

## DRAFT PROPOSED REGULATION ORDER

### METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

Adopt new section [to be inserted], title [to be inserted], California Code of Regulations, to read as follows: (Note: The entire text of section [to be inserted] set forth below is new language proposed to be added to the California Code of Regulations.)

#### **Section [to be inserted]. Methane Emissions from Municipal Solid Waste Landfills**

**(a) Purpose**

The purpose of this control measure is to minimize methane emissions from municipal solid waste (MSW) landfills pursuant to the California Global Warming Solutions Act of 2006 (Health & Safety Code, Sections 38500 et. seq.).

**(b) Applicability**

This section applies to all MSW landfills that received solid waste after January 1, 1977.

**(c) Exemptions**

- (1) *Hazardous Waste Landfills:* This section shall not apply to landfills that received only hazardous waste or are subject to the Comprehensive Environmental Response, Compensation and Liability Act U.S. Code Title 42, Chapter 103 (*Promulgated 12/11/80; Amended 10/17/86*).
- (2) *MSW Landfills Greater Than or Equal to 450,000 Tons of Waste-in-Place:* The requirements of subsections (e) through (g), with the exception of subsection (g)(2)(D), shall not apply to MSW landfills greater than or equal to 450,000 tons of waste-in-place (WIP), provided the following conditions are satisfied:
  - (A) The owner or operator submits an Exemption Request to the Enforcement Agency pursuant to subsection (c)(4).
  - (B) The landfill gas heat input capacity is less than 3.0 million British thermal units per hour (MMBtu/hr) recovered as determined using the procedures specified in subsection (h)(2).
- (3) *MSW Landfills Less Than 450,000 Tons of Waste-in-Place:* The requirements of subsections (e) through (g), with the exception of

subsection (g)(2)(D), shall not apply to MSW landfills less than 450,000 tons of WIP, provided the owner or operator shall submit the information required in subsection (g)(2)(D) on a one-time only basis within 90 days of the effective date of this section.

- (4) *Exemption Request:* Any owner or operator seeking an exemption pursuant to subsection (c)(2) shall comply with the following requirements:
- (A) A written request for an exemption shall be submitted to the Enforcement Agency within 90 days of the effective date of this section. After the 90-day period, the owner or operator shall comply with the requirements of this section until an exemption is granted by the Enforcement Agency.
  - (B) The written request for an exemption shall include copies of all applicable documentation demonstrating that the criteria in subsection (c)(2)(B) has been met and any other data or information requested by the Enforcement Agency necessary to determine whether an exemption should be granted. Examples of applicable documentation include, but are not limited to: landfill gas heat input capacity calculations, permits, or WIP information.
    - 1. For closed or inactive MSW landfills, the information required in subsection (g)(2)(D) shall be included within the exemption request.
  - (C) If the MSW landfill is active, the exemption granted under subsection (c)(2) shall be reevaluated after a period of 12 months.
    - 1. A renewal request shall be submitted every 12 months from the date of the approved exemption request to the Enforcement Agency until the owner or operator completes all closure requirements in accordance with the California Code of Regulations (CCR) Title 27, Sections 20950 through 21200.
  - (D) If the MSW landfill is closed or inactive, annual renewal of the exemption shall not be required.
- (5) *Reporting Requirements for Exempted Active MSW Landfills:* Any owner or operator of an active MSW landfill granted an exemption pursuant to this subsection shall report the information required in subsection (g)(2)(D) for each period of January 1 through December 31 and submit the report to the Enforcement Agency by March 31 of the following year.

- (6) *Expiration of Exemption:* If an exemption is terminated, the owner or operator shall comply with the requirements of this section.

**(d) Definitions**

For purposes of this section, the following definitions apply:

- (1) “Active MSW Landfill” means a MSW landfill that is accepting solid waste for disposal.
- (2) “Component Leak” means the concentration of methane measured one half of an inch or less from the component source that exceeds 500 ppmv, other than non-repeatable, momentary readings. Measurements from any vault shall be taken within 3 inches above the surface of the vault exposed to the atmosphere.
- (3) “Component” means any equipment that is part of the gas collection and control system and that contains landfill gas including, but not limited to, wells, pipes, flanges, fittings, valves, flame arrestors, knock-out drums, sampling ports, blowers, compressors, or connectors. Vaults containing gas collection system equipment, where the top of the vault is located at or near the surface of the landfill, are also considered as components.
- (4) “Continuous Operation” means that the gas collection and control system is operated continuously, the existing gas collection wells are operating under vacuum while maintaining landfill gas flow, and the collected landfill gas is processed by a gas control system 24 hours per day.
- (5) “Closed MSW Landfill” means that a MSW landfill is no longer accepting solid waste for disposal and has documentation that the closure was conducted in accordance with the applicable statutes, regulations, and local ordinances in effect at the time of closure, or can document that the landfill is no longer receiving solid waste.
- (6) “District” means any air quality management district or air pollution control district.
- (7) “Destruction Efficiency” means a measure of the ability of a gas control device to combust, transform, or otherwise prevent emissions of methane from entering the atmosphere.
- (8) “Energy Recovery Device” means any combustion device which uses landfill gas to recover energy in the form of steam or electricity, including, but not limited to, gas turbines, internal combustion engines, boilers, and boiler-to-steam turbine systems.

