F=0.5), is higher than the IPCC bulk waste default of 0.19 for North America. While we recognize that, the bulk waste Lo provided in the Table HH-1 is consistent with the Lo value used in the landfill threshold analysis (TSD reference) and in past U.S. GHG inventories, we suggest that this value is too high, and not supported by the most current research in this area. We recommend the EPA evaluate recent information which strongly suggests that the default Lo value of 0.067 tons CH_4/ton (equivalent to a AP-42 or LandGEM Lo of 100 m3 CH_4/ wet Mg) overestimates the methane generation potential of waste disposed of in U.S. landfills (Staley and Barlaz, 2009.) The Staley and Barlaz paper calculates the methane generation potential of waste disposed of in U.S. landfills as 59.1 and 63.9 m3 CH_4/wet Mg based on EPA and state waste characterization data respectively. These values are comparable to results of similar work at the Outer Loop landfill in Kentucky, for which a site-specific Lo of 48 m3 CH_4/ Mg wet refuse was developed by measurement of the biochemical methane potential of refuse samples. Given that the reporting threshold and emissions calculation requirements for landfills are based on the modeled generation potential, using the most accurate estimate of Lo is of critical importance.

Response: We reviewed the comment and the suggestion as far as other available materials. The default Lo value of 100 m^3 CH_4/wet Mg is based on substantial data. For the U.S. GHG inventory, we assessed methane generation in 2004 as a function of waste disposal rates. Assuming the gas collection system efficiency was 75 percent, the best fit Lo value was 99 m^3 CH_4/wet Mg. A literature review conducted at the time indicated Lo values range from 50 to 150 m^3 CH_4/wet Mg for individual landfills, but the central tendency value approximately 100 m^3 CH_4/wet Mg was recommended by every study. Assessments of landfill gas generation as evaluated in the recent draft update of AP-42 also derived an average Lo value of 100 m^3 CH_4/wet Mg based on gas collection data. However, this result was not corrected for gas collection efficiency. Instead, the revised AP-42 equation includes a factor of 1.3 to the equation to account for uncaptured emissions, resulting in an effective Lo of 130 m^3 CH_4/wet Mg suggesting the default Lo value of 100 m^3 CH_4/wet Mg may underestimate gas generation rather than overestimate it. While we recognize that there is significant variability in the landfill gas generation rates, based on all of the available data, we maintain that an average Lo value of 100 m^3 CH_4/wet Mg is appropriate, and this is equivalent to the default Lo value of 0.067 tons CH_4/ton of waste (or DOC of 0.20 when MCF=1, DOCF=0.5, and F=0.5) provided in subpart HH. As additional information becomes available, we can revisit this issue.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 11

Comment: Waste Management recommends the SWICS protocol as the best available method to estimate landfill emissions; however, we want to underscore the need for flexibility to make use of new tools (e.g., Bogner and Abichou models described below) that are under development for predicting methane emissions and oxidation. One such tool is a methane emissions model being developed by Dr. Jean Bogner and Kurt Spokas, who describe the model as "A current project for the California Energy Commission, which is developing a field-validated landfill methane emissions tool for annual site-specific emissions inclusive of seasonal methane oxidation. The California Energy Commission (CEC) initiated this 3-year project (2007-2010) in cooperation with the California Integrated Waste Management Board (CIWMB) and the Air Resources Board (ARB) to develop improved methods for landfill methane (CH_4) emissions in the context of the California greenhouse gas (GHG) inventory. The project methods expand upon previously published field-validated modeling and measurement approaches, integration of regional soils and climatic databases into improved models, and field validation at multiple sites, including intensive field validation over two annual cycles at the coastal Marina Landfill (Monterey, CA) and the Scholl Canyon Landfill in the Los Angeles area. In general, this project shifts the historic focus for GHG inventory methods from landfill CH_4 generation modeling to a more realistic emphasis on landfill CH_4 emissions, which vary spatially and temporally through daily, intermediate, and final cover materials. The final method will be a freely available web-based JAVA application, which includes a template for site-specific data on areas and types of cover materials, integration of USDA climate and soil temperature/moisture models, and a 1D model for annual emissions inclusive of seasonal trends for methane oxidation. Additional field validation is being provided by site-specific emissions data from several Waste Management sites in California." [Footnote: Bogner, J., Spolcas, K., Chanton, J., Franco, G., and Young, S., 2009,A new field-validated inventory methodology for landfill methane emissions, Solid Waste Assn. of North America (SWANA) Landfill Gas Symposium, Atlanta, GA, March 2009, published by SWANA, Silver Spring, MD.] Dr. Tarek Abichou of Florida State University, working with WM, is developing another tool to model methane emissions and oxidation in landfill cover materials. [Footnote: Abichou, T., Mahieu, K., Yuan, L., Chanton, J., and Hater, G. (2009), "Effects of Compost Biocovers on Gas Flow and Methane Oxidation in a Landfill Cover," Waste Management, 29, pp. 1595-1601.] This numerical approach combines water and heat flow with a gas transport and oxidation model to represent the physical and chemical processes in cover materials that control emissions and oxidation. The gas transport and oxidation model uses dynamic parameters of water content and temperature to estimate surface emission of methane and oxidation based on knowledge of cover design, management practices and daily climatic conditions. This model is currently being field-validated using emissions and oxidation measurements at several WM landfills in the U.S. We recommend the Agency continue to monitor the development of these and other approaches that offer the potential to provide site-specific and seasonally representative values for emissions and oxidation. Once successfully field-validated, these models would allow an estimate of emissions and oxidation that is decoupled from the estimation procedures and uncertainties associated with predicting landfill gas production and collection efficiency. We suggest the Agency consider establishing sector-specific technical review panels, comprising academic and field experts, to review and recommend new methods as they come available.

Response: We appreciate the comment and look forward to the availability of this tool. However, as we understand, this tool is not yet finalized or publically available. EPA remains committed to providing additional outreach materials, and we are developing guidance and screening tools to help landfill owners and operators to comply with this subpart. We consider this an on-going process and we will review the appropriateness of the California study and modeling tool once they are completed and made publicly available. If appropriate based on our review, we will provide guidance on how to use this new tool or, if necessary and appropriate, amend the rule to allow its use.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 9

Comment: We compliment the EPA on recognizing that landfill emissions are controlled by a number of factors that vary over time and in accordance with landfill physical conditions by providing the flexibility to use site-specific information in developing emissions estimates. The proposed rule requires each annual report to provide information on a number of items listed in §98.346 Data reporting requirements. Among the items listed, we wish to highlight and comment on the following: Oxidation fraction used in the calculations; estimated gas collection system efficiency for landfills with gas collection systems; and methodology for estimating system efficiency for landfills with gas collection systems. Allowing site-specific determinations of the fraction of methane oxidized and the collection efficiency of the landfill gas collection system will improve the accuracy of emissions estimates obtained by reflecting the current state of knowledge about these two factors. We applaud EPA for providing opportunities to include site-specific determinations in the proposed rule. To prevent any risk of misunderstanding in nationwide rule implementation, we recommend that the EPA explicitly accept the procedures outlined in the document entitled Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills (SWICS, 2009) for determining the fraction of methane oxidized, and the collection efficiency of the landfill gas collection system. SCS Engineers developed the protocol for the Solid Waste Industry for Climate Solutions (SWICS), a group representing public and private solid waste industry on climate change issues. The document, hereafter referred to as the SWICS protocol, presents the state-of-the-practice on landfill gas (LFG) collection efficiency, methane oxidation, and carbon sequestration in landfills. The findings and procedures contained in the SWICS protocol are the result of a critical review of the existing peer reviewed research literature by a group of academic and industry experts. SWICS members have used the SWICS protocol for voluntary reporting of landfill methane emissions to the California Climate Action Registry. The Climate Registry (TCR) has also recognized the protocol as a reference landfill emissions estimation methodology in their Solid Waste Disposal Facility Reporting Guidance available on the TCR website for use by owners and operators of MSW landfills. Waste Management intends to use the SWICS protocol for estimating our landfill emissions. This protocol is a refinement of the International Council of Local Environmental Initiatives (ICLEI), Climate Leaders and IPCC methods, and provides guidance for using site-specific data to establish more representative values for landfill gas collection efficiency and methane oxidation. Both of these important components in estimating landfill GHG emissions can vary greatly depending upon design of the landfill gas collection system, landfill cover type and cover material. The SWICS protocol uses peer-reviewed studies to support selection of collection efficiency and oxidation values based upon site-specific variations in collection system design and landfill cover. As part of our

company-wide GHG inventory effort, WM will be collecting, for each of its landfill sites, the area in square meters under daily cover, intermediate cover and final cover, with delineation of the cover materials, including sand, clay, organic, other (porous), and other –(non-porous). This information will be auditable both for internal or external quality assurance through annual site surveys that record this data and through purchase records for cover materials. Methane oxidation will be estimated using site-specific information about the landfill cover type and materials to select values based on validated field studies. Further, we will be asking each site engineer to delineate for each cover type, what percentage is controlled through a gas collection and control system and how and for what purpose the gas collection system was designed (e.g., to meet federal New Source Performance Standards (NSPS), odor control, or gas migration control). An estimation of landfill gas collection efficiency should take into account the type of collection system employed at the landfill and the regulatory requirements or drivers for installation and operation. Information on the design and purpose of the gas collection and control system can be verified through documentation in the landfill's air permit and reports filed pursuant to the permit. This information, in conjunction with cover type, will allow for a more precise, site-specific estimate of collection efficiency than use of the national default.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 8

Comment: EPA specifically requested comment on the use of models to determine a landfill's greenhouse gas emissions. The tools currently available to calculate generation and emissions from landfills have been the subject of intense scrutiny. A concern regarding the national models which are currently used is the use of generic default data that does not consider local conditions that can influence individual landfill site emissions as they would be reported under the proposed rule. A number of scientific advances have been published in the last ten years that require the updating of these default values. There are still issues which need to be addressed to account for site-specific collection efficiencies for landfill gas systems, CH_4 oxidation in cover soils, and the importance of carbon storage in landfills. Currently the State of California under the California Energy Commission (CEC) in cooperation with the California Integrated Waste Management Board is developing a field-validated landfill CH_4 emissions tool for annual site-specific emissions which will be inclusive of seasonal oxidation. This research is not completed as it was initiated in 2007 and is a 3-year project. The solid waste industry has been evaluating various methods to more accurately determine CH_4 emissions from landfills. The dynamic nature of landfills given the high spatial variability of CH_4 emissions has made this a difficult process. However, the Solid Waste Industry for Climate Solution (SWICS) has developed guidance on the best available method for estimating greenhouse gas emissions from landfills. This protocol replaces default values for landfill gas collection efficiency and methane oxidation in existing EPA models with ranges. The SWICS methodology is based on published literature reviews, which better account for effects of climate, landfill design and landfill cover types. The most recent version of the SWICS methodology (See DCN:EPA-HQ-OAR-2008-0508-0557.2 for SWICS methodology, Version 2.2, January 2009, Current MSW Industry Position and Stateof-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills, SCS Engineers) includes additional literature review of the IPCC Fourth Assessment Report and revisions to the 2007 California Air Resource Board (CARB) Greenhouse Gas

inventory. Further, Version 2.2 is based on a critical review of the previous version by academic experts in the waste management field. These experts re-reviewed literature sources, added literature sources, and completed a thorough evaluation of the research data to arrive at the most scientifically supportable conclusions regarding appropriate default values. (See DCN:EPA-HQ-OAR-2008-0508-0557.3 through 0557.5 for: Current MSW Industry Position and State of the Practice on LFG Destruction Efficiency in Flares, Turbines, and Engines, SCS Engineers, July 2007; Landfill GHG Template, SCS Engineers, Revised 9-16-08; and Final Methane DRE% White Paper Tables, SCS Engineers). Until a better landfill emission measurement method can be developed and proven more accurate, the SWICS method is a tool available which allows for more site-specific estimates than the other models available. At this time direct measurement methods are too complex, costly and under investigation and the historical models used to estimate do not have enough flexibility as noted above. Therefore, Republic proposes EPA to allow landfills the flexibility to use either a national default or to use the site-specific estimates such as the SWICs methodology. However, Republic still urges the EPA to consider waiting until the research is finalized for the development of a more refined emissions estimation method prior to requiring the inventory of site-specific GHG emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: John Seltz
Commenter Affiliation: Minnesota Pollution Control Agency (MPCA)
Document Control Number: EPA-HQ-OAR-2008-0508-0465.1
Comment Excerpt Number: 4

Comment: Regarding the development of a specific landfill gas tool, the MPCA endorses the development of such a tool. The tool should account for all important factors that govern CH_4 production and emission, including age and type of waste in place, moisture content, local weather, landfill design and maintenance, and the degree to which waste being deposited in under daily, intermediate or final cover. The tool should account for modern trade practices at landfills, such as leachate recirculation or bioreactors. The tool should be empirically validated.

Response: EPA remains committed to providing additional outreach materials and we are developing guidance and screening tools to help landfill owners and operators to comply with this subpart. We anticipate that the tools will help to implement the equations as specified in subpart HH, and will account for age, quantity, and type of waste as well as the soil moisture content (using precipitation rates or leachate recirculation as a proxy). Landfills with gas collection systems will also have variable collection efficiencies based on soil cover types.

Commenter Name: Kate M. Bailey
Commenter Affiliation: Eco-Cycle International
Document Control Number: EPA-HQ-OAR-2008-0508-0340
Comment Excerpt Number: 1

Comment: I would like to voice my support for the inclusion of landfills in the mandatory reporting class. Because landfill emit methane, a potent short-term greenhouse gas, they should be subject to regulation. Further, better data and technology are needed to improve our ability to quantify landfill methane emissions. Attention needs to be paid to the emissions occurring before a cap and gas system is put in place. Most importantly, emissions models must account for the

efficiency of a gas collection system over the lifetime of the landfill and not just rely upon the best case capture rate at a single point in time.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Keith Overcash
Commenter Affiliation: North Carolina Division of Air Quality (NCDAQ)
Document Control Number: EPA-HQ-OAR-2008-0508-0588
Comment Excerpt Number: 12

Comment: The Landfill approach should utilize the LandGEM model, to be consistent with the calculation of other pollutants emitted from landfills.

Response: LandGEM uses the first order decay model and the inputs could be selected in accordance with the rule requirements. As such, the LandGEM model may be used for estimating and reporting landfill emissions under subpart HH. Although the LandGEM model can be used directly for bulk MSW, it is not designed to track different waste types. Therefore, when data are available by waste type, LandGEM may still be used, but separate runs will need to be done to model different types of wastes. EPA remains committed to providing additional outreach materials and we are developing guidance and screening tools to help landfill owners and operators to comply with this subpart.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 12

Comment: EPA specifically requested comment on the use of models to determine a landfill's greenhouse gas emissions. National models used to calculate CH_4 and other pollutant emissions from landfills have been the subject of intense scrutiny. One major concern about a national model is that it uses generic default data that does not consider local conditions that can influence individual landfill site emissions as they would be reported under the proposed rule. A number of scientific advances have been published in the last ten years that require the updating of these default values. Issues that need to be addressed include collection efficiencies for landfill gas systems, CH_4 oxidation in cover soils, and the importance of carbon sequestration in landfills. Currently, the solid waste industry is evaluating various methods to more accurately determine CH_4 emissions from landfills. Because of the high spatial variability of CH_4 emissions, this determination has proven to be difficult, although a number of possible approaches are on the horizon. Until a better landfill emission measurement method can be developed and proven accurate, the Solid Waste Industry for Climate Solution (SWICS) developed guidance on the best available method for estimating greenhouse gas emissions from landfills. The objective of the SWICS methodology was to present a state-of-the-practice on landfill gas collection efficiency, CH_4 oxidation, and carbon sequestration in landfills based upon reviewed literature. Literature was reviewed to: 1. Compile and critically analyze published information on landfill gas collection efficiencies; 2. Compile and critically analyze published information on CH_4 oxidation in different types of landfill cover soils; 3. Evaluate carbon storage factors (CSF) calculated for different types of MSW; and 4. Evaluate the impact of landfill carbon sequestration on greenhouse gas emissions accounting and development of

reduction strategies and policies. SWICS released an early version of the paper titled, Current MS W Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills (July 2007) that detailed this methodology. The most recent revision (Version 2.2, January 2009) to the SWICS methodology is based on additional literature review that includes the IPCC Fourth Assessment Report and revisions to the 2007 California Air Resource Board (CARB) Greenhouse Gas inventory. In addition, the January 2009 revision is based on a critical review of the previous version by academic experts in the waste management field. These experts re-reviewed literature sources, added literature sources, and completed a thorough evaluation of the research data to arrive at the most scientifically supportable conclusions regarding appropriate default values.