- (9) "Enforcement Agency" means the Air Resources Board and any air quality management district or air pollution control district that the California Air Resources Board has entered into an Enforcement Agreement to enforce the requirements of this section.
- (10) "Facility Boundary" means the boundary surrounding the entire area on which MSW landfill activities occur and are permitted (CCR Title 27 section 20164).
- (11) "Gas Control Device" means any device used to dispose of or treat collected landfill gas, including, but not limited to, enclosed ground type flares, internal combustion engines, boilers and boiler-to-steam turbine systems, and gas turbines.
- (12) "Gas Collection System" means any system which employs various gas collection wells and connected piping, and mechanical blowers, fans, pumps, or compressors to create a pressure gradient and actively extract landfill gas.
- (13) "Gas Control System" means any system which disposes of or treats collected landfill gas by one or more of the following means: combustion, gas treatment for subsequent sale, or sale for processing offsite.
- (14) "Inactive MSW Landfill" means a MSW landfill that is no longer accepting solid waste for disposal.
- (15) "Landfill Gas" means any untreated, raw gas derived through a natural process from the decomposition of organic waste deposited in a MSW landfill, from the evolution of volatile species in the waste, or from chemical reactions of substances in the waste.
- (16) "Landfill Surface" means the area of the landfill under which decomposable solid waste has been placed, excluding the working face.
- (17) "MSW Landfill" means an entire disposal facility in a contiguous geographical space where solid waste is placed in or on land.
- (18) "Non-decomposable Solid Waste" means materials which do not degrade biologically to form landfill gas. Examples include, but are not limited to , earth, rock, concrete asphalt paving fragments, clay products, inert slag, asbestos, and demolition materials containing minor amounts (less than 10 percent by volume) of wood and metals. Materials that do not meet this definition shall be considered decomposable solid waste.
- (19) "Non-repeatable, Momentary Readings" means indications of the presence of methane, which persist for less than five seconds and do not

recur when the sampling probe of a portable gas detector is placed in the same location.

- (20) “Operator” means any person, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual, that operates the MSW landfill, or is responsible for complying with any federal, state, or local requirements relating to methane emissions from real property used for MSW landfill purposes and subject to this section.
- (21) “Owner” means any person, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual, that: holds title to the real property on which the MSW landfill is located, including but not limited to title held by joint tenancy, tenancy in common, community property, life estate, estate for years, lease, sublease, or assignment, except title held solely as security for a debt such as mortgage, or is responsible for complying with any federal, state, or local requirements relating to methane emissions from real property used for MSW landfill purposes and subject to this section.
- (22) “Perimeter” means along the MSW landfill’s permitted facility boundary.
- (23) “Professional Engineer” means an engineer holding a valid certificate issued by the State of California Board of Registration for Professional Engineers and Land Surveyors or a state offering reciprocity with California.
- (24) “Solid Waste” means all decomposable and non-decomposable solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial waste, manure, vegetable or animal solid and semisolid wastes, sludge, and other discarded solid and semisolid wastes. Solid waste also includes any material meeting the definition of Solid Waste in 40 CFR 60.751 (*Promulgated 3/12/1996*).
- (25) “Subsurface Gas Migration” means underground landfill gases that are detected at any point on the perimeter.
- (26) “Surface Leak” means the concentration of methane measured within 3 inches above the MSW landfill surface that exceeds 500 ppmv, other than non-repeatable, momentary readings.
- (27) “Waste-in-Place” means the total amount of solid waste placed in the MSW landfill estimated in tons. The refuse density shall be assumed to be 1,300 pounds per cubic yard and the decomposable fraction shall be 70 percent by weight unless other site specific factors are submitted to and approved by the Enforcement Agency

- (28) "Well Raising" means a MSW landfill activity where an existing gas collection well is temporarily disconnected from a vacuum source, and the non-perforated pipe attached to the well is extended vertically to allow the addition of a new layer of solid waste or the final cover; or is extended horizontally to allow the horizontal extension of an existing layer of solid waste or cover material. The extended pipe (well extension) is then re-connected in order to continue collecting gas from that well.
- (29) "Working Face" means the open area where daily waste is deposited and compacted with landfill equipment.

**(e) Requirements**

- (1) *Installation of the Gas Collection and Control System.*
  - (A) *Design Plan:* If a gas collection and control system which meets the requirements of subsection (e)(2)(A) and either subsections (e)(2)(B) or (e)(2)(C) has not been installed, the owner or operator of an active MSW landfill shall submit a Design Plan to the Enforcement Agency within one year after the effective date of this section. The Enforcement Agency shall review and either approve or disapprove the Design Plan, or request additional information be submitted. The Design Plan shall meet the following requirements:
    1. The Design Plan shall be prepared and certified by a professional engineer.
    2. The Design Plan shall provide for the control of the collected gas through the use of a gas collection and control system meeting the requirements in subsections (e)(2)(A) and either (e)(2)(B) or (e)(2)(C).
    3. The Design Plan shall include a schedule of inspection and maintenance intervals including dates and durations of expected system shutdowns.
    4. The Design Plan shall include any proposed alternatives to the requirements, test methods, procedures, compliance measures, monitoring, and recordkeeping or reporting requirements pursuant to (e)(9).
    5. As operating experience is gained and as site conditions change, the Design Plan may be revised, subject to the approval of the Enforcement Agency.

- (B) If an owner or operator is upgrading an existing gas collection and control system to meet the requirements of this section, the existing Design Plan shall be amended to include any necessary updates or addenda, and shall be certified by a professional engineer. Areas of an active MSW landfill that are closed or inactive shall also be included in the amended Design Plan.
- (C) Any owner or operator of a MSW landfill subject to the requirements of subsection (e)(1) shall install and operate a gas collection and control system within 18 months after approval of the Design Plan or disapproval of an exemption request pursuant to subsections (c)(2) or (c)(3).
  - 1. If the MSW landfill is closed or inactive, the owner or operator shall install and operate a gas collection and control system within 30 months after approval of the design Plan or disapproval of an exemption request pursuant to subsections (c)(2) or (c)(3).

(2) *Gas Collection and Control System Requirements.*

- (A) *General Requirements.* The owner or operator shall satisfy the following requirements for the operation of a gas collection and control system:
  - 1. Route the collected gas to a gas control device, or devices and operate the gas collection and control system continuously except as provided in subsections (e)(4) through (e)(7).
  - 2. Operate the gas collection and control system so that there is no component leak that exceeds 500 ppmv, measured as methane, at any component under positive pressure that contains landfill gas.
    - a. The gas collection and control system shall be monitored pursuant to subsection (f)(2)(C).
    - b. Any component leak shall be tagged and recorded pursuant to subsection (g)(1)(A)4 and repaired within 10 calendar days.
  - 3. Design the gas collection and control system to handle the expected gas generation flow rate from the entire area of the MSW landfill that requires control to prevent subsurface gas migration and to collect gas at an extraction rate to comply

with the surface methane emission limits in subsections (e)(3)(A) and (e)(3)(B) and component leak standard in subsection (e)(2)(A)2. The expected gas generation flow rate from the MSW landfill shall be calculated pursuant to subsection (h)(6).