Response: See Section III.HH of the preamble for a response to this comment. With regard to carbon storage in landfills, see response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document

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Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 29

Comment: Section V. HH (3), tools for calculating emissions: The Department recommends that the LandGEM model be used as a basic tool for GHG reporting by MSW landfills and, if suitable default parameters are defined, also for industrial landfills that are required to report GHG generation. The parameter values in Equation HH-1 or the IPCC Waste Model could be applied for individual waste streams if owners collect such data. Directions could be added to the LandGEM model for summing gas generation that was calculated separately for various waste types.

Response: See response to comment EPA-HQ-OAR-2008-0508-0588, excerpt number 12 on page 62 of this document.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0482
Comment Excerpt Number: 2

Comment: The proposed rule lists component-specific "DOC" and "k" factors for food waste, garden waste, paper, wood/straw, textiles, diapers, and sewage sludge. Aside from sewage sludge, no landfills track their waste receipts to this degree of detail. Some assumptions could be employed, but that would appear to be counter to the rule's intent to accurately quantify greenhouse gas emissions. Waste-specific (MSW, C&D, contaminated soils, sludge, etc.) factors for "DOC" and "k", however, would be more consistent with the waste receipt categories that landfills track, and would thus provide a more accurate snapshot of greenhouse gas emissions.

Response: The DOC and k values for different types of waste material were obtained from the 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*. While we expect that more accurate methane generation rates could be obtained if the quantity of these different waste materials were tracked, we also recognize that, under typical circumstances, the individual waste

material quantities are not available. We do recognize that there are times when specific wastes may be collected separately (e.g., leaf collection in the fall) and these quantities could be assigned to an appropriate waste material category (e.g., garden waste for the leaves). For these instances, the waste material specific data should be used since this delineation will improve the accuracy of the calculated methane generation rates. For other times, the bulk MSW waste defaults should be used.

We note that the DOC and k values for bulk MSW waste were developed based on projected methane generation rates based on measured landfill gas collection rates, the total quantity of waste disposed in the landfill, the landfill age, and the annual waste acceptance rate. The waste quantities used in the modeling excercise include both household waste material (MSW) and other types of wastes (including C&D waste, sludge, etc.). We further note that C&D waste can vary significantly in carbon content, and that it is likely inappropriate to consider all C&D waste to be inert as it is likely to contain some wood products. As C&D waste quantities were included in the development of the bulk MSW default values, we conclude that these waste quantities should be included when using the bulk waste default. For landfills that can attribute MSW waste quantities to specific types of waste material, it is recommended that the fraction of C&D waste that is wood be estimated (with the remaining fraction assigned to inerts) so that C&D waste is also attributed to specific waste materials. This is because the bulk waste DOC and k values, while appropriate for a mixture of MSW and C&D waste, is expected to overestimate methane generation from C&D waste by itself.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 16

Comment: The following text describes how these proposed values for collection efficiency, CH_4 oxidation, and carbon sequestration could be used to replace the current CARB default values for collection efficiency (e.g., 75%), CH_4 oxidation (e.g., 10%), and carbon sequestration (not subtracted from a landfill's greenhouse gas emissions) as well as similar default values used by EPA, IPCC, etc. Collection Efficiency – for each year: 1. Obtain actual landfill gas recovery data (flow and CH_4 content) for the landfill gas collection system; 2. Determine and evaluate the design, operation, performance, and the type of landfill gas collection system (NSPS, air quality compliance or other); 3. Determine the percent of landfill surface under each cover type (daily, intermediate, final, or geomembrane) during the year; 4. Calculate a weighted average collection efficiency based on cover type and other factors; and 5. Divide the actual recovery data by a calculated average collection efficiency value based on a weighted average of land surface area by cover type. CH_4 Oxidation – for calculating the CH_4 oxidation potential for each year: 1. Determine the percent of landfill surface area under each cover type (e.g., organic, clay, sand, or other) during the year; 2. If oxidation rates are used, apply the CH_4 oxidation rate factor for each cover type to calculate the additional CH_4 emission reduction; or 3. If percent oxidation is used, calculate an average oxidation percentage based on a weighted average of land surface area by cover type. Apply this factor to the amount of CH_4 not collected by the landfill gas system, or if there is not a gas system, this factor can be applied to the entire amount of estimated gas generation. Carbon Sequestration – for calculating amount of carbon sequestered: 1. Determine the weighted average computed CSF for the MSW in the landfill; 2. Determine the amount of MSW landfilled for the year (in short wet tons); 3. Multiply the weighted average computed CSF for the MSW in the landfill by the amount of MSW landfilled for the year (in short tons) to

calculate the sequestered amount in metric tonnes carbon dioxide equivalent (MT CO_2E); and 4. Include as a separate line item in landfill inventory for avoided emissions by carbon sequestration and subtract from the direct CH_4 emissions for that year. We strongly urge EPA to give facilities the flexibility to use either a national default, if the facility wishes, or to use a more site-specific estimate such as the peer-reviewed SWICS methodology.

Response: See Section III.HH of the preamble for a response to this comment. With regard to the suggested carbon sequestration factors, see response to comment EPA-HQ-OAR-2008-0508-0472.1, excerpt number 5 on page 25 of this document

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Commenter Name: Andrew C. Lawrence
Commenter Affiliation: Department of Energy (DOE)
Document Control Number: EPA-HQ-OAR-2008-0508-0612.1
Comment Excerpt Number: 10

Comment: Regarding Subpart HH, as stated in a previous comment, it is the understanding of DOE that if the facility exceeds the 25,000 metric tons of CO_2e, the facility would be required to report CO_2e emissions from any source category listed in any of the Subparts. For example, a DOE site operates a closed landfill which accepted wastes that could generate methane. A landfill closure plan was approved by EPA, without the requirement to employ a methane collection system. If this landfill is required to report, DOE recommends using the IPCC First Order Decay Model referenced in the preamble to the rule for calculating methane emissions from this source. DOE requests the EPA publish additional guidance within the rule or separately, as part of the IPCC model, on using this model for closed landfills.

Response: At this time, EPA is not going final with the requirements for industrial landfills. If the DOE landfill accepted municipal waste, it may need to report. We agree that the language in the proposed rule suggests that any facility that exceeds the 25,000 t CO_2e threshold would have to report landfill emissions, but that was not our intent. We included a threshold limit for municipal landfills specifically to limit reporting of landfill emissions to the larger MSW landfills. With respect to the use of the IPCC model, the IPCC model (as well as LandGEM) can be used to estimate methane generation. The equations provided in the final rule are equivalent to the IPCC model equations when a 6 month time delay (in methane generation) is used. EPA remains committed to providing additional outreach materials and we are developing guidance and screening tools to help landfill owners and operators to comply with this subpart.

Commenter Name: Peter Anderson
Commenter Affiliation: Center for a Competitive Waste Industry
Document Control Number: EPA-HQ-OAR-2008-0508-0331.1
Comment Excerpt Number: 2

Comment: §98.343(a) states that a first order decay model (FOD), modified with a lag function, is the basis to be used in reporting estimates of methane generation from MSW landfills. Notwithstanding the fact that a FOD is well supported for certain other continuous decay functions, and widely used for landfills, including by the Intergovernmental Panel on Climate Change (IPCC) (whose updated 2006 Guidelines the rule largely adopts), nonetheless, it is patently wrong as applied to lined landfills. For although moisture - lots of moisture - is a critical limiting condition for methanogenesis, and although low permeable covers interrupt essential

precipitation for decades in between periods of high gas generation before and afterwards, the model produces a continuous decay function with no relationship to reality over a landfills' entire lifetime. As regards the match ups between observation and model outputs in the literature, they are limited to small slivers of time that improperly ignores that critical confounding data. There are three major problems with the model itself, before turning to the inputs used. (a) Second wave of gas generation The overall model is based on a standard decay function, which is one that represents a natural process in which the original mass decays over time and thus, each year, will release less and less material than the year before because part of the original mass has been exhausted in the prior period. In landfills, the relevant waste constituents are food scraps, then soiled paper and later the textiles and wood, which decompose, creating gas and leachate. Those who advocate using a decay model first modify it to reflect the fact that new waste is added each year to the original material until the site is full. To account for that initial uptick, the particular decay function used in the IPCC guidelines that the rule incorporates resembles a dromedary camel's back - that is a camel with one hump - rising rapidly due to added wastes, and then slowly following the usual trailing off after the site closes as decomposition continues working for perhaps 100 years on the remaining carbon. However, this substantially differs from what actually will happen at landfills over the long term, which distinguishes its trajectory, for example, from the subatomic particles emitted by uranium isotopes. In traditional decay functions, there is typically no physical hurdle interposed in the process that impedes its occurrence. On the other hand, in a landfill, quite the opposite is the case. Along with heat, microbes and pH, which generally are not limiting conditions after passing through early phases of degradation, decomposition in a landfill cannot proceed unless there is a continuing adequate supply of moisture that is evenly distributed.[footnote 1:George Tchobanoglous, Integrated Solid Waste Management: Engineering Principles and Management Issues (McGraw-Hill, 1993), at pp. 72-73 and 393.] Unfortunately, this prerequisite condition does not exist. The interplay of the discarded organics, barrier performance and time plays out in ways that require a very different equation to describe. In a landfill, the first thing of note is that there is an initial wave of gas generation while it is open, continuing for a few years after closure, that is incomplete. For one thing, liquids are not evenly distributed in landfills. Municipal solid waste is highly heterogeneous, often confined in plastic bags, and heavily compacted. Along with the preferred paths of flow exhibited in a compacted heterogeneous mass, splayed flat plastic trash bags, along with daily cover, will also hinder equal vertical distribution of fluids. Estimates are that leachate only reaches 23% to 34% of the mass.[footnote 2: Debra Reinhart, Prediction and Measurement of Leachate Head on Landfill Liners, Florida Center for Solid and Hazardous Waste Management (Report #98-3) (1998), at p. viii.] More important, there is inadequate moisture for complete decomposition. The incoming garbage discarded in a landfill contains approximately ±20% moisture entrained with the trash. But, in dry tomb landfills that moisture is less than a half, and maybe not even a third, of what is needed to complete decomposition. As noted by landfill expert George Tchobanoglous: "For most MSW in the United States, the moisture content will vary from 15 to 40 percent, depending on the composition of the wastes, the seasons of the year, and the humidity of weather conditions, particularly rain [with an average of 21.2%] ... [I]n many landfills the available moisture is insufficient to allow for the complete conversion of the biodegradable organic constituents in the MSW. The optimum moisture content for the conversion of the biodegradable organic matter in MSW is on the of 50 to 60 percent. Also in many landfills, the moisture that is present is not uniformly distributed." [3][footnote 3: George Tchobanoglous, Integrated Solid Waste Management: Engineering Principles and Management Issues (McGraw-Hill, 1993), at pp. 72-73 and 393. Others suggest that optimal range lies between 40% - 70%. Debra Reinhart and Timothy Townsend, Landfill Bioreactor Design & Operation (Lewis Publishers, 1998), at p. 140. Still others have done research suggesting full methane conversion does not proceed until

moisture levels reaches 60%-70%. G. J. Farquhar, "Gas Production During Refuse Decomposition." 2 Water, Air and Soil Pollution 9, at pp. 483-495 (1973). See, also, 67 FEDERAL REGISTER 346462 (May 23, 2002).] Therefore, even at the time trash is buried in the landfill when moisture is at its peak, and even in those corners of the waste mass where the fluids reach, the available wetting may only rise to one-third of what is needed to fully decompose the organic material in the trash. Then, after the landfill is closed it becomes rapidly dehydrated. As landfill gas escapes or is actively drawn out of the waste body, it carries condensed moisture along with the gas that is approximately half of landfill gas. FIGURE 1 [see graph provided in DCN-HQ-OAR-2008-0508-0331.1] shows how the liquids removed as condensate reduce the moisture level after a landfill is closed, declining from the 20% moisture entrained in the incoming waste to 8%. That is less than the proportion of moisture in a piece of lumber, and is below that necessary to sustain any anaerobic perceptible decomposition. In the traditional dry tomb landfill design, which began the modern era of engineered landfills in the early 1990s, and had previously been the norm in the United States, a composite final cover is intended to be installed shortly after each section (or "cell") tops out in order to minimize rainfall entering the open site. This consists generally of two feet of clay overlain with a geomembrane (or plastic sheet such as used on rubber roofs of homes) and a drainage and soil layer to support vegetation.[footnote 5:5 40 C.F.R. §258.60.] All of this means that, once the waste body is sealed and infiltration is minimized, the act of generating gas will, for a time, deplete the wastes of most of the little moisture that was entrained when entombed. For the next several decades, and for as long as the cover is maintained, the site generally becomes biologically inactive, which is the underlying principle of dry tomb design. Although USEPA’s landfill rules relied upon barriers to contain releases, it did so in contravention of its own staff’s warnings that even composite liners "will ultimately fail" within decades after the agency’s post-closure care requirements have expired [footnote 6:53 FEDERAL REGISTER. 168, at pp. 33344-33345 (August 30, 1988).], "and when they do, "leachate will migrate out of the facility" [footnote 7: 46 FEDERAL REGISTER 11128-11129 (February 5, 1981). Similar: "A liner is a barrier technology that prevents or greatly restricts migration of liquids into the ground. No liner, however, can keep all liquids out of the ground for all time. Eventually liners will either degrade, tear, or crack and will allow liquids to migrate out of the unit. Some have argued that liners are devices that provide a perpetual seal against any migration from a waste management unit. EPA has concluded that the more reasonable assumption, based on what is known about the pressures placed on liners over time, is that any liner will begin to leak eventually." FEDERAL REGISTER (July 26, 1982), at pp. 32284-32285.] Yet, the EPA staff recognized, the duration of a landfill’s hazardous loadings that needs to be isolated may be "many thousands of years," [footnote 8: 46 FEDERAL REGISTER 28314-28328 (May 26, 1981). See, also, Commission of the European Community, Management and Composition of Leachate from Landfills: Final Report (1994), at p. 7, TABLE 1.2. H. Belevi and P. Baccini, "Long Term Behavior of Municipal Solid Waste Landfills," Waste Management and Research (1989), at p. 43. Peter Flyhammar, The Release of Heavy Metals in Stabilized MSW by Oxidation (Swedish Department of Water Resources, Nov ‘99), at p.20 TABLE 10.] long after the time when discharges will occur. Liners, therefore, only postpone pollution, and do not prevent it. As the agency’s Inspector General concluded, USEPA made that decision "seemingly based on a compromise of these competing interests. EPA officials we spoke to agreed that the 30-year time frame [after which postclosure maintenance ends] was not based on specific scientific criteria or research studies. [footnote 9: U.S. Environmental Protection Agency Inspector General, RCRA: RCRA Financial Assurance for Closure and Post-Closure (Number 2001-P-007) (March 28, 2001), at p. 31].] Therefore, landfills can be expected to also trace their biological activity in a bi-model function. The chart illustrates the bi-model form that an equation would have to track in order to begin to accurately model landfill gas emissions over time [see DCN: EPA-HQ-OAR-2008-0508-0331.1 for chart]. (b) Methane ratios

are not fixed. The other problem with the FOD models is that, in most cases, it will compute an incorrect value for methane emissions that can be as much as 50% inaccurate. As derived, equation Eq. 1 [see DCN: EPA-HQ-OAR-2008-0508-0331.1] implicitly assumes that landfill gas consists of equal fractions of carbon dioxide and methane. This is a common error in the literature usually arising out of an oversimplified transposition from chemistry textbooks that fails to account for what actually happens in landfills. The standard chemical postulate that describes decomposition of the carbon in organic material such as cellulose in the presence of methanogens [[see DCN: EPA-HQ-OAR-2008-0508-0331.1 for chemical equation]. [footnote 10:Solid Waste Management Agency of North America, Comparison of Models for Predicting Landfill Methane Recovery (1998), at pp. 2-1.] But, this textbook depiction is the denouement of a long chain of complex chemical reactions that is really based upon nothing more than a tendency of many observations. It masks a wide diversity among the individual data points seen and is not an immutable fact that falls out of mathematical equations.[footnote 11:IPCC, 2006 Guidelines for National Greenhouse Gas Inventories (2006), at p. 3.6.] The incorrect equality between CO_2 and CH_4 is carried through into the models in this way. In the first order decay function, the mathematical solution to the underlying decay function requires multiplying the product by 2 to derive the quantity of total gas emissions. [footnote 12: Debra Reinhart, First-Order Kinetic Gas Generation Model Parameters for Wet Landfills (EPA-600/R-05/072) (June 2005), at p. E-3 ("Reinhart Report"), at p. 2-6.] Since the gas being evaluated, methane, is assumed from the fallacious reading of the chemical conversion to be half of the total, the convention is to drop the 2 when solving for methane rather than total gas. This is what was done in EQUATION 1. However, the obvious experiential problem with this formulation, which considers methane to always be precisely one-half of total gas generation, is that it not only misapplies the chemistry. It is also contradicted by the data - actual field data, not assumptions - which often shows landfill gas measured with 55%-60% methane concentrations ratios. This is most often the case in landfills that accelerate decomposition, such as by controlled precipitation and leachate recirculation. In contrast, dry tomb landfills minimize liquid incursions, and the data shows that then methane ratios are observed to fall as low as 35% after the landfill is closed with a low permeable cover. Overall, observed methane ratios in landfill gas are reported to range from 35% to 60%.[footnote 13: U.S. Department of Energy, Renewable Energy Annual, at Ch. 10 (Growth of the Landfill Industry) Table 28 (1996).] The low methane concentration ratios occur in dry tomb landfills in part because there is inadequate moisture to complete methanogenesis or too much oxygen infiltration for viable colonies of methanogens. For, in order to maximize gas capture, the dry tomb system operator exerts maximum vacuum pressures through the collection wells until oxygen intrusions approach 5% when flammable conditions could be created.[footnote 14:40 C.F.R. §60.753(b).] By way of comparison, when managing for energy recovery, air infiltration must be limited to 0.05% - one hundred times less - to prevent poisoning the methanogens that require anaerobic environments. This means dry tomb landfills will tend to exhibit low methane ratios and high collection efficiency, while landfills that accelerate decomposition, and recover energy, will produce high Btu gas at the price of low capture rates. Together, this suggests that there may be a 50% variation in methane ratios from the low to the high end of the range, depending upon whether immediate gas control or other energy related objectives are pursued. All of these issues are simply ignored by the 50%/50% convention used in the model. Without a correct statement of the amount of methane - the key parameter that drives the output - the study conclusions cannot be relied upon. For most critical for these climate studies is the fact this degree of uncertainty is magnified between 25 (when methane's warming equivalence to CO_2 is measured over 100 years) and 72 times (when measured over 20 years), because methane has so much more warming potential than carbon dioxide. [footnote 15: IPCC, Fourth Assessment Report: Chapter 2: Changes in Atmospheric Constituents and in Radiative Forcing (2007), at p.212.] Thus, the 50% range of unaccounted for

variation in methane concentrations equates on a carbon dioxide-equivalent basis to 13 times to 36 times the reported methane quantities in the equations. Any non-trivial change in methane concentration, which is ignored by the unsupported assumption that methane is always 50%, virtually overwhelms almost the other factors in the analyses. Interestingly, the rule later requires continuous monitoring of actual methane concentration levels in collected landfill gas. See §98.343(b)(1). Methane ratios are one of the few knowable values in regard to landfills' responsibility for GHG emissions. With the enormity of the GWP multiplier effect, the one place where we have hard data should not be lost. The FOD function which is marked by continuous decay is patently the wrong model for lined landfills, which interpret most decomposition mid-way through their life cycle. Only if landfills were not covered would there be any potential to resurrect the model for buried wastes. (2) Lo Input In addition to the foregoing selection problems for the base model that estimates annual methane emissions, there are also serious questions about the inputs used to run the incorrect model. EPA has moved from AP-42 values to the IPCC's 2006 Guidance for Lo, which sets forth a formula, rather than a default value like AP-42, for those who choose to use site specific data. In the event that in practice the default value used is that 100 cubic meters per metric ton, there remains too much uncertainty to be usable. Previous attempts to chemically specify a methane potential from MSW, have not been overwhelmingly successful. They have ranged from 400 to 520 m3 CH_4/Mg of MSW. Even more sophisticated efforts to do so after eliminating the large variability in waste composition by isolating the degradable organic fraction for further analysis have only narrowed that to 100 to 310 m3 CH_4/Mg.[16][footnote 16: Reinhart Report, p.3-2.] That is still by a factor of more than 300%. For those reporting who purport to use site specific data in the IPCC formula for Lo, the core waste composition data compiled for waste inventories are notoriously uncertain. Rarely is the substantial expense made to properly compile a random sample of sufficient size with adequate care in sortation to provide estimated means without extremely large bands of uncertainty. At best, they are usually not better than plus or minus 20% at the 90% confidence interval, which is too large to provide reliable Lo values. (3) k Input The estimates of year-by-year gas generation are calculated from the assumption of the annualized first order methane generation rate, referred to in the equations as "k" in Equation H-1. In recognition of the fact that the first order decay model neglects to account for the critical need for moisture (see preceding section), the rule attempts to adjust the "k" value to account for purportedly different moisture conditions using arid (>580mm average annual precipitation) and non-arid (<580 mm) environments as a dummy variable. For three reasons, this attempt to use rainfall as a proxy for the moisture levels in the waste mass fails. First, precipitation is an invalid proxy for moisture levels in the waste mass, because the extent to which rainfall infiltrates and is distributed throughout the landfill depends upon, among other things: (1) Whether there is a low permeable cover; (2) Whether outside liquids are added; (3) Whether leachate is re-circulated; (4) The waste's composition, its overall and distributed heterogeneity, and how densely the wastes are compacted; (5) The effectiveness of the leachate collection system; (6) Ambient temperature and transpiration; and (7) The waste mass, site geometry and surface grading practices. All of these significant intervening factors, especially the first three, which directly implicate the relationship, if any, between rainfall and internal moisture and dispersal levels, are simply ignored. The result is to make the underlying analysis of rainfall differences meaningless as a predictor of moisture actually inside, and the extent it is distributed within, the landfill. Second, apart from the disconnect between rainfall and moisture levels, the statistical basis for the specified relationships based upon precipitation patterns is uncertain. We were unable to find in the rule and Technical Support Document the bases for the default values in Table HH-1. But, if widely cited regression analyses were used, they are not reliable. That would be the study by Peer et al. [footnote 17: R. L. Peer, et al., A comparison of methods for estimating global methane emissions from landfills, 26 CHEMOSPHERE 387 (1993).] used a very small, and

unrepresentative sample without any statistical validity. The statistical reliability of regression or econometric studies are only as good as the suitability of the sample, the quality of the data, the theoretical foundation of the regression equations, and the appropriateness of error specifications and estimation methods. If there are significant deficiencies in any of the areas of sample suitability, data quality, regression structure, error specifications or estimation methods, a regression analysis" results should not be considered as statistically reliable. The Peer study is deficient in all of these areas. The study is a single time period cross-sectional analyses utilizing data from a sample of individual landfill sites. Both studies use a derived measure of landfill production as the dependent variable. It regresses the derived measure of landfill methane production on various explanatory variables. Sample Selection. The data set used by Peer was drawn from twenty-one non randomly selected landfill sites, less than 1% of the total population. The size and selection procedures associated with the samples for each of the studies raise statistical reliability concerns. The representative quality of the sample is important for determining whether estimated regression results can be generalized to a broader population. When samples are small and not representative, the estimation results can not reliability be applied to a broader population. Consider, for example, a statistical study of human height. If the study's sample for is drawn from professional basketball players, the results will not be applicable to the population as a whole. The sample selection methods used in also tends towards the selection of unrepresentative samples. Individual landfills were selected on the basis that the sites were thought to be "optimized" or landfill operators "appeared to be trying to optimize methane recovery." It appears that subjective qualitative assessments, rather than empirical standards, were used to select landfill sites for the Peer data set, and the criteria themselves does not reflect the diversity of the entire population. Data Quality. Regression analysis is futile without well defined and accurately measured variables. Measurement errors in the dependent and independent variables create statistically reliability problems. There are no actual measurements of the key variable, annual landfill methane production. The Peer study derives an annual methane production variable from the measured levels of methane recovery. Peer assumes a methane recovery rate 75%. Their derived methane production variable is calculated by dividing methane recovery by 0.75. Though they use a 75% recovery rate for all landfills, Peer states in its conclusion: Gas recovery systems do not capture 100 percent of the gas; the recovery efficiency is generally estimated to range from 50 to 90 percent...but no field verification of this assumption has been found by the authors. Therefore, emission factors derived using gas recovery data may have to be adjusted upwards to account for the lost gas." Neither are there independent measures of actual methane production as a fraction of total gas generation, something for which there is actual data available. Rather, this estimation procedure is for total gas generation, not the methane fraction. Equation Foundation. The Peer study does not advance a well formed theoretical model of landfill methane production which can serve as a basis for the estimated regression equations, apparently because earlier calculations suggested other important explanatory variables were statistically insignificant. The problem of ‘statistically insignificant’ coefficient estimates arises for many reasons, some of which do not imply that the variable is not, in fact, important. One of the reasons for insignificant coefficients is a small sample size that leads to limited degrees of freedom, as is evident the Peer study. If the excluded data are truly relevant, their exclusion leads to estimation bias and unreliable results. Coefficient significance is not an appropriate means for deleting two or more variables from a regression model. Various appropriate tests exist for testing overall significance of a set of variables - in particular maximum likelihood ratio tests. It appears that these forms of significance testing were not performed, nor was the need to reopen the study parameters to widen the sample. Error Specification and Estimation Procedures. Given the problems discussed above, one cannot assume that the equation error term has a standard normal distribution, which is an essential prerequisite for statistical analysis. For a standard normal error term specification

to be appropriate, a number of conditions should to exist such as measurement errors for the independent variables are not symmetrically distributed around zero, there are no measurement errors for the explanatory variables, relevant variables are not excluded, and landfills are assumed without any supporting basis to operate at a similar level of efficiency. These conditions are not met for the two studies. There are alternative estimation procedures that can adequately deal with the problems (other than a lack of sufficient degrees of freedom) discussed above. Such estimation formulations would involve more complex non-linear regression equations and non-standard normal error distributions. Though more complex, the coefficients of such equations could be estimated by procedures such as maximum likelihood estimation. For the reason of all of the deficiencies discussed above, the results of the regression analyses should not be relied upon to provide credible annual methane production quantities and generation rates. Even if all of the problems discussed above did not exist, just the low levels of R2s (one measure of the explanatory power of estimated regression equations) do not support a conclusion that the regression analyses provide reliable results. By their stated limitations, the analyses also shed no light on pre-coverage methane production and do not address the problem of rehydration and associated methane production after a landfill had been abandoned. Third, the "k" factor, or the methane generation rate, is a constant value that is applied each year over many decades against the assumed total gas potential in the remaining carbon in order to estimate annual gas generation. However, after the first or second decades, a final cover will be installed over the landfill. Capping will severely restrict rainfall from infiltrating the waste mass (until sometime in the distant future when maintenance ends and the cover fails). After that transition point when the cover is installed, the amount of rainfall becomes far less important if not meaningless, and, therefore, distorts the annual estimates. Essentially, then, over the entire relevant time period, modifications to increase or decrease "k" cannot cure the fact that the model fails to include a coefficient to control for discontinuous data for moisture inside the landfill. (4) Oxidation is limited and conflicted Equation HH-8 assigns a default value of 10% for oxidation. But, the basis for that value is totally misapplied. EPA’s 10% assumption was previously stated to be upon a 1994 study by Czepiel, which found in field and laboratory studies that 10% of the methane generated in a landfill was oxidized in the cover soil over the course of a year. [footnote 18: P. M. Czepiel, et al., "Quantifying the effect of oxidation on landfill methane emissions," Journal of Geophysical Research (July, 20, 1996), at p. 16,720.] When landfill gases are truly diffused throughout the overlying soil blanket, as would tend to have been the case with properly maintained dirt or clay-only covers as they were typically constructed in the 1970s and 1980s, this study could be partially applicable. However, gases are usually not diffused at the surface throughout that earthen layer, because, in most cases, since 1991 a composite cap or several feet of clay have been required under that soil blanket as part of the final cover. In practice, this usually includes a 60-mil (or /16") high density polyethylene plastic membrane that effectively impedes the passage of gases from the waste into that cover soil. [footnote 19: 40 C.F.R. §258.60(a)(1)] That fact is key. Ignore the very real complications of translating "hot house" experiments to the real world across different climatic conditions and operational controls, it still means that, in the U.S. experience, methane is not diffused throughout the topsoil for maximum oxidizing effect. Instead, the gases are concentrated in high fluxes at a handful of cracks and tears in the plastic sheet. The few high flux emissions quickly overwhelm the capacity of the topsoil to oxidize the escaping methane through these hot spots. Czepiel expressly stated that not only was his study not done at a landfill with a synthetic geomembrane, but also, "[p]eriodic maintenance of the cover materials has minimized significant surface cracks" in the clay layer, as well. [footnote 20: P. M. Czepiel, et al., "Quantifying the effect of oxidation on landfill methane emissions," Journal of Geophysical Research (July, 20, 1996), at pp.16,727 16,721 16727 and 16729. Also, AEA Technology, Methane emissions from UK landfills (UK Dept.of the Environment)(1999), at p. 2-9]. Even if one ignored these fundamental flaws and nonetheless

counted oxidation offsets, then, to be consistent, one would have to also reduce capture efficiency of the gas collection system that depends upon a good vacuum to perform as designed. An open face would seriously degrade performance, almost certainly to a greater degree than the oxidation effect. This internal contradiction is simply ignored in all of the supporting studies. (5) Methane destruction in ICEs Equation HH-8 also specifies a default value for the methane destruction coefficient across all platforms of 99%, unless the manufacturer specifies a lower value. However, AP-42 tests clearly find a substantially lower destruct value for internal combustion engines (ICE) than flares, which is of substantial import in a full technical analysis of flaring compared to electric generation at existing landfills.

Response: We appreciate the level of scrutiny and detail to which the commenter reviewed and commented on the proposed methodologies. While the commenter criticizes the use of the first order decay model, the commenter does not provide any workable alternative. We recognize the complexities of modeling a biological system and have acknowledged the uncertainties associated with the proposed approach. However, the commenter appears focused on landfills that have geomembrane covers. While the degradation aspects for "dry tomb" waste disposal may be very different from those with soil or clay covers, we do not anticipate that these landfills will be in the majority. We do request information on soil cover type and leachate recirculation in the final rule to better understand the prevalence of these practices. While we do allow the use of a default 50% methane concentration for landfills without gas collection systems, we require landfills with gas collection systems to measure methane composition in the landfill gas. In the final rule, we also provided an equation for determining Lo as a function of DOC, which allow the reporter to account for the measured methane composition in the gas generated. Furthermore, statistical analysis of the data available from landfills with gas collection systems where methane composition and flow were measured provide a strong basis for the use of the first order decay model and the proposed input parameters. Therefore, we are retaining this modeling approach in this final rule.

Commenter Name: Peter Anderson
Commenter Affiliation: Center for a Competitive Waste Industry
Document Control Number: EPA-HQ-OAR-2008-0508-0331.1
Comment Excerpt Number: 1

Comment: For the reasons documented in detail in the second section, modeling, with the wrong model, and with essential inputs that are unknown, unknowable and inapposite, cannot produce usable point estimates, or even a usable range of reasonableness. That does not mean, however, that reporting should not be required. Certain practices almost certainly will be a strong indicator of poor performance, and reporting on those practices will enable the Agency to consider measures to modify those practices under §111(h) of the Clean Air Act Amendments of 1990.

Response: We agree with the commenter that MSW landfills (that generate greater than or equal to 25,000 tCO_2e/yr of CH_4) should report their emissions and that the methods used in the subpart are expected to provide data useful for purposes of future policy analysis.

Commenter Name: Keith Overcash
Commenter Affiliation: North Carolina Division of Air Quality (NCDAQ)
Document Control Number: EPA-HQ-OAR-2008-0508-0588

Comment Excerpt Number: 26

Comment: EPA states: "We have reviewed tools for calculating emissions and emissions reductions from these sources, including IPCC's Waste Model, and National Council of Air and Stream Improvement's GHG Calculation Tools for Pulp and Paper Mills, and EPA's LandGEM, and are seeking comment on the advantages and disadvantages of using these tools as a model for tool development and on the utility of providing such a tool." The advantages of such tools are that they are well-established, reviewed and familiar. LandGEM is currently being used for other pollutants and use of this model rather than the equation provided in the rule would allow consistency across methods used for criteria and hazardous air pollutants.