4. The gas collection system shall be designed and operated to draw gas toward the gas collection device or devices to minimize air intrusion that could cause fires or damage to the gas collection and control system.
5. Whenever solid waste is to be brought to the surface during the installation or preparation of wells, piping, or other equipment, or when solid waste is to be excavated and moved, the owner or operator shall provide a description of the mitigation measures planned or taken to prevent the release of methane or other emissions into the atmosphere pursuant to subsection (g)(1)(A)7

(B) *Requirements for Flares.*

1. Route the collected gas to an enclosed ground type flare that achieves a methane destruction efficiency of at least 99 percent by weight.
  - a. Enclosed flares shall be equipped with automatic dampers, an automatic shutdown device, a flame arrester, and continuous recording temperature sensors.
  - b. During restart or startup there shall be a sufficient flow of propane or commercial natural gas to the burners to prevent unburned collected methane from being emitted to the atmosphere.
  - c. The gas control device shall be operated within the parameter ranges established during the initial or most recent source test and monitored for the operating parameters specified in subsection (f)(2).
2. Route the collected gas to an open flare that achieves a methane destruction efficiency of at least 98 percent by weight and meets the requirements of 40 CFR 60.18 (Promulgated 1/21/86). The operation of an open flare shall not be allowed except under the following conditions in subsections (e)(2)(B)2.a. or (e)(2)(B)2.b.:

- a. Until January 1, 2018, the provisions of subsection (e)(2)(B)1 shall not apply to any open flare installed and operating prior to August 1, 2008.
  - i. Continued operation of the open flare may be allowed if the owner or operator can demonstrate to the satisfaction of the Enforcement agency that the landfill gas quality is insufficient to support the continuous operation of an enclosed flare, or other gas control device, pursuant to subsection (c)(2)(B).
- b. The owner or operator is seeking to temporarily operate an open flare during the repair or maintenance of the gas control system, or while awaiting the installation of the gas control system, or to remedy a situation (e.g., offsite gas migration) where there is an imminent, life endangering threat to humans requiring immediate action.
  - i. Any owner seeking to temporarily operate an open flare shall submit a written request to the Enforcement Agency pursuant to subsection (e)(9).

(C) *Requirements for Gas Control Devices other than Flares.*

- 1. Route the collected gas to an energy recovery device, or series of devices that achieve a methane destruction efficiency of at least 99 percent by weight. Lean burn internal combustion engines shall reduce the outlet methane concentration to less than 3,000 ppmv, dry basis, corrected to 15 percent oxygen.
  - a. If a boiler or a process heater is used as the gas control device, the landfill gas stream shall be introduced into the flame zone. Where the landfill gas is the primary fuel for the boiler or process heater, introduction of the landfill gas stream into the flame zone is not required.
  - b. The gas control device shall be operated within the parameter ranges established during the initial or most recent source test and monitored for the operating parameters specified in subsection (f)(2).

2. Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All emissions vented to the atmosphere from the gas treatment system shall be subject to the requirements of subsections (e)(2)(B) or (e)(2)(C).
- (D) *Source Test Requirements:* The owner or operator shall conduct an annual source test for any gas control device(s) subject to the requirements of subsections (e)(2)(B) or (e)(2)(C) using the test methods identified in (h)(7). An initial source test shall be conducted within 180 days of initial start up of the gas collection and control system. Each succeeding complete annual source test shall be conducted no later than 45 days after the anniversary date of the initial source test.
- (3) *Surface Methane Emission Limits:* Except as provided in subsections (e)(6) and (e)(8), at no location on the MSW landfill surface shall methane concentrations exceed the following limits:
  - (A) 500 ppmv, other than non-repeatable, momentary readings, as determined by instantaneous surface emissions monitoring, and
  - (B) An average methane concentration limit of 25 ppmv as determined by integrated surface emissions monitoring.
- (4) *Well Raising:* The requirements of sections (e)(2)(A)1, (e)(2)(A)2, and (e)(3), shall not apply to individual wells involved in well raising provided the following conditions are met:
  - (A) New fill is being added or compacted in the immediate vicinity around the well.
  - (B) Once installed, a gas collection well extension is sealed or capped until the raised well is reconnected to a vacuum source.
  - (C) Well disconnection times are recorded pursuant to subsection (g)(1)(A)1.
- (5) *Gas Collection and Control System Inspection, Maintenance, and Repair:* The requirements of subsections (e)(2)(A) through (e)(2)(C) and (e)(3), shall not apply to specific portions of a MSW landfill undergoing inspection, maintenance, or repair of the gas collection and control system provided the following conditions are met:

- (A) The owner or operator has provided a schedule of the inspection and maintenance intervals, including dates and durations of expected system shutdowns, as required in subsection (e)(1)(A)3.
  - (B) Methane emissions are minimized during shutdown pursuant to subsection (e)(2)(A)5.
  - (C) The requirements of subsection (g)(1)(A)1 and (g)(1)(A)2 are satisfied.
- (6) *Temporary Shutdown of Gas Collection System Components:* The requirements of subsections (e)(2)(A)1, (e)(2)(A)2, and (e)(3), shall not apply to individual landfill gas collection system components that must be temporarily shut down in order to repair the components, to connect new landfill gas collection system components to the existing system, to prevent or extinguish fires, or to perform construction activities meeting the requirements of subsection (e)(7), provided the following requirements are met:
- (A) Existing gas collection system components are being repaired or are being shut down to prevent or extinguish fires.
  - (B) New gas collection system components are required to maintain compliance with this section and are included in the most recent Design Plan as specified in subsection (e)(1)(B).
  - (C) The requirements of subsection (g)(1)(A)1 are satisfied.
- (7) *Construction Activities:* The requirements of subsection (e)(3) shall not apply to the working face of the landfill or to areas of the landfill surface where the landfill cover material has been removed and refuse has been exposed for the purpose of installing, expanding, replacing, or repairing components of the landfill gas, leachate, or gas condensate collection and removal system, provided the following requirements are met:
- (A) The owner or operator shall maintain records of any construction activities for a period of 5 years. Records shall be available for inspection by the Enforcement Agency upon request. The records shall contain the following:
    - 1. A description of the actions being taken, the areas of the MSW landfill that will be affected by these actions, the reason the actions are required, and any landfill gas collection system components that will be affected by these actions.