Response: See response to comment EPA-HQ-OAR-2008-0508-0588, excerpt number 12 on page 62 of this document.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0212.1g
Comment Excerpt Number: 2

Comment: We did also notice that in the Preamble, page 575, U.S. EPA was seeking comment regarding the monthly landfill gas sampling of methane flow, as well as concentration, and U.S. EPA is proposing continuous methane monitoring in landfill gas collection systems. Our experience has been in landfills with installed and operated landfill gas collection control systems, particularly those that are subject to the New Source Performance Standards for Landfills, that there is very little fluctuation in the methane levels in the pipeline that U.S. EPA is proposing to measure and not nearly enough fluctuation to warrant continuous monitoring of methane.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Thomas W. Easterly
Commenter Affiliation: Indiana Department of Environmental Management (IDEM)
Document Control Number: EPA-HQ-OAR-2008-0508-0525.1
Comment Excerpt Number: 20

Comment: Indiana questions the need for CEMS and airflow rate equipment for Tier 4 landfill emission reporting. Most flares at landfills are open flares which vent directly to the atmosphere. In order to comply with the reporting rule, many landfills will need to enclose the flare to appropriately measure emissions. Indiana recommends removing or revising the monitoring requirements for landfill flares.

Response: Neither the proposed nor the final rule requires CEMS and airflow rate equipment for landfill flares. See Section III.HH of the preamble for a response to this comment.

Commenter Name: Phillip McNeely
Commenter Affiliation: City of Phoenix, AZ
Document Control Number: EPA-HQ-OAR-2008-0508-0374.1

Comment Excerpt Number: 10

Comment: Oppose the proposed requirement for landfills with gas collection systems to continuously measure the methane (CH_4) flow and concentration at the flare. Landfills in an and environment do not exhibit much variation in gas flow and concentration from month to month under normal operation. The continuous monitoring requirement is an unnecessary expense and burden. For the reporting purposes of this rule, the increased level of accuracy, garnered by requiring continuous monitoring equipment, is not necessary and does not justify the increased monitoring costs, or in the calculation and reporting effort. Inlet temperature, pressure, and methane composition are stable enough that landfill owners should not be required to install continuous monitors and recorders for these parameters but should be able to report this data based upon routine periodic monitoring. Inlet temperature, pressure, and methane composition are not required under current landfill regulation for those landfills subject to NSPS regulation nor do they add significant accuracy to the emissions calculations needed for the report.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael S. Dae
Commenter Affiliation: Energy Developments, Inc. (EDI)
Document Control Number: EPA-HQ-OAR-2008-0508-0706.1
Comment Excerpt Number: 2

Comment: EDI requests clarification on the requirements for mandatory use of the Tier 4 calculation methodology specified in §98.33(b)(5)(ii), As currently proposed the individual subheadings do not include either an "and" or "or" qualifier. Therefore it is not clear whether a unit must use the Tier 4 calculation methodology if it meets just one of the subheadings or it this only applies when a unit meets all six subheadings. LFGTE facilities are typically designed and permitted to operate as close to 8,760 hours per year as achievable. If meeting only one of the subheadings in this section requires use of the Tier 4 calculation methodology this would apply to essentially every LFGTE facility in the U.S. In addition to the operating hours, most of these facilities include multiple units with individual exhaust stacks. As proposed, this section would require the installation of numerous Continuous Emissions Monitors (CEMs) per facility. This would result in a significant economic impact to the facilities and a disincentive to future renewable energy projects of this type.

Response: The requirements for Tier 4 monitoring of stationary combustion units have been clarified in the final rule. All criteria must be met in order to be required to use the Tier 4 monitoring method.

Commenter Name: Michael S. Dae
Commenter Affiliation: Energy Developments, Inc. (EDI)
Document Control Number: EPA-HQ-OAR-2008-0508-0706.1
Comment Excerpt Number: 3

Comment: The proposed rule requires that units operating over 1,000 hours per year install the required CEMs no later than January 1, 2011. For LFGTE facilities this would be in addition to monitoring already required for compliance with NSPS Subpart WWW, NSPS Subpart JJJJ, Title V permits and other applicable air permits. EDT believes this would place an undue burden

on this renewable energy industry.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 7

Comment: EPA requested comments on continuous monitoring versus another method such as monthly monitoring of CH_4 flows and concentrations. The current regulations for landfills under the NSPS Subpart 60 WWW do not require continuous CH_4 monitoring. Since most landfills do not have continuous CH_4 monitoring equipment it will be impossible to secure and place the equipment by the proposed start date for data collection beginning January 1, 2010. The added cost of such equipment will average $30,000 per device. Republic is unsure of the justification to require continuous CH_4 monitoring when it has been common industry practice to test on a monthly basis since there is little fluctuation of the CH_4 concentrations over the monthly time period. Republic recommends monthly monitoring by using existing equipment which has been used since the landfill NSPS rules were promulgated in 1996.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 6

Comment: As part of its proposal, EPA recognizes that different industries face varying degrees of difficulty in accurately measuring GHG emissions, given that most industries have never before monitored or reported such emissions. Republic supports EPA's efforts to appropriately tailor the monitoring requirements for each industry to ensure a workable program. For landfills, the preamble notes that direct emissions measurement is not feasible and Republic agrees – although direct measurement techniques are currently being developed for research purposes, the technology is relatively untested and cannot yet provide EPA with the reliable, industry-wide data it desires. Accordingly, Republic supports EPA's "Option 2" calculation method for landfills, which relies on both emission measurement and facility-specific calculations. As EPA suggests, Option 2 effectively balances accuracy and cost. Republic also supports EPA's proposal to allow sources with material-specific data to refine the calculations accordingly while also allowing facilities without such data to rely on more general calculations based on the information that is available. However, Republic disagrees that all landfills with a gas collection system should be required to compute GHG emissions two different ways. As currently proposed, landfills with a gas collection system must calculate GHG emissions based on the both the IPCC First Order Decay Model and based on an Engineering Method that relies on the rate of gas flow and the CH_4 concentration of the gas. Certainly, due to rounding errors or natural variabilities in the different forms of data, the results of these two calculations will not be identical. Yet EPA makes no mention of how to resolve the inevitable differences or whether one method is to be preferred over another. Instead, EPA would merely require reporting of two different calculations at the same time. This duplicative approach is unnecessary and inconsistent

with EPA's efforts to minimize the burden on reporting sources. In addition, many landfills, even those with gas collection systems, do not already have the necessary monitoring equipment in place to collect the data needed for the Engineering Method proposed. For these reasons, Republic recommends allowing reporting sources to choose the one that suits each particular facility, or at least choosing one method over the other for consistency.

Response: After consideration of this comment, we have determined that use of both methods is justified under the rule. First, we note that in both of these methods, measurements of landfill gas collection rates are needed in order to estimate methane emissions. Therefore, the only additional requirement of the "Engineering Method" is an assessment of the landfill gas collection efficiency, and a default value of 75% is provided for that. The additional calculation is expected to require minimal effort during the reporting year, especially compared to the effort required to collect the waste data and gas collection rate data needed to perform the primary calculations. Second, we see a significant benefit to obtaining this additional information. There is significant uncertainty with the modeling approach as well as assumptions regarding landfill gas collection system efficiency. As such, the comparison of the methane generation and emission rates generated by these two methods will be valuable as we assess the appropriateness of model and input parameters for future policy analysis. Therefore, we conclude that the very slight increase in burden to evaluate the landfill's methane emissions using the two separate methods is justified for those facilities with gas collection systems.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 6

Comment: The Proposed Rule does not adequately address the testing, monitoring and reporting requirements for landfills – the largest source of methane emission in the US aside from enteric fermentation. The ability to use default values essentially allows landfills to use antiquated rule-of-thumb techniques when there are proven field measurement tests available. The proposed methodologies are below the technical caliber of any of the methodologies used for the calculation of emissions from stationary combustion. The EPA should be using this opportunity to establish an accurate baseline of known methane emissions by requiring this significant source category to implement best available field measurement techniques. The technology exists (in fact, it has been used by the landfill industry) and it is affordable; therefore EPA should require application of such to fix this soft spot in GHG reporting procedures. To address these issues, thereby making significant improvements in the quality of landfill GHG emission reporting, and to ensure landfill reporting is equitable with other reporting requirements, the EPA should: 1. Require direct measurement of landfill methane emissions for large landfills; 2. Improve the methodology for applying default collection efficiencies for the remaining landfills that exceed the reporting threshold; 3. Modify the reporting threshold with potential to emit (PTE) calculations to recognize the extreme variability in landfill GHG emission quantification; 4. Require the reporting of all biogenic emissions, consistent with the requirements placed on other sectors; and 5. Revise the application of the first order decay model to calculate at least 95% of the theoretical methane generation.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 3

Comment: Covanta proposes that the US EPA should be focusing on large sources of GHG emissions in the waste management sector including methane from landfills – the largest source of methane in the US aside from enteric fermentation. Landfills are an example of a GHG source that can be measured more accurately yet the Proposed Rule does not include these methods.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: William Paraskevas
Commenter Affiliation: Andrews Engineering
Document Control Number: EPA-HQ-OAR-2008-0508-0342
Comment Excerpt Number: 3

Comment: The proposed rules at 40 CFR 98.343(b) call for continuous monitoring of flow rate, methane concentration, pressure and temperature of collected gas in landfill gas collection systems before it enters any treatment systems (e.g. flares). The preamble to this section of the rule asks for comments on monthly monitoring of methane concentration as an alternative to continuous monitoring of methane concentration. Landfills with gas systems built according to the New Source Performance Standards for Landfills (NSPS - 40 CFR Part 60, Subpart WWW) monitor and adjust their gas collection wells on a monthly basis. These adjustments help keep methane concentrations fairly consistent in the gas that is sent to treatment systems. At landfills that we have worked with where methane concentrations are measured monthly, the coefficients of variation for these readings range between 4% and 8%. We believe that this range of coefficients of variation is low enough to demonstrate a reasonable degree of control over the gas composition sent to the treatment system. This, in turn, would justify sampling and analysis for methane concentration on a monthly basis as opposed to continuous monitoring.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 25

Comment: The Preamble s. IV.HH.3 requests comment on requiring use of a continuous gas flow meter even if other parameters are performed on a less frequent basis. We have reservations about requiring use of continuous gas flow meters even if a landfill were allowed to monitor the other parameters on a discrete schedule, such as monthly. The Department recommends allowing open landfills that only flare gas to monitor flow on a periodic basis, and that could be biweekly. We recommend allowing closed landfills that are not co-located with open landfills to monitor flow on a monthly basis. In addition. gas flows to standby flares should also be quantified, for excess above what the electrical generating plant can use and for plant downtimes. The rule should be specific on requiring monitoring and reporting flow and gas concentration for any time

periods where gas is diverted to flares, although continuous monitoring may be an excessive requirement. Our experience is that back up flares are needed to provide combustion capacity for any site that uses landfill gas for electrical generation and that, for some sites, a considerable fraction of total gas generated is flared rather than used as fuel. Flares are essential for larger MSW landfills to control odors in areas not connected to the gas extraction system or for when the electrical generating plant is down.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 11

Comment: Veolia appreciates EPA's discussion of the advantages and disadvantages of the most appropriate method (modeling, engineering, or direct measurement) to use when reporting landfill CH_4 emissions. We agree with EPA's assessment regarding the use of "direct measurement" methods such as optical remote sensing and flux chambers. EPA notes that these methods are currently being used for research purposes but are "complex and costly, their application to landfills is still under investigation and they may not produce accurate results if the measuring system has incomplete coverage." EPA's assessment is accurate. EPA made the right decision to reject the use of this methodology at this time.

Response: We appreciate this comment.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 10

Comment: EPA proposes that landfills continuously measure the CH_4 flow, concentration (with a Gas Chromatograph), temperature and pressure of collected landfill gas at the flare or energy device. EPA requested comment on monthly as opposed to continuous sampling. The EPA's New Source Performance Standards (NSPS), (40 CFR Part 60, Subpart WWW), requires continuous monitoring of landfill gas flow and combustion temperature but does not require continuous monitoring of CH 4 concentration. Because this level of monitoring is not a regulatory requirement, it is not in place at most landfills. However, EPA is proposing that facilities start collecting data on January 1, 2010. Obtaining this equipment and placing it in service in time to begin reporting on this date would be impossible. Based on EPA data, at least 2,400 MSW landfills would have to install at least one CH_4 quality monitoring device. Given an average cost of $30,000 per device, the cost of supplying this data would be about $72,000,000 to the solid waste industry. Veolia supports monthly testing of CH_4 concentration with a Landtec GEMTM2000 (infrared (IR) cell), or similar device, because it is the common instrument used throughout the nation for NSPS/EG compliance monitoring. It appears from equation HH-4 that the continuous monitoring of landfill gas temperature and pressure is required to convert flow volume from acfm to scfm. It is common practice throughout the industry to use a thermal mass flow meter that automatically reports flow in scfm. These devices are also used to demonstrate compliance with the NSPS/EG requirements. The Agency does not provide a rationale for

continuous emission monitoring that would improve monitoring over the Agency's current NSPS/EG rules. Veolia recommends that EPA not require continuous emission monitoring until it can justify the need for the data and the cost to obtain it. Veolia requests that the requirement for continuous landfill gas temperature and pressure be eliminated if other means are available to report CH_4 flow in scfm. Likewise, equation HH-4 should be revised accordingly.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 27

Comment: The agency's proposal to require landfills with gas collection systems to continuously measure the methane flow and concentration at the flare or energy device (16559) is financially burdensome. The capital costs as well as operation and maintenance costs of a continuous composition analyzer are prohibitive for many facilities. Instead, we recommend that MSW landfills be allowed to calculate quarterly by means of engineering formulae and/or modeling the amount of methane present at the flare or energy device. Moreover, in many cases it is not practical or even possible for the MSW facility to measure the amount of methane or even landfill gas at the energy device because this device is not owned, operated, or controlled by the facility. In a number of cases, the MSW facility pipes the landfill gas to an energy device or end user sometimes miles away. We recommend that the agency exempt such MSW facilities from the proposed GHG reporting because no significant GHGs are emitted from such landfills. Indeed, it appears that such facilities would de facto be exempt because no methane or landfill gas is destroyed by the landfill itself.

Response: With regard to frequency of CH_4 monitoring in the final rule, see Section III.HH of the preamble for a response to this comment. With regard to reporting by facilities where operation of the landfill gas to energy project is separate from the landfill itself, see response to comment EPA-HQ-OAR-2008-0508-0376.1, excerpt number 20 on page 5 of this document.

Commenter Name: Keith Overcash
Commenter Affiliation: North Carolina Division of Air Quality (NCDAQ)
Document Control Number: EPA-HQ-OAR-2008-0508-0588
Comment Excerpt Number: 25

Comment: We disagree with the need for costly continuous analyzers; flow and concentration are sufficient.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: See Table 3
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0635
Comment Excerpt Number: 101

Comment: We also recommend that EPA move expeditiously to direct measurement methodologies for characterizing landfill emissions. We support, as an interim step, EPA's proposal to require covered facilities to calculate CH_4 generation and emissions using the IPCC First Order Decay Model and to estimate CH_4 emissions from gas collection systems using engineering methods. We strongly recommend that EPA's final rule require the use of material-specific inputs in the model where available, as we agree that "this option is expected to provide more accurate emission estimates" than bulk waste inputs and require "site-specific data to determine waste disposal quantities." We ask EPA to continue to evaluate the developments in methodologies and require direct measurement of CH_4 emissions when the technologies to do so are available and reliable as direct measurement will result in more accurate emissions data than that produced by modeling and engineering methods.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 6

Comment: The use of continuous monitoring equipment is an unnecessary expense and burden for many landfills. EPA should not require landfills with gas collection systems to continuously measure CH_4 flow and concentration. The standard operating procedure at many landfills with gas collection systems is to collect monthly CH_4 flow and concentration data at the flare. Landfill gas generation does not vary significantly over time. In addition, operating experience with landfills in an arid environment shows that gas flow and concentration vary even less over time than the more typical landfill operations. Therefore, SWANA recommends monthly monitoring using a GEM2000 or an equivalent field monitoring device for parameters such as CH_4 flow and concentration. Further elaborating on this point, for the reporting purposes of this rule the increased level of accuracy garnered by requiring continuous monitoring equipment is not necessary and does not justify the increased monitoring costs, calculation and reporting effort. The Inlet temperature, pressure, and methane composition, for instance, are stable enough that landfill owners should not be required to install continuous monitors and recorders for these parameters but should be able to obtain and report this data on a reduced frequency, such as monthly. These parameters are not required under current landfill regulation nor do they add significant accuracy to the emissions calculations needed for the report. The cost of adding continuous monitoring devices is significant and must also include installation, maintenance, and calibration costs. For landfill owners with more than one landfill or with multiple flares at each landfill the costs increase rapidly.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bruce A. Wald
Commenter Affiliation: ITT Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0601
Comment Excerpt Number: 3

Comment: EPA should add the remote sensing option to the Landfills summary document

Proposed Rule: Mandatory Reporting of Greenhouse Gases (EPA-430-F-09-009) as detailed in italics below under section "How Would GHG Emissions Be Calculated?" "Alternatively, facilities may use remote sensing technologies annually to directly detect and measure facility-level methane emissions." EPA should likewise insert appropriate additions to the detailed MRR proposed rule Subpart HH, Landfills.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0482
Comment Excerpt Number: 3

Comment: Equation HH-4 utilizes a summation of daily values for gas flow rate, methane concentration, temperature, and pressure. In our experience, the daily fluctuations in these parameters for a well-run landfill gas system are minimal, and thus daily monitoring and tabulation may be excessive.

Response: See Section III.HH of the preamble for a response to this comment. In addition, the commenter suggested that these fluctuations are minimal for well-run landfill gas systems, but not all landfill gas systems are necessarily well-run.

Commenter Name: Peter Anderson
Commenter Affiliation: Center for a Competitve Waste Industry
Document Control Number: EPA-HQ-OAR-2008-0508-0331.1
Comment Excerpt Number: 3

Comment: §98.344 requires monitoring and reporting on many key operating practices that provide significant information necessary to qualitatively identify those with significant methane consequences. Included among them are, but not limited to, monitored or recorded - 1. Methane concentrations and total volumes of methane captured 2. Total volumetric flow of landfill gas, and associated pressure 3. Methane destruction efficiency 4. Cover system description 5. Number of collection wells and associated acreage EPA has done an excellent job of beginning to lay out critical reporting areas. We would strongly urge that this list be expanded to include for NSPS landfills the following additional parameters- 1. Whether and the amount of leachate recirculated in association with what affected volume of waste 2. Whether leachate collected in a closed cell is carried over to be recirculated in an open cell 3. Whether and how much sludge is disposed of and its moisture content 4. The average negative pressure each month exerted through each horizontal and/or vertical gas collector and the rated pressure design basis of the collector 5. The length of time from when a cell reaches 90% of final grade to when an intermediate cover and a final cover are installed, and the design of the final cover Site specific information is critical in these areas because the de facto shift beginning around 1997 to wet cell from dry tomb operation, which were done for air space recovery, reduced leachate treatment costs and/or energy recovery, can potentially present profound, and poorly considered, negative impacts on fugitive methane. Anecdotal field reports increasingly indicate that wet cell operations fundamentally alter their practices, described in the sidebar, and they do so directly in contravention of Subtitle D's dry tomb principles, which are intended to minimize releases into the environment. These changes are ramped up for energy recovery because the gas generated in

conventional dry tomb landfills has too little energy value to be economical (about 40% methane compared to natural gas's 70%-90%). For that reason, major operational changes were made - without this fact ever having been brought clearly to the attention of regulators or the public - in order to increase the volume of methane generated towards 60%, some part of which already escapes. Further compounding this fact, those same operational changes also significantly degrade the landfill's pre-existing capacity to capture gas emissions, which means there is more methane, and more of that escapes. Even though put in other contexts, the industry's own admissions have reached the point that this critical fact about energy recovery causing more methane, more of which escapes, has been firmly established - Furthermore, a site with a collection system that is used solely for energy recovery is usually not capable of achieving as high a collection efficiency as compared to one that is compliant with NSPS regulations."[footnote 21: Solid Waste Industry for Climate Solutions, Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills (Jul 2007), at 10.] "[Overpulling] and other related strategies can lessen surface emission (to extents somewhat difficult to measure and quantify) and achieve better gas recovery and quality (more easily quantified). However they can reach points of diminishing returns. In the case of increasing extraction or "overpull" relative to generation, air entrainment inhibits methane generation. And with overpull, dilution of landfill gas with air can limit certain energy uses." [footnote 22: Don Augenstein et. al., Improving Landfill Methane Recovery - Recent Evaluations and Large Scale Tests, Presentation to Methane to Markets Partnership Expos (2007), at p. 3.] "Gas recovery efficiency is maximized [when] header pipeline methane [concentration is] at 40 to 50% (rather than 50 to 60 percent, suggesting tuning wells for maximum recovery."[23][footnote 23: Solid Waste Association of North America, Comparison of Models for Predicting Landfill Methane Recovery (1998), at p. 2-3.] "With regards to LFG-reovery you can design a project to maximise its economics (energy recovery), but the result is a reduced efficiency. Or you can design a project with optimised efficiency but with reduced economics. The latter project will not be profitable." [footnote 24: Oonk, H. and T. Boom, Landfill gas formation, recovery and emissions. TNO-report 95-130, TNO, Apeldoorn, the Netherlands. (1995).] If EPA is to prevent de facto changes in Subtitle D's original dry tomb principles from creating major near term increases in methane, at the same time as we urgently need to buy time for CO_2 reductions to slowly take hold and to avert crossing a tipping point, then it must have an adequate data base of how prevalent are potentially injurious practices.

Response: We appreciate the perspective provided by the commenter, especially since most commenters request less burdensome reporting. The reporting requirements included in the final rule were primarily designed to enable EPA to verify data submitted by reporters. For more information on the general approach to verification see Preamble Section II.N of this final rule. While some of these activities may influence methane generation, we can obtain the same information from the data elements already required to be reported (e.g., methane composition of the landfill gas). We have added a requirement to report leachate recirculation as this will impact soil moisture and increase methane generation. Most of the other data elements requested by the commenter are not directly relevant for the calculation or verification of the reported methane emissions. As such, we have not included these other parameters in the reporting requirements in the final rule.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 9

Comment: Landfills in general are unlikely to know the specific composition of the waste materials because tracking for MSW, C&D, etc is done by the weight or cubic yard and not broken down specifically by the composition of the materials. Therefore, using a national composition rate is a more reasonable approach. Republic is also concerned regarding EPA's proposal when waste disposal quantities are not readily available. The proposal requires a determination on the population served by the landfill in these instances. Depending on the location of the landfill, many serve multi-cities, counties and states on a daily basis. This makes estimating populations serviced by the landfill difficult and impossible to report which will lead to inaccurate reporting. We request EPA not to require population estimates.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 10

Comment: Republic believes the EPA should consider the amount of C&D waste accepted at the landfill when determining the CH_4 emissions. Since C&D waste is likely to not produce GHG emissions, the amount of C&D accepted should not be included when calculating the emissions to better reflect the emissions. We recommend EPA to allow for C&D waste to be separated from the actual landfill emissions by including a provision for "inert waste". This would be consistent with the IPCC waste component model.

Response: See response comment EPA-HQ-OAR-2008-0508-0212.1g, excerpt number 4 on page 14 of this document.

Commenter Name: Stephen E. Woock
Commenter Affiliation: Weyerhaeuser Company
Document Control Number: EPA-HQ-OAR-2008-0508-0451.1
Comment Excerpt Number: 4

Comment: We direct EPA's attention to use of forest product industry information and alternatives for the landfill (Subpart HH) methodologies.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 17

Comment: EPA proposes using national waste composition rates as a default value if specific composition is unknown. While Veolia tracks the amount of MSW, C&D, etc, either by weight or by cubic yard, we do not know the specific composition of those materials. As a result, using national composition rates is reasonable. EPA also proposed determining the population served

by the landfill for those years when waste disposal quantities are not readily available. The population a landfill serves today varies daily. Today's regional landfills accept waste from numerous haulers from varying geographic areas and even multiple states. Waste sources vary for a number of reasons including pricing, available transportation, and other competitive factors. Estimating the daily population served by the facility will be impossible. In addition, solid waste from a city or county can go to different landfills on the same day because different hauling companies collect materials from different customers and use different disposal facilities. While it might be possible to estimate the population served by a residential waste collector using the same landfill, estimating the population served by haulers collecting from businesses will be impossible. We strongly urge EPA not to require population estimates. In most cases will be impossible to accurately report. Rather waste disposal volumes for years in which waste disposal quantities are not known, should be estimated using the procedures allowed by the NSPS/EG. §60.755(a)(1) allows for the average annual acceptance rate to be used.

Response: While we require the use of waste composition data when they are available, we recognize that these data may not be determinable, in which case the bulk MSW waste parameters must be used. With regard to methodologies that may be use to estimate historic disposal quantities, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Stephen E. Woock
Commenter Affiliation: Weyerhaeuser Company
Document Control Number: EPA-HQ-OAR-2008-0508-0451.1
Comment Excerpt Number: 19

Comment: Weyerhaeuser does not agree with using direct measurement to quantify the waste entering the landfill. In Subpart HH Landfills at §98.343 (a)(4) EPA proposes to require direct measurement of the waste entering the landfill. However, elsewhere (e.g. Subpart A, §98.3 3 "Calculating GHG Emissions") the quantification of solid fuels is obtained from company records. Weyerhaeuser believes the quantification of comparable materials should be consistently applied within this proposed rule, if it can be done so on a technically sound basis. Given that the quantification of the solid fuels can be done to the level of requisite accuracy using company records, then this same methodology should be technically sufficient, and thus allowed, to quantify solid waste entering the landfill. In short, if the accuracy of using company records is appropriate for solid fuel usage, then it should also be appropriate for solid waste entering a landfill.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Gary Moore
Commenter Affiliation: Pensacola Plant of Ascend Performance Materials LLC
Document Control Number: EPA-HQ-OAR-2008-0508-0366.1
Comment Excerpt Number: 16

Comment: Reliable production records are available going back 20 – 25 years not the fifty years needed for the proposed method of methane calculation. The lack of past land disposal records and production records as well as the reduction in biodegradable content through burning invalidate the proposed method if estimating methane emissions. In general, onsite industrial landfills are relatively small in size. Additionally, EPA has acknowledged that the bulk of

methane emissions from industrial landfills come from Pulp and Paper, Food Processing or Ethanol Production industries. We propose that EPA exempt industrial landfills not in the identified industries that have been closed for 20 years or more.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Marcelle Shoop
Commenter Affiliation: Rio Tinto Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0636.1
Comment Excerpt Number: 12

Comment: At a minimum, EPA should not require industrial landfills with emissions less than this threshold to determine waste quantities by direct mass measurement using industrial scales. Rather, EPA should allow reporters to use any measurement method specified in an applicable permit or any reasonable estimation method that is adequately documented.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: William Paraskevas
Commenter Affiliation: Andrews Engineering
Document Control Number: EPA-HQ-OAR-2008-0508-0342
Comment Excerpt Number: 2

Comment: This comment pertains to a part of the instructions for the GHG emission calculation methodology for landfills under 40 CFR 98.343(a)(3). This paragraph states that "For years prior to reporting for which waste disposal quantities are not readily available for MSW landfills, Wx shall be estimated using the estimated population served by the landfill in each year…". Basing waste disposal quantities on the estimated population served may not be the most accurate method for determining waste quantities; particularly in areas that are or have been served by more than one landfill. Over the course of time, landfills may enter or depart the market; hauling companies that supply the landfills may vary their geographic coverage, acquire or be acquired by other firms or go out of business. Trying to estimate the population served by a particular landfill under these conditions would be tedious at best and most likely impossible. We recommend that alternate approaches be allowed for estimating waste disposal quantities when actual year-to-year waste receipts are not known. One such approach is to estimate waste disposal quantities based on waste volume and density. Topographic maps of landfills are generally available and can be used to calculate total volumes of waste in landfills. These volumes can be converted to mass figures based on waste densities. The latter can be extrapolated from site data from years in which volume and mass were measured or can be taken from general industry average values from the technical literature. Once the total mass between topographic mappings is calculated, it can be apportioned over the years that the landfill operated in that timeframe. This approach has been used under the New Source Performance Standard (NSPS) rules (40 CFR Part 60, Subpart WWW) for calculating design capacity and non-methane organic compound (NMOC) emission rates.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Marcelle Shoop
Commenter Affiliation: Rio Tinto Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0636.1
Comment Excerpt Number: 9

Comment: The proposed rule suggests that an entity that is required to report emissions because it falls within one or more of the listed source categories must also report emissions for other source categories regardless of thresholds. EPA recognized that in some cases this means that a reporting entity would need to report on minor emissions from sources, but concluded it need not adopt the use of de minimis reporting thresholds in part "because [although] some facilities subject to the rule could still have Some relatively small sources, the proposal indudes simplified emissions estimation methods for smaller sources, where appropriate." (74 Fed. Reg. at 16473). However, EPA did not provide simplified estimation methods for all relevant sources - in particular there is no simplified estimation methodology for industrial landfills under SUbpart HH that does not require the use of precise scales. As described below, this potential oversight presents significant financial and reporting burdens not justified to determine very small levels of emissions. The HH calculation methodologies for industrial landfills specify that the quantity of waste disposed in reporting years must be determined by -direct mass measurement of waste entering the landfill using industrial scales with a manufacturer's stated accuracy of ±2 percent" 98.343(a)(4). This methodology assumes all industrial landfills are of a size to justify the use of scales (or even highly accurate scales) for mass determinations. Several Rio Tinto facilities would be subject to the reporting rule pursuant to Subpart F, aluminum production, or pursuant to SUbpart A because they have emissions greater than the 25,000 metric tons C02e threshold from stationary combustion sources. As noted above, pursuant to 98.2(a)(1) or (2), such facilities also would be required to report emissions from industrial landfills, regardless how minor those emissions may be. Many permitted on site "industrial" landfills typically receive very small levels of organic waste or in some cases are located in desert or arid locations where anaerobic activity is low. Given the nature of these small industrial landfills, there may be no scales onsite to determine the amount of waste disposed. Rather, the quantity of waste is estimated in accordance with permits or other needs and appropriate methodologies. Where scales might be accessible they might not meet the proposed rule requirements or it might be costly to utilize for every load.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 30

Comment: Default parameters for bulk waste are probably sufficiently accurate for use by most MSW landfills and our recommendation is to allow MSW and industrial landfill owners to use the bulk parameters as a default.

Response: We appreciate the support of the bulk waste parameters and the final rule allows for their use for MSW landfills. With regard to industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: Robert Rouse
Commenter Affiliation: The Dow Chemical Company
Document Control Number: EPA-HQ-OAR-2008-0508-0533.1
Comment Excerpt Number: 39

Comment: Estimating the Amount of Waste Sent to an Industrial Landfill Should Allow Other Estimation Methods and Not Require the Use of Industrial Scales. Section 98.343(a)(4) requires that industrial landfills use industrial scales for determining the amount of wastes entering the landfill. Many landfills determine waste loads based on volume rather than weight. There are good estimating and sampling methods available that will provide similar accuracy. This requirement would require these facilities to install scales at or near their landfill. This additional accuracy and expense associated with the purchase, installation and operation of an industrial scale is not needed due to other uncertainties in the calculation methods, such as variability in waste composition, assumption that the Waste Disposal factor (WDF) has stayed constant over a long period of time (potentially 50 years), other uncertainties with determining historical disposal, and the use of standard factors given in Table HH-1. Even though EPA presented data showing that emissions from MSW landfills are significantly higher than those from industrial landfills, they are only proposing to require the use of scales at industrial landfills and allowing MSW landfills to use other records and very general household waste disposal factors (Table HH-2). The expected level of accuracy should be similar for both MSW and industrial landfills. Dow recommends that section 98.343(a) be revised to eliminate the requirement for the use of industrial scales at industrial landfills and allow the use of other records such as those mentioned for MSW landfills. The rule should allow for the use of typical waste disposal records and other testing on parameters such as density and chemical analysis.