2. Construction start and finish dates, projected equipment installation dates, and projected shut down times for individual gas collection system components.
  3. A description of the mitigation measures planned or taken to minimize methane and other potential air quality impacts.
- (B) Any new gas collection system components must be included in the most recent Design Plan as specified in subsection (e)(1)(B).
- (8) *Permanent Shutdown and Removal of the Gas Collection and Control System:* The gas collection and control system at any closed MSW landfill can be capped or removed provided the following requirements are met:
- (A) The gas collection and control system was in operation for at least 15 years, unless the owner or operator can demonstrate to the satisfaction of the Enforcement Agency that due to declining methane rates the MSW landfill will have a difficult time operating a gas collection and control system for a 15-year period.
  - (B) Surface methane concentration measurements do not exceed the limits specified in (e)(3)(A) and (e)(3)(B) as determined using the procedures in subsection (h)(3).
  - (C) The owner or operator can demonstrate that methane concentration measurements in any existing subsurface boundary probes do not exceed five percent by volume based on quarterly perimeter well testing performed pursuant to CCR Title 27, section 20921.
  - (D) The owner or operator submits an Equipment Removal Report to the Enforcement Agency pursuant to subsection (g)(2)(B).
- (9) *Alternative Compliance Options.*
- (A) Any alternatives to the requirements, test methods, procedures, compliance measures, monitoring, and recordkeeping or reporting requirements requested by the owner or operator shall be submitted in writing to the Enforcement Agency.
    1. The Enforcement Agency shall review the alternatives and either approve, disapprove, or request that additional information be submitted.

2. The Enforcement Agency shall deny the approval of any alternatives not providing equivalent levels of enforceability and methane emission control.

**(f) Monitoring Requirements**

- (1) *Surface Emissions Monitoring Requirements:* Any owner or operator of a MSW landfill with a gas collection and control system shall conduct instantaneous and integrated surface monitoring of the landfill surface on a quarterly basis using the procedures specified in subsection (h)(3).
  - (A) *Instantaneous Surface Monitoring:* Any reading exceeding the limits specified in subsection (e)(3)(A) shall be recorded as an exceedance and the following actions shall be taken:
    1. The owner or operator shall record the date, location, and value of each exceedance, along with re-test dates and results as specified in subsection (g)(1)(A)(4). The location of each exceedance shall be clearly marked and recorded on a topographic map of the MSW landfill, drawn to scale with the location of both the grids and the gas collection system clearly identified.
    2. The owner or operator shall initiate corrective action, such as, but not limited to, watering, providing additional cover material and compacting, or well vacuum adjustments, to correct the exceedance within 5 calendar days of discovery.
    3. The location of the exceedance shall be re-monitored within 10 calendar days of the date that the exceedance was first discovered.
      - a. If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be re-monitored again no later than 10 calendar days after the second exceedance.
      - b. If the re-monitoring shows a third exceedance, the owner or owner or operator shall install a new or replacement well as determined to achieve compliance no later than 45 calendar days after detecting the third exceedance.
    4. Any closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that has no monitored

exceedances of the limit specified in subsection (e)(3)(A) after 4 consecutive quarterly monitoring periods may monitor annually. Any exceedances of the limits specified in subsection (e)(3)(A) detected during the annual monitoring that can not be remediated within 10 calendar days shall result in a return to quarterly monitoring of the affected grids.

5. Any exceedances of the limits specified in subsection (e)(3)(A) detected during any compliance inspections by the Enforcement Agency shall result in a return to quarterly monitoring of the affected grids.

(B) *Integrated Surface Monitoring:* Any reading exceeding the limit specified in subsection (e)(3)(B) shall be recorded as an exceedance and the following actions shall be taken:

1. The owner or operator shall record the average surface concentration measured as methane for each grid along with re-test dates and results as specified in subsection (g)(1)(A)(4). The location of the grids and the gas collection system shall be clearly marked and identified on a topographic map of the MSW landfill drawn to scale.
2. The owner or operator shall initiate corrective action, such as, but not limited to, cover maintenance or repair, or well vacuum adjustments, to correct the exceedance within 5 calendar days of discovery.
3. The grid exceeding the limit shall be re-monitored within 10 calendar days of the date that the exceedance was first discovered.
  - a. If the re-monitoring of the grid shows a second exceedance, additional corrective action shall be taken and the location shall be re-monitored again no later than 10 calendar days after the second exceedance.
  - b. If the re-monitoring shows a third exceedance, the owner or operator shall install a new or replacement well as determined to achieve compliance no later than 45 calendar days after detecting the third exceedance.
4. Any closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that has no monitored

exceedances of the limit specified in subsection (e)(3)(B) after 4 consecutive quarterly monitoring periods may monitor annually. Any exceedances of the limits specified in subsection (e)(3)(B) detected during the annual monitoring that can not be remediated within 10 calendar days shall result in a return to quarterly monitoring of the affected grids.

5. Any exceedances of the limits specified in subsection (e)(3)(B) detected during any compliance inspections by the Enforcement Agency shall result in a return to quarterly monitoring of the affected grids.
- (2) *Gas Control System Equipment Monitoring:* The owner or operator shall monitor the gas control system using the following procedures:
- (A) For a flare or any other enclosed combustor the following equipment shall be installed, calibrated, maintained, and operated according to the manufacturer's specifications:
    1. A temperature monitoring device equipped with a continuous recorder which has an accuracy of plus or minus ( $\pm$ ) one percent of the temperature being measured expressed in degrees Celsius or Fahrenheit. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity greater than 44 megawatts.
    2. At least one gas flow rate measuring device which shall record the flow to the control device(s) at least every 15 minutes.
  - (B) For a gas control device other than an enclosed combustor, demonstrate compliance by providing information satisfactory to the Enforcement Agency describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. Alternatives to this subsection shall be submitted as specified in subsection (e)(9). The Enforcement Agency may specify additional appropriate monitoring procedures.
  - (C) Components containing landfill gas and under positive pressure shall be monitored quarterly for leaks. Any exceedances of the limit specified in subsection (e)(2)(A)2 shall be recorded pursuant to subsection (g)(1)(A)4.
    1. Component leak testing at MSW landfills having landfill

gas-to-energy facilities may be conducted prior to scheduled maintenance or planned outage periods.

**(g) Recordkeeping and Reporting Requirements.**

*(1) Recordkeeping Requirements.*

(A) The owner or operator shall maintain the following records for at least five years:

1. All gas collection system downtime exceeding 5 calendar days, including individual well shutdown times, and the reason for the downtime.
2. All gas control system downtime in excess of 1-hour, the reason for the downtime, and the length of time the gas control system was shutdown.
3. Expected gas generation flow rate as calculated in subsection (h)(6).
4. Records of all component leak testing and landfill surface monitoring, tagged leaks in exceedance of the limits in subsections (e)(2)(A)2 or (e)(3), including the location of the leak, leak concentration in ppmv, date and time of discovery, the action taken to repair the leak, date of repair, any required re-monitoring, and the re-monitored concentration in ppmv, the installation date and location of each well for gas collection system expansion, and records of any construction activities pursuant to subsection (e)(7).
5. Annual solid waste acceptance rate and the current amount of waste-in-place.
6. Results of subsequent source tests pursuant to subsection (e)(2)(D).
7. Records describing what mitigation measures planned or taken to prevent the release of methane or other emissions into the atmosphere.
8. Continuous records of the equipment operating parameters specified to be monitored under subsection (f)(2)(A) and (f)(2)(B) as well as records for periods of operation during which the parameter boundaries established during the most

recent source test are exceeded. The following constitute exceedances that shall be recorded:

- a. For enclosed combustors except for boilers and process heaters with design heat input capacity of 44 megawatts (150 MMBtu/hr) or greater, all 3-hour periods of operation during which the average combustion temperature was more than 28 degrees Celsius (82 degrees Fahrenheit) below the average combustion temperature during the most recent source test at which compliance with subsections (e)(2)(B) or (e)(2)(C) was determined.
- b. For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone as required under subsection (e)(2)(C)1.a.
- c. Any owner or operator who uses a boiler or process heater with a design heat input capacity of 44 megawatts or greater to comply with subsection (e)(2)(C) shall keep records of all periods of operation of the boiler or process heater (e.g., steam use, fuel use, or monitoring data collected pursuant to other State, local, Tribal, or Federal regulatory requirements).

(B) The owner or operator shall maintain the following records for the life of the gas control device, as measured during the initial source test or compliance determination:

1. The control device vendor specifications.
2. The expected gas generation flow rate as calculated in subsection (h)(6).
3. For enclosed combustors (except boilers and process heaters greater than 44 megawatts):
  - a. The average combustion temperature measured at least every 15 minutes and averaged over the same time period of the performance test.
  - b. The percent reduction of methane achieved by the control device determined pursuant to subsection (e)(2)(B)..

4. For a boiler or process heater, the description of the location at which the collected gas vent stream is introduced into the boiler or process heater over the same time period of the performance test.
  5. For an open flare: the flare type (i.e., steam-assisted, air-assisted, or nonassisted); all visible emission readings, heat content determination, flow rate or bypass flow rate measurements, and exit velocity determinations made during the performance test as specified in CFR 40 60.18 (Promulgated 1/21/86); and continuous records of the flare pilot flame or flare flame monitoring and records of all periods of operations during which the pilot flame of the flare flame is absent..
- (C) *Record Storage:* MSW landfill owners or operators shall maintain copies of the records and reports required by this section and provide them to the Enforcement Agency within five business days upon request. Records and reports must be kept at a location within the State of California
- (2) *Reporting Requirements.*
- (A) *Closure Report:* Any owner or operator of a MSW landfill which has ceased accepting waste shall submit a Closure Report to the Enforcement Agency within 30 days of waste acceptance cessation.
1. The Closure Report shall include the last day solid waste was accepted, the closure date of the MSW landfill, and the estimated WIP:
  2. The Enforcement Agency may request additional information as necessary to verify that permanent closure has taken place in accordance with the requirements of any applicable State, Federal, or local statutes, regulations, and ordinances in effect at the time of closure.
- (B) *Equipment Removal Report:* A gas collection and control system Equipment Removal Report shall be submitted to the Enforcement Agency 30 days prior to well capping, removal or cessation of operation of the gas collection, treatment, or control system equipment. The report shall contain all of the following information:
1. A copy of the Closure Report submitted pursuant to subsection (g)(2)(A).

2. A copy of the initial Source Test Report or other documentation demonstrating that the gas collection and control system has been installed and operated for a minimum of 15 years, unless the owner or operator can demonstrate to the satisfaction of the Enforcement Agency that due to declining methane rates the landfill will have a difficult time operating a gas collection and control system for a 15-year period.
3. All records needed to verify that landfill surface methane concentration measurements do not exceed the limits specified in subsections (e)(3)(A) and (e)(3)(B).

(C) *Annual Report:* Any operator or owner subject to the requirements of subsection (e)(2) shall prepare an annual report for the period of January 1 through December 31 of each year. The annual report shall be submitted to the Enforcement Agency by March 15 of the following year. The initial annual report shall be submitted within 180 days of installation and start-up of the gas collection and control system. The annual report shall contain the following information:

1. MSW landfill name, owner and operator, address, and solid waste information system (SWIS) identification number.
2. Total volume of landfill gas collected (reported in standard cubic feet).
3. Average composition of the landfill gas collected (reported in percent methane and percent carbon dioxide by volume).
4. Gas control device type, year of installation, rating, fuel type, and total amount of landfill gas combusted in each control device.
5. The date gas collection and control system was installed and in full operation.
6. The percent methane destruction efficiency of each gas control device(s).
7. Type and amount of supplemental fuels burned with the landfill gas in each device.
8. Total volume of landfill gas shipped off-site for combustion, the composition of the landfill gas collected (reported in

percent methane and percent carbon dioxide by volume), and the recipient of the gas.