Response: This provision was specific to industrial landfills. With regard to industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: John Piotrowski
Commenter Affiliation: Packaging Corporation of America (PCA)
Document Control Number: EPA-HQ-OAR-2008-0508-1029.1
Comment Excerpt Number: 6

Comment: The waste disposal measurement and tracking requirements associated with this Subpart involve a disproportionate level of effort and expense for the quality and quantity of CO_2 emission data generated. Industrial landfills are typically designed to operate as "dry tombs" compared to municipal solid waste (MSW) facilities that feature leachate recirculation to enhance anaerobic decomposition and effect accelerated waste stabilization. Our company's on-site landfills receive a combination of boiler ash, construction debris, non-repulpable resinated paper waste, dregs, sand/grit and miscellaneous trash. On a dry tonnage basis, the inorganic fraction of these combined waste streams represents the lion's share of the total mass. Also, the moisture content of each of these waste streams can vary considerably; consequently, accurately establishing the dry mass of any of these materials is difficult and subject to considerable

variation. Requiring the installation of dedicated scales to track waste tonnages is an unnecessary expenditure. Due to the configuration of our facilities, the industrial scale requirement found at §98.343(a)(4) will necessitate capital expenditures for new scales with additional costs for operation and maintenance. These elaborate tracking and weighing requirements are standard practices at MSW landfills due to tipping fee considerations. However, requiring this same practice at industrial landfills is unwarranted. We believe that periodic calibration of the trucks hauling landfill waste to determine the weight to volume ratio of various waste StrCUMS proN ides a practical measurement for industrial landfills. The waste placement calculation is simplified to the equation: Truck bed volume x number of truckloads x waste weight per unit of volume = net weight landfilled We have determined that landfill emissions are dwarfed by the stationary and process source emissions at our facilities. For example, using the NCASI GHG calculator tool, direct and indirect Cil IG landfill emissions (i.e., CO_2e) represent less than 0.5% of a facility total, an amount that, in our opinion, represents background noise in the context of facility-wide GHG emission totals. Frankly, if substantial amounts of methane were generated at our captive landfills, we would collect and burn it as a fuel. As it is, we find that our landfills produce so little methane that even flaring the landfill gas would be problematic. The amount of staff labor and capital cost required to comply with the provisions proposed in Subpart HH is exceedingly high when compared to facility GHG emissions on either an absolute or proportional basis. We strongly urge the Agency to simplify the proposed tracking and recordkeeping requirements and allow industrial landfills to utilize existing work practices in combination NCASI's GHG calculator tool to report landfill GHG emissions.

Response: See Section III.HH of the preamble for a response to this comment.

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5. DETAILED GHG EMISSION CALCULATION PROCEDURES/EQUATIONS IN THE RULE

Commenter Name: Lorraine Krupa Gershman
Commenter Affiliation: American Chemistry Council (ACC)
Document Control Number: EPA-HQ-OAR-2008-0508-0423.2
Comment Excerpt Number: 143

Comment: The requirement in §98.343 (a)(1) to start calculations 50 years prior to the year being reported must be flexible. Records of waste deposited in industrial landfills may not exist prior to when these landfills became regulated.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Niki Wuestenberg
Commenter Affiliation: Republic Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0557.1
Comment Excerpt Number: 5

Comment: We would like the EPA to revise the equations under HH-6 and HH-8 to include an adjustment (decrease) to the quantity of recovered CH_4 (R) to account for that percentage of recovered landfill gas (R) that is no longer controlled by the landfill owner/operator.

Response: Upon review, we have determined that it is not appropriate to have facilities adjust R if the recovered gas is sent off-site, because this would greatly overstate the actual emissions at the facility. The final rule requires facilities to report their methane generation rates and to indicate whether the collected gas is combusted on-site or sent off-site. We find no reason to assume that all gas sent off-site for destruction is actually emitted as methane. We have concluded that this information provides a reasonable estimate of emissions as well as important information on where the gas is used.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 12

Comment: We also request that equations HH-6 and HH-8 in this subpart be revised to include an adjustment (decrease) to the quantity of recovered CH_4 (R) to account for that percentage of R that is directed off-site and site and/or not destroyed within the landfill owner/operator owned on-site control devices.

Response: See response to comment EPA-HQ-OAR-2008-0508-0557.1, excerpt number 5 on page 89 of this document.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 9

Comment: We request that equations HH-6 and HH-8 in this subpart be revised to include an adjustment (decrease) to the quantity of recovered CH_4 (R) to account for that percentage of R that is directed off-site and site and/or not destroyed within the landfill owner/operator owned on-site control devices.

Response: See response to comment EPA-HQ-OAR-2008-0508-0557.1, Excerpt Number 5 on page 89 of this document.

Commenter Name: See Table 2
Commenter Affiliation:
Document Control Number: EPA-HQ-OAR-2008-0508-0679.1
Comment Excerpt Number: 213

Comment: §98.343. Equations HH-6 through HH-8 use stars to indicate multiplication. These should be replaced with traditional symbols for multiplication (e.g. "X"). This issue is not limited to subpart HH; EPA is inconsistent throughout the proposed rule with the use of "*" or "X" or alternate symbols to indicate multiplication.

Response: We have revised the equations in subpart HH to use "×" for the multiplication symbol.

Commenter Name: Lorraine Krupa Gershman
Commenter Affiliation: American Chemistry Council (ACC)
Document Control Number: EPA-HQ-OAR-2008-0508-0423.2
Comment Excerpt Number: 145

Comment: In §98.343, the expectation to start calculations 50 years prior to the year being calculated is established. Since the first year to be calculated is 2010, the data in Table HH-2 need only go back to 1960. Data in Table HH-2 from 1940 to 1959 should be deleted.

Response: We have deleted rows in Table HH-2 that are not needed for the reporting rule.

Commenter Name: J. Jared Snyder
Commenter Affiliation: New York State Department of Environmental Conservation
Document Control Number: EPA-HQ-OAR-2008-0508-1184
Comment Excerpt Number: 14

Comment: There are two equations for the calculation of methane (CH_4) emissions from landfills with collection systems (HH-6 and HH-8). One is based on a calculation of methane generation for the entire landfill and the other is based on an extrapolation of emissions from measured methane recovery. It is unclear why the draft regulation requires both calculations to be performed and both results to be reported. The method based on methane recovery, required by 98.343(c)(3)(ii), should be clarified and equation HH-8 should be modified to show how to account for recovery system coverage over the landfill. It is unclear how the information required by 98.346 (z) and (aa) differs from that required by 98.346(k) or if cumulative emissions are intended. This should be clarified.

Response: Both calculation approaches are required to help EPA assess the appropriateness of the modeling parameters as well as the estimated landfill gas collection efficiency. We have also provided an additional table to subpart HH that provides additional factors and equations that account for recovery system coverage over the landfill. We also clarified the reporting requirements and eliminated the duplicative reporting requirement noted by the commenter.

Commenter Name: Lorraine Krupa Gershman
Commenter Affiliation: American Chemistry Council (ACC)
Document Control Number: EPA-HQ-OAR-2008-0508-0423.2
Comment Excerpt Number: 144

Comment: The factors in Table HH-1 listed under the heading ³Waste model – bulk waste option´ are not sufficiently diverse to support the wide range of materials that have been placed into industrial landfills. For example, a landfill containing waste polymer plastic would not be represented by a DOC of 0.2028, since polymer plastic cannot be biologically degraded. This further supports our position that EPA should limit industrial landfills subject to reporting to those at pulp and paper, and food processing facilities.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 12

Comment: The soil oxidation default of 10% noted in Equations HH-6 and HH-8 is appropriate; however, landfills should not be permitted to substitute other soil oxidation factors given the tremendous uncertainty in current research and industry positions. We expect that this was the EPA's intention, but it should be clearly stated to prevent confusion or misinterpretation. Soil oxidation is subject to significant uncertainty depending on LFG constituent, soil type, moisture, cover imperfections, etc. Oxidation by certain landfill covers observed in controlled laboratory or limited scale field studies may not simulate cover conditions and fugitive LFG escape pathways present in large scale open or closed landfills. At this time the state-of knowledge appears insufficient to resolve this potential bias and is another indication of the difficulty estimating landfill emissions. As it relates to soil oxidation, the SWICS position paper referenced earlier asserts that microorganisms present in landfill cover materials effectively oxidize fugitive methane before being released through landfill surfaces and proposes an oxidation range of 22-55% depending on soil type. The data used in SWICS' analysis are based on controlled column tests and small-scale field studies. These test conditions do not account for the large emission variability caused by landfill gas channeling through fissures, cracks, and other cover imperfections that occur at operating landfills. To account for this variability IPCC uses an oxidation factor of 10%. The following explains IPCC's concern over soil oxidation uncertainty, a concern that is not addressed by the SWICS paper: "Oxidation factor (OX): The oxidation factor is very uncertain because it is difficult to measure, varies considerably with the thickness and nature of the cover material, atmospheric conditions, and climate, the flux of the methane, and the escape of methane through cracks/fissures in the cover material. Field and laboratory studies which determine oxidation of CH_4 only through uniform and homogeneous soil layers may lead to overestimation of oxidation in landfill cover soils." The EPA also recognized the contribution of cracks in its Technical Support Document. stating "a significant fraction of the landfill gas releases may be focused in very limited areas where larger fissures in the surface soil exist." Given these significant testing limitations as well as the plethora of field variables that can affect soil oxidation (waste type, cover material type and thickness, climate, daily and seasonal variability, and landfill O&M practices) the limited database does not justify SWICS' proposed soil oxidation values. Consequently, the EPA default of 10% should be mandatory. The one exception would be if the landfill submitted direct methane emission monitoring data using OTM-10, since the direct emissions as measured via OTM-10 would already account for soil oxidation.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Traylor Champion
Commenter Affiliation: Georgia-Pacific, LLC (GP)
Document Control Number: EPA-HQ-OAR-2008-0508-0380.1
Comment Excerpt Number: 36

Comment: GP supports AF&PA's comment on landfills. AF&PA is providing a study

conducted by NCASI on landfill emissions and has pointed out important differences between existing calculation tools and methods and EPA's provided method in the reporting rule. Notably, differences exist in the default parameters of DOC and k provided by EPA that should be resolved.

Response: This comment is specific to the default factors for pulp and paper waste. With regard to industrial landfills, see Section III.HH of the preamble for a response to this comment.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 12

Comment: We believe that landfill gas generation equations proposed to be used for emissions reporting overstate the emissions from arid landfills. This is based on observations resulting from the methane monitoring currently required of landfills subject to the Federal CAA Title V air program. Landfills regulated under NSPS must perform quarterly surface methane monitoring. Data from these monitoring events for arid landfills indicate that surface emissions are well below the emissions standard required by regulation; however calculations using the equations in the proposed rule show that the landfills in arid regions would have significant emissions. These high calculated emissions rates are not consistent with those observed in the field during surface methane monitoring events. As such the mandatory reporting rule must allow site-specific methods be used in place of these default methods and equations.

Response: From this comment it is not clear why the quarterly surface methane monitoring suggests that the landfill gas generation equations overestimate emissions from arid landfills. First, we note that quarterly surface methane monitoring is only required for landfills that are required to install landfill gas collection systems. The surface methane monitoring is required to demonstrate that the collection system is operating efficiently; it does not have any reflection on the quantity of gas generated. The landfill gas generation equations provide an estimate of the methane generation. When landfill gas collection is used, methane emissions (that methane leaving the landfill surface) will be significantly lower than methane generation. Second, it is difficult to translate surface concentration measurements to mass flux emission rates. The commenter did not provided information on how these surface concentration measurements would be used to develop site specific methods or inputs. Assuming the commenter is stating that these monitoring data suggest that the default landfill gas collection efficiency is inappropriate, we do note that, in the final rule, we include the SWICS protocol method for estimating landfill gas collection efficiency, which allows facilities to develop site-specific gas collection efficiencies under a structured and verifiable procedure. We also note that the default "k" values provided in the rule do account for slower degradation rates expected in arid regions. Therefore, we find that the equations and defaults provided in the final rule are appropriate. Landfills with gas collection systems will also have an independent measure of methane generation based on the quantity and composition of landfill gas collected via verifiable methods. Beyond the alternatives provided in the rule (for DOC, k, and gas collection efficiency), we determined site-specific methods would result in unverifiable and likely less accurate emissions data, and are therefore not allowed in the final rule.

Commenter Name: Rhea Hale
Commenter Affiliation: American Forest & Paper Association (AF&PA)
Document Control Number: EPA-HQ-OAR-2008-0508-0909.1
Comment Excerpt Number: 15

Comment: The forest products industry does not typically collect gases from its landfills and consequently does not continuously monitor flow and composition in gas collection systems. The industry quite often does not produce enough gas to even flare it. Therefore, instead, we suggest that the formulas found in the WRI/WBCSD GHG Protocol GHG Calculation Tool also be an available option used to calculate emissions from these types of systems.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: John H. Skinner
Commenter Affiliation: Solid Waste Association of North America (SWANA)
Document Control Number: EPA-HQ-OAR-2008-0508-0659.1
Comment Excerpt Number: 17

Comment: SWANA believes that the EPA should use default values for landfill gas collection efficiency and methane oxidation rates, as established in a landfill industry white paper.[See reference provided by commenter.] The recommended values for collection efficiency are: 1. 50-70 percent (mid-range default = 60%) for a landfill or portions of a landfill that are under daily soil cover with an active landfill gas collection system installed (note that because of limited test data on daily soil covers, the selected range is based on the opinion of experts involved with the creation and review of this document); 2. 54-95 percent (mid-range default = 75%) for a landfill or portions of a landfill that contain an intermediate soil cover with an active landfill gas collection system; and 3. 90-99 percent (mid-range default = 95%) for landfills that contain a final soil and geomembrane cover systems with an active landfill gas collection system. [See submittal for data table summarizing methane oxidation rates.]

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 7

Comment: The U.S. EPA should require all landfills generating more than 100,000 metric tons of CO_2 emissions per year to use representative annual source testing performed in accordance with EPA Method OTM-10, Optical Remote Sensing for Emission Characterization from Non-point Sources. According to the Proposed Rule Technical Support Document for the Landfill Sector, the 100,000 metric ton threshold would apply to only 13% of active and closed landfills, but would represent approximately 55% of the greenhouse gas emissions from landfills. An approach requiring direct measurement for GHG reporting for landfills above a certain threshold is consistent with the Proposed Rule's provisions for stationary combustion sources, where only sources with maximum rated heat input capacities less than 250 mmBtu / hr are permitted to use simpler emissions calculation methods. Optical Remote Sensing (ORS), performed in accordance

with OTM-10, is a viable method to measure CH_4 emissions from area sources such as landfills. The landfill industry has provided a significant quantity of results from ORS in support of its comments on the draft revisions to AP-42 for landfills. Furthermore, ORS testing at landfills has been the subject of a cooperative research agreement (CRADA) between the EPA and Waste Management. If the landfill industry deems this data appropriate to develop emission factors, it should be appropriate for inventory purposes. The industry's submittal of ORS data for EPA's consideration during the revision of AP-42 is a strong endorsement of the method's use in developing greenhouse gas inventories. Finally, the ORS data submitted in support of a GHG emissions reporting requirement will be more representative by design than the data provided to support the industry's position on emission factors. In order to provide a representative result, landfill operators must complete direct measurement of methane emissions using ORS for each operating stage present at the landfill site. In typical landfill operations, there are often as many as five distinct stages, each exhibiting different landfill gas collection efficiencies: Stage 1 – Period after initial placement of waste in an operating cell with no gas collection system in place. According to federal New Source Performance Standards (NSPS), this period may extend for up to five years from the date of first placement of waste in a landfill cell. Stage 2 – An interim gas collection system is installed for the active cell. Stage 3 – Final gas collection system is installed for previously active cell; however, an impermeable cap may or may not be in place, and the side(s) of the cell adjacent to other operating cell(s) is (are) not closed and are a pathway for horizontal LFG migration and escape. Stage 4 – Entire landfill or discrete landfill phase is closed with permanent cap. Gas collection system is in place and assumed to be fully operational. Impermeable cap and landfill gas collection system are assumed to be properly maintained. Stage 5 – Landfill gas collection system turned off. In addition, some stages may need to be subdivided based on construction or operational differences. For example, if a landfill has two distinct phases both with permanent caps and closure (Stage 4), one with a clay cap and the other with a synthetic cap, direct measurement of methane emissions using ORS should be completed for both phases separately. Measurements should be required at least quarterly to manage seasonal variations. The EPA should develop a robust methodology, in consultation with landfill operators and technology experts, for use of ORS in compliance with GHG reporting requirements. A tiered approach to direct GHG emissions reporting will help mitigate the expense to smaller landfill operators such as municipalities, while ensuring proper direct measurement for larger sources. Given the generally low costs of landfilling, annual source testing in accordance with OTM-10 is unlikely to represent a significant additional cost burden to landfill waste management.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Steven Niehoff
Commenter Affiliation: Weaver Boos Consultants
Document Control Number: EPA-HQ-OAR-2008-0508-0212.1g
Comment Excerpt Number: 3

Comment: My final comments are related to the emission calculation section of the Proposed Rule. Table HH-1 of the Proposed Rule lists emission factors for all landfills or separate emission factors that may be used for various composition categories such as food, waste, paper, textiles, or diapers. No landfill that we are aware of tracks their waste intake to this degree or to this level of composition, and, therefore, we believe that all facilities that are going to be reporting are likely going to be using the default values for municipal solid waste or industrial

waste landfills. We did notice a possible compromise, though, specifically the reporting requirements in Section 98.346, request composition data of the waste if it is available, specifically the landfills report their waste intake categorized by waste type such as municipal solid waste, construction demolition debris, or sludge. We would request that EPA provide emission factors for these specific waste types, such as municipal waste, construction demolition debris, and sludge, rather than these more refined categories, so that I think the final numbers you will be getting as far as methane generation, I think will ultimately be a bit more accurate and more true to what is actually being emitted.