9. Most recent topographic map of the site showing the areas with final cover and a geomembrane and final cover without a geomembrane with corresponding percentages over the landfill surface.
10. The information required by subsections (g)(1)(A)1, (g)(1)(A)2, (g)(1)(A)4, (g)(1)(A)5, and (g)(1)(A)6.

(D) *Reporting Requirements for MSW Landfills Exempted Pursuant to Subsections (c)(2) and (c)(3):* Any owner or operator granted an exemption under subsections (c)(2) and (c)(3) shall report the following information to the Enforcement Agency:

1. MSW landfill name, owner and operator, address, and solid waste information system (SWIS) identification number.
2. The landfill's estimated waste-in-place, in tons.
3. Most recent topographic map of the site showing the areas with final cover and a geomembrane and final cover without a geomembrane with corresponding percentages over the landfill surface.

(E) *Notification of Upset or Breakdown:* The owner or operator shall notify the Enforcement Agency whenever a breakdown, malfunction, or operational upset condition exists which would tend to increase emissions of methane or whenever any operating condition contrary to any provision of the section.

1. Such notice shall be given to the Enforcement Agency no later than four hours after occurrence during regular workday hours or no later than two hours from the end of the Enforcement Agency's workday if the occurrence happens outside regular Enforcement Agency workday hours.
2. The notice shall provide the Enforcement Agency information as to causes and corrective action being taken, with a schedule for return to required operating conditions. If a facility is subject to the provisions of Rule 3.8, Federal Operating Permits, then all recordkeeping requirements of that Rule pertaining to upsets, breakdown, or malfunctions, apply.

- (F) Any report, or information submitted pursuant to this section shall contain certification by a responsible official of truth, accuracy, and completeness. This certification and any other certification required under this section shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

**(h) Test Methods and Procedures**

- (1) Hydrocarbon Detector Specifications: Any instrument used for the measurement of methane shall be a gas detector that meets the calibration, specifications, and performance criteria of EPA Reference Method 21 (40 CFR 60, Appendix A) [*insert effective date*], except for the following:

- (A) "Methane" shall replace all references to volatile organic compounds (VOC).
- (B) The calibration gas shall be methane.
- (C) The hydrocarbon detector shall be equipped with a data logger.

- (2) *Determination of Landfill Gas Heat Input Capacity*: The landfill gas heat input capacity shall be determined pursuant to subsections (h)(2)(A), (h)(2)(B), or (h)(2)(C) as applicable:

- (A) *MSW Landfills without Carbon Adsorption or Passive Venting Systems*: The heat input capacity shall be calculated using the procedure below. The calculation along with relevant parameters shall be provided as part of the report to the Enforcement Agency to demonstrate that the criteria in subsection (c)(2)(B) has been met. The Enforcement Agency may request additional information as may be necessary to verify the heat input capacity from the MSW landfill. Site specific data may be substituted when available.

***Calculate Heat Input Capacity***

Heat Input Capacity (MMBtu/hr) = Methane Gas Generation (scfm)  
x 60 minutes/1 hour x 0.75 Collection Efficiency x GHV x 1  
MMBtu/1,000,000 Btu

Where:

Collection Efficiency = the landfill gas collection efficiency in percent (%) which shall be 75 percent.

GHV (Gross Heating Value) = Gross heating value of methane, which shall be 1,012 in units of British thermal units per standard cubic feet, or Btu/scf; source:

<http://epa.gov/lmop/res/converter.htm>).

**Methane Gas Generation:** CH<sub>4</sub> Generation is calculated using the following equation:

$$\text{CH}_4 \text{ Generation (Mg of CH}_4) = \frac{\{ \text{ANDOC}_{\text{year-start}} \times [1 - e^{-k}] - \text{ANDOC}_{\text{deposited-last year}} \times [1/k \times (e^{-k \times (1-M/12)} - e^{-k}) - (M/12) \times e^{-k}] + \text{ANDOC}_{\text{deposited-same year}} \times [1 - ((1/k) \times (1 - e^{-k \times (1-M/12)}) + (M/12))]\}} \times \text{FCH}_4$$

Where:

CH<sub>4</sub> Generation = CH<sub>4</sub> generated in the inventory year in question (Mg of CH<sub>4</sub>) using the Mathematically Exact First-Order Decay Model provided in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3 (Source: [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)).

FCH<sub>4</sub> = Fraction of decomposing carbon converted into CH<sub>4</sub> (Default = 0.5)

**To Convert Methane Generated from Mg of CH<sub>4</sub> to SCFM**

$$\text{CH}_4 \text{ Gas Generated (scfm)} = \text{CH}_4 \text{ Generation (Mg/year)} \times 1 \text{ year} / 525,600 \text{ minutes} \times 1,000,000 \text{ g/Mg} \times 1 \text{ mole CH}_4 / 16.04246 \text{ g CH}_4 \times 0.83662 \text{ SCF/mole landfill gas}$$

**Define ANDOC%**

$$\text{ANDOC}\% = \sum_i \text{WIPFRAC}_i \times \text{TDOC}_i \times \text{DANF}_i$$

Where:

WIPFRAC<sub>i</sub> = Fraction of the i<sup>th</sup> component in the WIP

TDOC<sub>i</sub> = Total Degradable Organic Carbon fraction of the i<sup>th</sup> waste component (Mg of that component/Mg of Total WIP)

DANF<sub>i</sub> = Decomposable Anaerobic Fraction of the i<sup>th</sup> waste component, that fraction capable of decomposition in anaerobic conditions (Mg of decomposable carbon for that component/Mg TDOC<sub>i</sub> for that component)

**Define ANDOC**

$$ANDOC = WIP \text{ (Tons)} \times 0.9072 \text{ (Mg/Ton)} \times ANDOC\%$$

Where:

ANDOC = Anaerobically Degradable Organic Carbon, carbon that is capable of decomposition in an anaerobic environment (Mg of carbon)

WIP = Waste-in-Place estimate of all the landfilled waste (wet weight) as reported to the CIWMB (tons)

**Calculate ANDOC<sub>year-end</sub>**

$$ANDOC_{year-end} = ANDOC_{year-start} \times e^{-[k]} + ANDOC_{deposited-last\ year} \times [1/k \times (e^{-[k \times (1-M/12)]} - e^{-[k]}) - (M/12) \times e^{-[k]}] + ANDOC_{deposited-same\ year} \times [(1/k) \times (1 - e^{-[k \times (1-M/12)]}) + (M/12)]$$