Response: EPA prefers to obtain disposal estimates based on the detailed waste composition (e.g., food, paper, textiles, diapers, etc). These waste categories are used by other countries and represent the preferred approach following the IPCC inventory guidelines. Accepted default values of the more generic waste classes (e.g., MSW or construction/demolition debris) are more highly variable and consequently, many of these waste classes do not have accepted default DOC values. However, we do recognize that the detailed composition data may not be available. In these cases, use of the bulk MSW default DOC value is allowed.

Commenter Name: Chris Greissing
Commenter Affiliation: Industrial Minerals Association - North America (IMA-NA)
Document Control Number: EPA-HQ-OAR-2008-0508-0705.1
Comment Excerpt Number: 24

Comment: If reporting of GHG emissions from industrial landfills is not limited to the food processing, pulp and paper, and ethanol production facilities, then EPA should amend Table HH-1 and provide specific factors that are relevant to the regulated industry. Calculations for industrial landfills may be done using material-specific waste quantity data or bulk waste data and various factors are referenced in Table HH-1. For the material-specific model for industrial landfills the only factors provided are for food processing and pulp and paper facilities. We do not believe that these factors are appropriate for industrial landfills associated with soda ash production and that it is highly likely that their use will significantly overestimate the methane emissions from these facilities. Similarly, the degradable organic carbon fraction value used in the bulk waste model will also overestimate methane emissions for soda ash plant landfills.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Traylor Champion
Commenter Affiliation: Georgia-Pacific, LLC (GP)
Document Control Number: EPA-HQ-OAR-2008-0508-0380.1
Comment Excerpt Number: 35

Comment: The current requirement of direct mass measurement of waste entering the landfill with industrial scales with a manufacturer's stated accuracy of ±2% is overly burdensome and costly due to the minimal contribution of industrial landfill greenhouse gas emissions to overall facility emissions. In the pulp and paper industry, all waste is generated on-site. There is no financial transaction taking place for waste entering the landfill and, therefore, no need to accurately weight the material. There are also materials that are conveyed and sluiced to solid waste disposal areas that could not be monitored across truck scales. It is a common practice to use company records such as truck counts and product yield data to determine the approximate

amount of waste disposed of in on-site industrial landfills rather than conducting direct mass measurements of the waste or trucks. Therefore, to comply with the current proposed requirement, facilities would have to install costly industrial scales with a high degree of accuracy. This potential cost is unnecessary given the minimal contribution of industrial landfill emissions to total facility emissions. In addition, there is often a large portion of landfilled waste at pulp and paper mill industrial landfills that is inert and will not generate CH_4, such as boiler ashes. GP interprets the current calculation methodology to allow for conducting material-specific calculations for the waste categories for which DOC and k parameters are provided in Table HH-1 for those years in which material-specific waste quantities are measured. Presumably, if there exists no DOC and k parameters in Table HH-1 for a given waste category, such as boiler ashes, reporters would assume they are zero and no CH_4 is generated from that waste. This assumption would more accurately calculate CH_4 emissions from a landfill by excluding quantities of inert wastes rather than assuming all wastes generate CH_4. However, as discussed above, it is not common to measure waste disposed of in industrial landfills at all, much less by type; therefore, it is unclear if pulp and paper mills could use this methodology without specific measurements of each waste type, or mills should use the generic DOC and k parameters provided under the "Industrial Waste Landfills – Pulp and Paper" category with the full quantity of waste disposed of in the landfill in a given year. Pulp and paper mills are able to estimate the type and quantity of wastes disposed of in a year through use of company records and process parameters. GP recommends EPA specifically allow industrial landfills to use company records to determine the quantity and type of wastes disposed of in a given year, and to exclude the portion of waste that is inert and will not generate CH_4.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 26

Comment: Regarding the Landfills Source Category at Subpart HH, the Preamble to the proposed rule states (16559): To accurately use this [proposed] method, waste disposal data are needed for the 50 year period prior to the year of the emissions estimate. We emphasize that very few, if any, municipal solid waste (MSW) landfills have been in operation for 50 years. Therefore, EPA's proposal of this method for estimating GHG releases is seriously flawed.

Response: We clarify that waste disposal data are only required for years that the landfill is in active operation (i.e., years for which the landfill receives waste), but that this data should be collected as far back as 1960, at a minimum. While MSW landfills may not actively receive waste for 50 years, they will continue to emit significant quantities of methane for decades after closure. As such, a landfill that stopped receiving waste in 1990 may still have significant methane emissions. To accurately assess these emissions, data are needed for the quantity of waste disposed of between 1960 and 1990, at a minimum. If the landfill operated for more than 30 years (say it opened in 1955), collecting waste data for these additional years will improve the emission estimate, but are not required by the rule. For landfills that did not begin receiving waste until after 1960, the rule specifies that the calculations are limited to those years after waste is received. We did not intend to suggest that waste data were required prior to the opening of the landfill.

6. MONITORING AND QA/QC REQUIREMENTS

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 11

Comment: When modeling methane emissions, the calculations in §98.343(a)(1) must account for more than the 50 years of waste disposal, otherwise significant amounts of methane generation will not be calculated. For example, for landfills located in areas with less than 20 inches of rain per year where the default rate constant is 0.02 / year, requiring only fifty years worth of data omits 36.8% of the methane generation potential of a given ton of waste. The extent of historic disposal records required must take into account the value of the rate constant assumed in the calculation. The IPCC 2006 guidelines notes that "The [First Order Decay] method requires data to be collected or estimated for historical disposals of waste over a time period of 3 to 5 half-lives in order to achieve an acceptably accurate result." Although IPCC identifies 50 years as good practice, the use of 50 years introduces significant and unnecessary errors. [See DCN:EPA-HQ-OAR-2008-0508-0548.1 for data table of the omission of methane generation] To ensure inventory accuracy, with little additional effort, the EPA should specify that a minimum of five half-lives worth of data are required for the methane generation calculation. At the five half-lives threshold, the calculation will capture 96.9% of the methane generation potential, within the materiality thresholds of most verified GHG accounting programs currently in place. To minimize the reporting burden, the EPA should allow estimates of historic data, potentially based on waste-in-place calculations, where records are not available.

Response: We recognize that for a small fraction of arid landfills that have a long operational history, limiting the required reporting to 50 years will omit a portion of the gas generated by these facility. However, we also recognize that only about 10 percent of the population (and the corresponding projected quantity of waste disposed) live in arid regions. As a result, few landfills will have an emission time horizon significantly exceeding 50 years. As noted by commenter EPA-HQ-OAR-2008-0508-0615, excerpt number on page 102 of this document, few MSW landfills have been operating for 50 years. We selected the 50 year time horizon, in part, because sanitary landfill use was not widespread prior to 1960. While we maintain that a 50 year time horizon is appropriate for the final rule, we also note that, in the future historical disposal data will be available from past GHG inventories and can be used to further evaluate this time horizon for future policy analyses. Under the commenters proposal, arid landfills would be required to estimate waste disposal pratices over a period of 175 years. MSW landfills do not operate over such long periods. In fact, this would pre-date the use of sanitary landfills. We have provided additional methods for assessing waste disposal quantities in historic years as suggested by the commenter, see Section III.HH of the preamble for a response to this comment.

Commenter Name: William Paraskevas
Commenter Affiliation: Andrews Engineering
Document Control Number: EPA-HQ-OAR-2008-0508-0342

Comment Excerpt Number: 5

Comment: Landfills have invested significant effort and expense in equipment to comply with NSPS regulations, which cover much of the same information and systems as in the proposed GHG reporting rules. We believe it is desirable and practical for the GHG rules to recognize the existing gas monitoring equipment as acceptable for providing the information to be required under the GHG rules.

Response: The NSPS requires determination of non-methane organic carbon concentrations to determine rule applicability and monitoring of ambient methane concentrations at the landfill surface to ensure proper operation of the gas collection system. Neither of these monitoring methods are applicable for estimating landfill gas generation or emissions. We have provided additional options in the final rule for monitoring landfill gas for sites with collection systems. Due to the differences in scope of pollutants considered in the current NSPS rules versus those of this rule, it is appropriate for the monitoring requirements of the two rules to be different as well.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 28

Comment: Section V. HH (3), monthly sampling of CH_4 flow and concentration versus continuous recording: Most MSW landfills in Wisconsin collect landfill gas by gas extraction wells and piping connected to blowers. The gas is either flared or is used as fuel in an electrical generating plant, with excess sent to a standby flare. Those MSW landfills that flare gas only are not usually equipped with continuous flow monitors but could alter their current gas monitoring to a monthly schedule. Those MSW landfills that operate electrical generating plants likely already have installed continuous gas flow and concentration monitoring hardware and could report on that basis. Our recommendation is that both approaches be allowed, with continuous monitoring applied to landfills that operate electrical generating plants. In addition, gas flows to standby flares should also quantified, for excess above what the electrical generating plant can use and for plant downtimes. Our experience is that back up flares are needed to provide combustion capacity for any site that uses landfill gas for electrical generation and that, for some sites, a considerable fraction of total gas generated is flared rather than used as fuel. The rule should be specific on requiring monitoring flow and gas concentration for any time periods where gas is diverted to flares, although continuous monitoring may be an excessive requirement.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 26

Comment: Section 98.344 on monitoring & QA/QC requirements: Sub (b): The Department recommends that MSW landfills that only flare gas be allowed to monitor methane using

portable handheld meters, as well as to allow monitoring on a less frequent basis, as recommended above. Portable handheld meters could be required to be calibrated against gas chromatographs on a periodic basis to assure sufficiently accurate readings.

Response: In the final rule, we have provided additional monitoring alternatives, including the use of weekly sampling. We expanded the methods applicable for determining methane concentration. Provided the portable meter is appropriately calibrated, the method suggested by the commenter appears to be allowable under the final rule.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 24

Comment: Section 98.343(b)(1) on calculating GHG emissions: The Department recommends that MSW landfills that only flare gas be allowed to monitor the specified quality parameters on a discrete schedule, no less often than monthly. MSW landfills that flare gas do not monitor gas flow rates, etc, continuously and would encounter considerable costs and equipment purchases to acquire and install it.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 18

Comment: EPA proposes that these landfills would continuously measure the CH_4 flow and concentration at the flare or energy device. EPA requested comment on monthly as opposed to continuous sampling. The NSPS requires continuous monitoring of landfill gas flow and temperature but does not require continuous monitoring of CH_4. Because this level of monitoring is not a regulatory requirement, it is not in place at most landfills. However, EPA is proposing that facilities start collecting data on January 1, 2010. Obtaining this equipment and placing it in service in time to begin reporting on this date would be impossible. Based on EPA data, at least 2400 MSW landfills would have to install at least one monitoring device. Given an average cost of $30,000 per device, the cost of supplying this data will be staggering. NSWMA supports monthly testing because it is the common practice throughout the nation and is often a state permit requirement. In addition, the Agency does not provide a rationale for continuous emission monitoring that would improve monitoring over the Agency's current NSPS/EG rules. NSWMA recommends that EPA not require continuous emission monitoring until it can justify the need for the data and the cost to obtain it.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bill Perez
Commenter Affiliation: LANDTEC North America, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-1485
Comment Excerpt Number: 1

Comment: In several industries including; landfill gas (LFG), manure management, anaerobic digesters, waste-water treatment plants and others, portable infrared analyzers are the instruments of choice for quantifying methane in the field. Fixed infrared analyzers with automatic calibration systems have been proven reliable and cost effective on Clean Development Mechanism (CDM) projects throughout the world. These infrared monitoring systems are passing independent third party validations on CDM projects and generating certified emission reduction credits. We ask the EPA to include calibrated infrared technology as an acceptable method for quantifying methane when reporting Greenhouse gas emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Traylor Champion
Commenter Affiliation: Georgia-Pacific, LLC (GP)
Document Control Number: EPA-HQ-OAR-2008-0508-0380.1
Comment Excerpt Number: 37

Comment: The current requirement of determining the amount of landfill gas CH_4 destroyed using gas chromatography is overly burdensome and costly because the equipment is expensive to purchase and maintain. Further, the data would not be useful because the emissions are a small fraction of overall mill emissions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 17

Comment: Waste Management supports the Agency's conclusion that direct measurement methods for measuring surface methane emissions from landfills are costly, complex, and their application at landfills still under investigation. The Agency, in its draft revisions to the AP-42 Emission Factors for MSW Landfills, recommended use of Optical Remote Sensing with Radial Plume Mapping (ORS-RPM) to quantify the uncontrolled emission of landfill gas as described in Other Test Method 10 (OTM-10). Waste Management, in recent comments to EPA, argued vigorously against this recommendation saying that the method has not been validated for measuring fugitive methane or other hydrocarbons at landfills and therefore should not be recommended as a reliable method at this time. Waste Management has been testing the TDL OTM-10 method at landfills to insure its proper development and application. It is because of Waste Management's work in this research area that EPA came to understand and acknowledge that there are limitations with the OTM-10 for estimating fugitive emissions at landfills. WM brought this issue to the attention of the EPA in 2007. This resulted in a cooperative agreement between the Office of Research and Development and WM to perform a series of acetylene

tracer experiments designed to better understand how to determine the area contributing to the measured VRPM flux and therefore derive unit emission rates for landfills (Thoma et al 2008). [Footnote: Thoma, E.D.; Thorneloe, S.A.; Segall, R.R.; Green, R.B.; Hater, G.R.; Hashmonay, R.A.; Modrak, M.T.; Chase, Mi.; Goldsmith, C.D.. "Development of EPA OTM 10 for landfill applications, interim report 2." In Proceedings of the Global Waste Management Symposium, Copper Mountain, CO, September 7-10, 2008.] Based on the results of this cooperative study, Thoma et al 2009 [footnote: Thoma, E.D.; Green, R.B.; Hater, G.R.; Goldsmith C.D.; Swan, N.D.; Chase,M.J.; Hashmonay, R.A. Development of EPA OTM 10 for Landfill Applications. submitted to the ASCE Journal of Environmental Engineering, January 2009] have proposed a multiple linear regression model to estimate the surface area contributing to the VRPM mass flow. While this certainly represents progress in the application of the OTM-10 method to landfills, the paper describing the model has yet to be published in the peer-reviewed literature, nor has it been subjected to the level of application necessary to demonstrate its accuracy for use as a regulatory method. While Waste Management supports providing the ability to use site-specific, direct measurement data, which may one day better represent emissions, it is premature to recommend OTM-10 or similar methods as the means by which these data can be reliably obtained. The EPA Office of Research and Development, has itself, enumerated the advantages and disadvantages of using OTM-10, and has stated in meetings and briefing materials that it is "probably not the best tool for whole-facility emission estimation because it is difficult to piece together smaller area measurements and scale them to a whole landfill measure due to large uncertainty." [Footnote: EPA Briefing "Discussion on New Area Source Research, EPA-WM meeting February 3, 2009, RIP, NC.] Because of these inherent difficulties with using OTM-10 to measure landfill emissions, EPA and WM are developing an additional Cooperative Research and Development Agreement to test the use of a complimentary tool using a mobile tracer method.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Michael E. Van Brunt
Commenter Affiliation: Covanta Energy Corporation
Document Control Number: EPA-HQ-OAR-2008-0508-0548.1
Comment Excerpt Number: 13

Comment: The requirements for landfill gas system monitoring proposed at §98.343(b)(1) are appropriate. Given the potency of methane and the variability in landfill operations, continuous monitoring is imperative. However, it is important to note that landfills capture only a portion of the landfill gas generated either at a point in time or over the life of the waste in a landfill. In contrast, continuous monitoring of stationary combustion and electrical generation source categories capture emissions data for the entire source stream over the full life of the facility.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Angela D. Marconi
Commenter Affiliation: Delaware Solid Waste Authority
Document Control Number: EPA-HQ-OAR-2008-0508-0472.1
Comment Excerpt Number: 4

Comment: Preamble Section V.HH along with part 98.343 (b)(1) of the rule specify continuous

monitoring requirements for flow rate, CH_4, temperature and pressure prior to any treatment equipment. Currently, monitoring at DSWA's three landfills is done following condensate knockout and, in some cases, following gas compression. These measurements should be accepted for inventory purposes. Continuous CH_4 measurement is not done prior to flaring. Installation of the monitoring equipment as currently required in the rule will be expensive, redundant and may not be possible by the deadline (January 1, 2010). Many sites have several control devices (engines and flares), which would require several separate monitoring systems. DSWA recommends allowing monthly monitoring using a GEM (or equivalent device) for inventory purposes. Continuous monitoring of CH_4 is not necessary, nor is monthly laboratory analysis.