Where:

ANDOC<sub>year-end</sub> = ANDOC remaining undecomposed at the end of the inventory year in question

ANDOC<sub>year-start</sub> = ANDOC in place at the beginning of the inventory year in question

ANDOC<sub>deposited-last year</sub> = ANDOC deposited during the previous inventory year

ANDOC<sub>deposited-same year</sub> = ANDOC deposited during the inventory year in question

M = Assumed delay before newly deposited waste begins to undergo anaerobic decomposition (Months, Default = 6)

k = Assumed rate constant for anaerobic decomposition; k = ln2/half-life (years); half-life is the number of years required for half of the original mass of carbon to degrade

The following values for the assumed rate constant for anaerobic decomposition (or “k”) shall be used:

Average Rainfall (Inches/Year)	k Value
<20	0.020
20-40	0.038
>40	0.057

Source: U.S. EPA

<http://www.ncgc.nrcs.usda.gov/products/datasets/climate/data/precipitation-state/ca.html>.

**Draft Proposed Regulation Order - For Discussion Purposes Only - Do Not Cite or Quote**

The following waste characterization default values shown in Tables 1A, 1B, 2 and 3 in addition to the model equations shall be used in estimating the methane generation potential for a MSW landfill:

<b>Table 1A</b>	<b>Waste Type (%) by Year</b>				
<b>Waste Type</b>	<b>Up to 1964</b>	<b>1965-1974</b>	<b>1975-1984</b>	<b>1985-1992</b>	<b>1993-1995</b>
Newspaper	6.4%	6.4%	5.9%	4.8%	3.9%
Office Paper	10.7%	11.3%	12.0%	13.1%	15.0%
Corrugated Boxes	10.8%	13.5%	11.5%	10.5%	10.3%
Coated Paper	2.2%	2.0%	2.4%	2.1%	1.8%
Food	14.8%	11.3%	9.5%	12.1%	13.4%
Grass	12.1%	10.3%	10.1%	9.0%	6.6%
Leaves	6.1%	5.1%	5.0%	4.5%	3.3%
Branches	6.1%	5.1%	5.0%	4.5%	3.3%
Lumber	3.7%	3.3%	5.1%	7.0%	7.3%
Textiles	2.1%	1.8%	1.7%	3.3%	4.5%
Diapers	0.1%	0.3%	1.4%	1.6%	1.9%
Construction/Demolition	2.6%	2.5%	3.5%	3.9%	4.5%
Medical Waste	0.0%	0.0%	0.0%	0.0%	0.0%
Sludge/Manure	0.0%	0.0%	0.0%	0.0%	0.0%

Source: US EPA Municipal Solid Waste publication: <http://www.epa.gov/msw/pubs/03data.pdf>.

<b>Table 1B</b>	<b>Waste Type (%) by Year</b>	
<b>Waste Type</b>	<b>1996-2002<sup>1</sup></b>	<b>2003-present<sup>2</sup></b>
Newspaper	4.3%	2.2%
Office Paper	4.4%	2.0%
Corrugated Boxes	4.6%	5.7%
Coated Paper	16.9%	11.1%
Food	15.7%	14.6%
Grass	5.3%	2.8%
Leaves	2.6%	1.4%
Branches	2.4%	2.6%
Lumber	4.9%	9.6%
Textiles	2.1%	4.4%
Diapers	6.9%	4.4%
Construction/Demolition	6.7%	12.1%
Medical Waste	0.0%	0.0%
Sludge/Manure	0.1%	0.1%

Source:  
<sup>1</sup>CIWMB Statewide Waste Characterization Study (1999).  
<sup>2</sup>CIWMB Statewide Waste Characterization Study (2004).

<b>Table 2</b>		
<b>Waste Type</b>	<b>TDOC</b>	<b>Source</b>
Newspaper	46.5%	EPA
Office Paper	39.8%	EPA
Corrugated Boxes	40.5%	EPA
Coated Paper	40.5%	EPA
Food	11.7%	EPA
Grass	19.2%	EPA
Leaves	47.8%	EPA
Branches	27.9%	EPA
Lumber	43.0%	IPCC
Textiles	24.0%	IPCC
Diapers	24.0%	IPCC
Construction/Demolition	4.0%	IPCC
Medical Waste	15.0%	IPCC
Sludge/Manure	5.0%	IPCC
Sources EPA <i>Solid Waste Management and Greenhouse Gasses: A Life-Cycle Assessment of Emissions and Sinks</i> , Exhibits 7-2, 7-3 (May 2002). IPCC <i>Guidelines for National Greenhouse Gas Inventories</i> , Chapter 2, Table 2.4, 2.5 and 2.6 (2006).		

<b>Table 3</b>		
<b>Waste Type</b>	<b>DANF</b>	<b>Source</b>
Newspaper	16.1%	EPA
Office Paper	87.4%	EPA
Corrugated Boxes	38.3%	EPA
Coated Paper	21.0%	EPA
Food	82.8%	EPA
Grass	32.2%	EPA
Leaves	10.0%	EPA
Branches	17.6%	EPA
Lumber	23.3%	CEC
Textiles	50.0%	IPCC
Diapers	50.0%	IPCC
Construction/Demolition	50.0%	IPCC
Medical Waste	50.0%	IPCC
Sludge/Manure	50.0%	IPCC
Sources: EPA <i>Solid Waste Management and Greenhouse Gasses: A Life-Cycle Assessment of Emissions and Sinks</i> Exhibits 7-2, 7-3 (May 2002). CEC <i>Inventory of California Greenhouse Gas Emissions and Sinks: 1990-2004</i> (December 2006). IPCC <i>Guidelines for National Greenhouse Gas Inventories</i> , Chapter 3, 3.13 (2006).		

- (B) *MSW Landfills with Carbon Adsorption Systems:* The landfill gas heat capacity shall be determined by measuring the actual total landfill gas flow rate (scfm) using an existing flow meter or other flow measuring device such as a standard pitot tube and methane concentration (percent by volume) using a hydrocarbon detector meeting the requirements of (h)(1). The total landfill gas flow rate shall be multiplied by the methane concentration and then multiplied by the gross heating value (GHV) of methane of 1,012 Btu/scf to determine the landfill gas heat input capacity.
- (C) *MSW Landfills with Passive Venting Systems:* The landfill gas heat input capacity shall be determined pursuant to subsections (h)(2)(A) and (h)(2)(C)1.

- 1. The owner or operator shall measure actual landfill gas flow rates (scfm) by using a flow measuring device such as a standard pitot tube and methane concentration (percent by volume) using a hydrocarbon detector meeting the requirements of (h)(1) from each venting pipe that is within the waste mass. Each gas flow rate shall then be multiplied by its corresponding methane concentration to obtain the individual methane flow rate. The individual methane flow rates shall be added together and then multiplied by the GHV of methane of 1,012 Btu/scf to determine the landfill gas heat input capacity.
  - a. The owner or operator shall use the highest value for the landfill gas heat input capacity as determined by using the procedures in subsections (h)(2)(A) and (h)(2)(C)1.

(3) *Surface Emissions Monitoring Procedures:* The owner or operator shall measure the landfill surface concentration of methane using a hydrocarbon detector meeting the requirements of subsection (h)(1). The landfill surface shall be inspected using the following procedures:

- (A) *Monitoring Area:* The entire landfill surface shall be divided into individually identified 50,000 square foot grids. The grids shall be used for both instantaneous and integrated surface emissions monitoring.
  - 1. Testing shall be performed by holding the probe of the hydrocarbon detector within 3 inches of the landfill surface while traversing the grid.

2. The walking pattern shall be no more than a 25-foot spacing interval and shall traverse each monitoring grid.
  - a. If the owner or operator has no exceedances of the limits specified in subsections (e)(3)(A) or (e)(3)(B) after 4 consecutive quarterly monitoring periods, the walking pattern spacing may be increased to 100-foot intervals. The owner or operator shall return to a 25-foot spacing interval upon any exceedances of the limits specified in subsections (e)(3)(A) or (e)(3)(B) that can not be remediated within 10 calendar days or upon any exceedances detected during a compliance inspection by the Enforcement Agency..
3. Portions of slopes that are 30 degrees and greater, wet or icy surfaces, construction areas, and other dangerous areas may be excluded from landfill surface inspection.
4. Surface testing shall be terminated when the average wind speed exceeds 5 miles per hour or the instantaneous wind speed exceeds 10 miles per hour. The Enforcement Agency may approve exceptions to the wind speed requirement for MSW landfills consistently having measured winds in excess of these specified limits. Average wind speed shall be determined on a 15-minute average using an on-site anemometer with a continuous recorder for the entire duration of the monitoring event.
5. Surface testing shall be conducted when there has been no measurable precipitation in the preceding 72 hours prior to sampling.

(B) *Instantaneous Surface Emissions Monitoring:* The owner or operator shall record any instantaneous surface readings that exceed a methane concentration of 200 ppmv, other than non-repeatable, momentary readings,

1. Surface areas of the MSW landfill that exceed a methane concentration limit of 500 ppmv shall be marked and remediated pursuant to subsection (f)(1)(A).
2. Any landfill surface areas with cover penetrations, distressed vegetation, cracks or seeps shall also be inspected visually and with a hydrocarbon detector.

3. Testing results shall be maintained and submitted pursuant to subdivision (g)(1)(A)4.
- (C) *Integrated Surface Emissions Monitoring:* Integrated surface readings shall be recorded on a data logger and then averaged for each grid.
1. A continuous integrated surface sample shall be taken while walking a course of approximately 2,600 linear feet over a 25-minute period.
  2. Individual monitoring grids that exceed an average methane concentration of 25 ppmv shall be identified and remediated pursuant to subsection (f)(1)(A).
- (4) *Gas Collection and Control System Leak Inspection Procedures.* Leaks shall be measured using a hydrocarbon detector meeting the requirements of (h)(1).
- (5) *Determination of Concentration.* The percentage concentration of methane and oxygen in the landfill gas shall be determined as prescribed in EPA Reference Method 3C (40 CFR 60, Appendix A) [*insert effective date*].
- (6) *Determination of Expected Gas Generation Flow Rate.* The expected gas generation flow rate shall be determined as prescribed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3 using a recovery rate of 75 percent.
- (7) *Control Device Efficiency Determination.* Either EPA Reference Methods [*to be inserted*] shall be used to determine the efficiency of the control device in reducing methane by at least 99 percent or in reducing the outlet methane concentration to less than 3,000 ppmv, dry basis, corrected to 15 percent oxygen.
- (8) *Sampling Ports:* Every gauge, monitor or sensor will be collocated with a sampling port for the Enforcement Agency's use. The sampling ports must be maintained and free of blockages. The sampling ports must have a removable cap. The Sampling ports must be capped when not in use.

**(i) Penalties**

- (1) Any owner or operator who fails to comply with the requirements of this section, who fails to submit any information, report, or statement required by this section, or who knowingly submits any false statement or representation in any application, report, statement, or other document

filed, maintained, or used for the purposes of compliance with this section may be subject to civil or criminal penalties set forth in article 3 (commencing with section 42400) of chapter 4 of part 4, division 26 of the Health and Safety Code. In assessing penalties, the Executive Officer will consider the factors set forth in Health and Safety Code section 42400.8 including but not limited to willfulness of the violation, the length of time of noncompliance, whether compliance was attempted, whether the violation is a first offense or repeat offense, the magnitude of non-compliance, and cooperation with enforcement personnel in providing the requested information.

**(j) Enforcement**

*Right of Entry:* For purposes of inspecting MSW landfills covered in this section, and inspecting or auditing the records required by this regulation or obtaining samples, an employee of the Enforcement Agency or its designee, upon presentation of proper credentials, has the right to enter any facility (with any necessary safety clearances) where the landfill is located or records are kept

**(k) Severability.** Each part of this section shall be deemed severable, and in the event that any part of this section is held to be invalid, the remainder of this section shall continue in full force and effect.

NOTE: Authority cited: sections [to be inserted]