Response: See Section III.HH of the preamble for a response to this comment. Please note that we have established means of using weekly evaluations of pressure and temperature for continuous flow systems not currently equipped with automatic pressure and temperature corrections.

Commenter Name: William Paraskevas
Commenter Affiliation: Andrews Engineering
Document Control Number: EPA-HQ-OAR-2008-0508-0342
Comment Excerpt Number: 4

Comment: We also request clarification on requirements for acceptable monitoring devices for those landfills that elect to do continuous monitoring of methane concentration. 40 CFR 98.343(b) references 40 CFR 98.344 for specifications on the type of monitor to be used for measurement of methane concentration. However, the latter section primarily addresses methods for calibrating methane composition monitors. It is not clear from the text whether the continuous monitors must incorporate gas chromatographic methods as integral parts of the monitoring equipment for determining methane concentrations or whether other detection techniques, such as infrared sensors are acceptable.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Rhea Hale
Commenter Affiliation: American Forest & Paper Association (AF&PA)
Document Control Number: EPA-HQ-OAR-2008-0508-0909.1
Comment Excerpt Number: 13

Comment: AF&PA objects to the requirement to weigh truckloads entering landfills, let alone to 2% accuracy. This requirement appears to be written for MSW landfills and it is not common practice for captive industrial landfills to physically weigh inputs. Instead we recommend that estimation methods outlined in the proposal to calculate previous years' data be applied in future years as well. To require physical measurement of each load in reporting years is overly burdensome, costly and does not significantly enhance the accuracy of emissions estimates. A facility should, however, have the option to amend these calculations to reflect site specific circumstances and deposition rates.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Stephen E. Woock
Commenter Affiliation: Weyerhaeuser Company
Document Control Number: EPA-HQ-OAR-2008-0508-0451.1
Comment Excerpt Number: 20

Comment: At §98.343 (a)(4) EPA proposes to specify the direct measurement of the waste entering a landfill by using a device with a manufacturer's stated accuracy of ±2%. Weyerhaeuser does not agree with specifying by rule an accuracy level to track the material entering the landfill. The level of accuracy for measuring any material, whether it is fuel usage or waste entering a landfill, should be consistent within this proposed rule. In Subpart A at §98.34 (b) "Monitoring and QA/QC Requirements", the owner/operator is directed to document the procedures used to ensure the accuracy of the estimates of fuel usage. In addition, the estimated accuracy is to be recorded and the technical basis for these estimates provided. In sum, the accuracy for measuring fuel usage is determined using documented procedures and a sound technical basis. Typically these will be based on the manufacturer's specified accuracy guarantees. In comparison, specifying a device accuracy value (e.g. ±2%) is first inconsistent with Subpart A's monitoring and QA/QC requirements, and secondly, it disregards (and will likely be in conflict with) the a manufacturer's actual accuracy guarantees.

Response: This provision was specific to industrial landfills. See Section III.HH of the preamble for a response to this comment.

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7. PROCEDURES FOR ESTIMATING MISSING DATA

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 19

Comment: EPA proposes using national waste composition rates as a default value if specific composition is unknown. While most landfill operators will know the amount of MSW, C&D, etc, either by weight or by cubic yard, they are unlikely to know the specific composition of those materials. As a result, using national composition rates is reasonable.

Response: We appreciate the comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 20

Comment: EPA proposed determining the population served by the landfill for those years when waste disposal quantities are not readily available. However, only a few landfills will know the size of the population that they serve. These landfills will be smaller facilities whose wasteshed

is limited to a specific population base, such as a city, county, or group of local governments. This limited wasteshed will be intentional either as a permit requirement or because the facility is designed to serve a specific geographic area. Most regional landfills serve a wasteshed whose population can vary on a day-to-day basis depending on which haulers in which cities choose to use that disposal facility. In particular, regional landfills serving a multi-state area receive, on a daily basis, solid waste that comes from a variety of locations. Waste sources vary for a number of reasons including pricing, available transportation, and other competitive factors. Regional landfills can receive solid waste generated in many cities in two or more states. Estimating the daily population served by the facility will be impossible. In addition, solid waste from a city or county can go to different landfills on the same day because different hauling companies collect materials from different customers and use different disposal facilities. While it might be possible to estimate the population served by a residential waste collector using the same landfill, estimating the population served by haulers collecting from businesses will be impossible. We strongly urge EPA not to require population estimates. In most cases will be impossible to accurately report.

Response: See Section III.HH of the preamble for a response to this comment.

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8. DATA REPORTING REQUIREMENTS

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1
Comment Excerpt Number: 27

Comment: Section 98.346 on data reporting requirements: The Department recommends that MSW landfill operators be required to report on whether their facility practices leachate recirculation or uses additional liquids under an RD&D permit, to raise the moisture content of the landfilled waste or uses other measures to enhance waste decomposition and gas generation rates. If leachate recirculation or additional liquids are effective, an MSW landfill can generate landfill gas at considerably higher rates than would be predicted using Equation HH-1 and the parameters in Table HH-l.

Response: We have revised the final rule to require landfills that use leachate recirculation to use the "wet" or "high-end" k values in order to more accurately characterize methane generation at these landfills. We have also added a reporting requirement in the final rule to indicate whether or not leachate recirculation is practiced at the landfill.

Commenter Name: Rhea Hale
Commenter Affiliation: American Forest & Paper Association (AF&PA)
Document Control Number: EPA-HQ-OAR-2008-0508-0909.1
Comment Excerpt Number: 14

Comment: The data reporting requirements in Section 98.346 again appear geared toward MSW landfills. Much of this data either doesn't exist or does not appear to be required to estimate

GHG emissions. Specifically, it is recommended that the provisions in 98.346 that are not explicitly required to estimate emissions be deleted. AF&PA at a minimum believes these include paragraphs c,d,l,m,v,w,x, and y.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Linda L. Koop
Commenter Affiliation: Texas Clean Air Cities Coalition (TCACC)
Document Control Number: EPA-HQ-OAR-2008-0508-1037.1
Comment Excerpt Number: 4

Comment: Many of the TCACC members own and/or operate existing landfills, or have owned them in the past. Many local governments also struggle with identification and subsequent closure of historical landfills that may exist within the boundaries of the local government. The TCACC has concerns related to the data requirements in the rule for landfills. Many local governments would not have access to the required data to fulfill the reporting requirements. If the data could be recovered, it would be at an extreme cost to the local government. If a member of TCACC chose to estimate their landfill by the estimated population serviced, what would be adequate for documentation to support this estimate?

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 21

Comment: NSWMA urges EPA to allow MSW landfills that accept C&D waste to submit data reflecting the amount of C&D in the landfill. Many MSW landfills accept C&D as part of their daily intake. EPA has noted that this material is not likely to produce greenhouse gases. We suggest that if a landfill accepts C&D it should be allowed to submit waste composition data showing the amount of C&D and the resulting reduction in CH_4 emissions. We note that the IPCC waste component model includes "inert waste" that does not generate greenhouse gas. We recommend that EPA also include such language.

Response: See response to comment EPA-HQ-OAR-2008-0508-0212.1g, excerpt number 4 on page 14 of this document.

Commenter Name: Bruce J. Parker
Commenter Affiliation: National Solid Wastes Management Association
Document Control Number: EPA-HQ-OAR-2008-0508-2126
Comment Excerpt Number: 22

Comment: We request clarification of s. 98.33(b)(5)(ii). We believe that EPA's intent is to require the use of the Tier 4 calculation only if a unit meets the requirements of all 6 subheadings, otherwise the Tier 4 calculation is not required. We are concerned that if it is

required for a single subheading, for instance (C): the unit has operated for more than 1,000 hours in any calendar year since 2005, this will include every landfill gas to energy project in the U.S. Furthermore, this requires the installation of continuous monitoring equipment on the stacks of each emission unit, a requirement that currently exceeds the vast majority of operating air permits. The requirement to install this equipment by 2011 is unduly burdensome and is made worse by the reality that these are biogenic emissions. As noted in our earlier comments, we are strongly opposed to any reporting requirements for these biogenic emissions. We see no value in adding to the cost of reporting biogenic emissions the expense of flaring or converting landfill gas to energy. Finally, the NSPS JJJJ requires performance testing on stationary electrical generation engines every 8760 hours or 3 years of operation. This testing should be sufficient for electrical generation equipment.

Response: See response to comment EPA-HQ-OAR-2008-0508-0706.1, excerpt number 2 on page 74 of this document.

Commenter Name: Robbie LaBorde
Commenter Affiliation: CLECO Corporation (CLECO)
Document Control Number: EPA-HQ-OAR-2008-0508-1566
Comment Excerpt Number: 8

Comment: Subpart HH includes landfills as a source category and in 98.340 states that the category includes industrial landfills including but not limited to food processing, pulp and paper mills and ethanol production. 98.341 states one must report emissions if a facility contains a landfill and meets the eligibility requirements of either 98.2(a)(1) or (2). 98.343 describes how to calculate the green house gag emissions and makes reference to table HH-1 for parameters to be used in the equations. 98.346 describes the reporting requirements which includes the reporting of the fractions of the various materials in a landfill. However, the Subpart does not describe how to proceed if the landfill does not contain material described in Table HH-1. The Subpart does not indicate if the Data Reporting Requirements of 98.346 are to be followed if green house gas emissions are insignificant due to types of materials in landfill or if green house gas emissions cannot be calculated due to a lack of applicable parameters in Table HH-1. For instance, if the landfill contents are a mixture of bottom ash and fly ash from a coal-fired boiler, the Subpart does not indicate how to proceed.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Ronald H. Strube
Commenter Affiliation: Veolia ES Solid Waste
Document Control Number: EPA-HQ-OAR-2008-0508-0690.1
Comment Excerpt Number: 18

Comment: Veolia urges EPA to allow MSW landfills that accept C&D waste to submit data reflecting the amount of C&D in the landfill. Many MSW landfills accept C&D as part of their daily intake. EPA has noted that this material is not likely to produce greenhouse gases. We suggest that if a landfill accepts C&D it should be allowed to submit waste composition data showing the amount of C&D and the resulting reduction in CH_4 emissions. We note that the IPCC waste component model includes “inert waste” that does not generate greenhouse gas. We recommend that EPA also include such language.

Response: See response to comment EPA-HQ-OAR-2008-0508-0212.1g, excerpt number 4 on page 14 of this document.

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9. RECORDS THAT MUST BE RETAINED

Commenter Name: Michael Carlson
Commenter Affiliation: MEC Environmental Consulting
Document Control Number: EPA-HQ-OAR-2008-0508-0615
Comment Excerpt Number: 30

Comment: Information on waste disposal quantities and waste composition data are usually not available for closed (as defined above- not as defined by the proposed rule) MSW facilities. Thus, it is impossible to retain or provide the agency with such records for many old landfill sites.

Response: See Section III.HH of the preamble for a response to this comment.

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10. COST DATA

Commenter Name: Marcelle Shoop
Commenter Affiliation: Rio Tinto Services, Inc.
Document Control Number: EPA-HQ-OAR-2008-0508-0636.1
Comment Excerpt Number: 10

Comment: In the absence of a de minimis exception or simplified methodology, costs of complying with the rule are substantially disproportionate to the low level of emissions that would be reported. One Rio Tinto facility estimated the potential costs to comply with this requirement. For two small landfills (approximately 5,000 short tons of wastelyear) the capital cost of installing scales could be as much as $50,000 each for a total cost of $100,000, with operating and driver time resulting in an estimated annualized cost of over $23,000. Other lower cost volume estimation approaches might include the use of on-board truck weighing systems or the reliance on spot checks on scales at nearby locations, with estimated annualized costs of $3,500 or $1,875 respectively. These costs are substantially higher than the capital and O&M costs EPA estimated for Subpart HH Landfills in the RegUlatory Impact Analysis (RIA). See Table 4-61 of the RIA (estimating annualized capital costs of $175 and annualized O&M Costs of $467).

Response: The requirement to weigh landfill truckloads is specific to industrial landfills. See Section III.HH of the preamble for a response to this comment.

Commenter Name: Matthew Frank
Commenter Affiliation: Wisconsin Department of Natural Resources
Document Control Number: EPA-HQ-OAR-2008-0508-1062.1

Comment Excerpt Number: 32

Comment: Some requirements of the rule, such as continuous recording of gas data, would be a considerable expense for smaller landfills that exceed the 10,000 Mg CO_2, trigger value, for modest or dubious gains in accuracy of the predictions.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Kerry Kelly
Commenter Affiliation: Waste Management (WM)
Document Control Number: EPA-HQ-OAR-2008-0508-0376.1
Comment Excerpt Number: 15

Comment: The mandatory reporting rule requires "continuous" monitoring of methane in collected landfill gas (LFG) at MSW landfills, and defines "continuous" to incorporate measurements in 15-minute increments. While this requirement is technically feasible, it does not reflect current regulatory requirements for MSW landfills or the state-of-the practice. Further, the investment required for new equipment and installation would be approximately $40,000 or more per facility, and would require a significant investment in labor for maintenance, calibration and recordkeeping. The NSPS, Subpart WWW, requirements for MSW landfills do not require any methane monitoring for collected LFG on a regular basis. The standards do require monitoring of oxygen and temperature at the collection system wellhead(s), and monitoring of total landfill gas flow to the control device(s). The only methane monitoring required is for surface emissions on a regular basis and at the control device outlet(s) during formal performance tests. However, it is common industry practice to measure methane concentration of collected LFG on a monthly basis as part of gas wellhead monitoring that occurs pursuant to 40 CFR 60.756(a). Further, many states have written this requirement into their version of the NSPS regulations and/or require it in applicable air permits. While continuous monitoring of the methane concentration of collected LFG is not "business as usual" for MSW landfills, it is a common component of GHG offset protocols for generation of methane destruction offsets from voluntary, beyond "business as usual" projects at eligible MSW landfills. Because a tradable commodity is the result of these GHG offset projects, the measurement procedures for offset generation go well beyond those commonly employed for regulatory compliance. WM has installed continuous methane concentration measurement equipment at selected sites that have been approved and third-party verified for generating offsets for trade on the CCX platform. Our experience has shown that while the methane concentration of LFG can vary due to many factors, it tends to vary minimally over a brief period such as a 15-minute interval. Given the far greater uncertainties associated with measuring the other variables in the landfill emissions calculation methodology, the increased accuracy gained by continuous monitoring of methane concentration would be insignificant. At this early stage of landfill GHG emissions estimation science, monthly monitoring should more than suffice for purposes of the GHG reporting rule.

Response: See Section III.HH of the preamble for a response to this comment.

Commenter Name: Peter Anderson
Commenter Affiliation: Center for a Competitve Waste Industry
Document Control Number: EPA-HQ-OAR-2008-0508-0331.1

Comment Excerpt Number: 4

Comment: Whenever EPA creates programs such as the LMOP effort to encourage LFGTE, other subsidies follow, creating unintended consequences that the agency has not yet considered. For, together, those subsidies make diversion, which produces no uncontrolled methane, seem more expensive, and thereby puts in motion forces that will worsen efforts to reduce greenhouse gases. EPA should establish protocols to specifically consider these broader secondary and undesirable side effects from its efforts to wind up subsidizing the lowest choice on the integrated waste hierarchy - and the worst for climate change - landfilling.

Response: Thank you for your comment. As we assess future policy options, we will consider, to the best of our ability, the potential consequences of those policies.

Table 1

COMMENTER	AFFILIATE	DCN
James Greenwood	Valero Energy Corporation	EPA-HQ-OAR-2008-0508-0571.1 EPA-HQ-OAR-2008-0508-0571.2
Charles T. Drevna	National Petrochemical and Refiners Association	EPA-HQ-OAR-2008-0508-0433.1 EPA-HQ-OAR-2008-0508-0433.2

Table 2

COMMENTER	AFFILIATE	DCN
Karin Ritter	American Petroleum Institute (API)	EPA-HQ-OAR-2008-0508-0679.1
James Greenwood	Valero Energy Corporation	EPA-HQ-OAR-2008-0508-0571.1
William W. Grygar II	Anadarko Petroleum Corporation	EPA-HQ-OAR-2008-0508-0459.1

Table 3

COMMENTER	AFFILIATE	DCN
Craig Holt Segall	Sierra Club	EPA-HQ-OAR-2008-0508-0635.1
Melissa Thrailkill	Center for Biological Diversity	EPA-HQ-OAR-2008-0508-0430.1