Appendix A-1

Proposed Regulation Order

Proposed Amendments to the Regulation on Methane Emissions from Municipal Solid Waste Landfills

[Note: This version of the Proposed Regulation Order complies with Government Code section 11346.2 subdivision (a)(3). The proposed amendments are shown in underline to indicate additions and ~~strikethrough~~ to indicate deletions from the existing regulatory text. Placeholder text to be updated upon adoption of the proposed amendments is shown in angle brackets (such as <effective date of the amendments – OAL to insert>). Sections for which no changes are proposed in this rulemaking are indicated with "* * * *." For ease of readability, CARB has also provided a version of the proposed amendments that can toggle between amendments in strikeout/underline and a "clean" version with amendments incorporated into the regulatory text, which can be found in Appendix A-2.]

Date of release: September 23, 2025
Date of hearing: November 20, 2025

Chapter 1. Air Resources Board

Subchapter 10. Climate Change

Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions

Subarticle 6. Methane Emissions from Municipal Solid Waste Landfills

Proposed Regulation Order

Title 17, California Code of Regulations

Amend sections 95462, 95463, 95464, 95465, 95467, 95468, 95469, 95470, 95471, 95475, and Appendix I; and

Repeal section 95466 of title 17, California Code of Regulations, to read as follows:

§ Subarticle 6: Methane Emissions from Municipal Solid Waste Landfills

* * * *

§ 95462. Exemptions.

(a) This subarticle does not apply to landfills that receive only hazardous waste, or are currently regulated under the Comprehensive Environmental Response, Compensation and Liability Act 42 U.S.C, Chapter 103 *(Promulgated 12/11/80; Amended 10/17/86)*.

(b) This subarticle does not apply to landfills that ~~receive~~contain only construction and demolition wastes, inert waste, or non-decomposable wastes.

(c) This subarticle does not apply to closed or inactive MSW landfills with less than 450,000 tons of waste-in-place.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 39003, 39500, 39600 and 39601, Health and Safety Code.

§ 95463. Determination for Installing a Gas Collection and Control System.

(a) *Controlled MSW Landfills:* Each owner or operator of a controlled MSW landfill (as defined in section 95475) shall comply with sections 95464 through 95476.

~~(a) *Active MSW Landfills Less Than 450,000 Tons of Waste-in-Place:* Each owner or operator of an active MSW landfill having less than 450,000 tons of waste-in-place must submit a Waste-in-Place Report to the Executive Officer pursuant to section 95470(b)(4), within 90 days of the effective date of this subarticle.~~

~~(1) The Waste-in-Place report must be prepared for the period of January 1 through December 31 of each year. The report must be submitted to the Executive Officer by March 15 of the following year.~~

~~(2) The Waste-in-Place report must be submitted annually until either:~~

~~(A) The MSW landfill reaches a size greater than or equal to 450,000 tons of waste-in-place; or~~

~~(B) The owner or operator submits a Closure Notification pursuant to section 95470(b)(1).~~

(b) *Uncontrolled MSW Landfills ~~Greater Than or Equal to 450,000 Tons of Waste-in-Place~~:* ~~Within 90 days of the effective date of this subarticle or upon reaching 450,000 tons of waste-in-place~~ By March 15, 2027, each owner or operator of an uncontrolled MSW landfill (as defined in section 95475) ~~having greater than or equal to 450,000 tons of waste-in-place must~~shall calculate the landfill gas heat input capacity pursuant to section 95471(b) and ~~must~~shall submit an Annual Uncontrolled Landfill ~~Gas Heat Input Capacity~~ Report to the Executive Officer.

(1) If the calculated landfill gas heat input capacity is less than 3.0 million British thermal units per hour (MMBtu/hr) recovered, the owner or operator ~~must~~shall:

(A) Recalculate the landfill gas heat input capacity annually using the procedures specified in section 95471(b).

(B) Submit an ~~a~~Annual Uncontrolled Landfill ~~Gas Heat Input Capacity~~ Report by March 15 each year to the Executive Officer until either of the following conditions is met:

1. The calculated landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr recovered, or

2. If the MSW landfill is active, the owner or operator submits a Closure Notification pursuant to section 95470(b)(1). Submitting the Closure Notification fulfills the requirements of this subarticle. If the MSW landfill is closed or inactive, submittal of the Closure Notification is not required to fulfill the requirements of the subarticle.

(2) If the landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr recovered the owner or operator ~~must~~shall either:

(A) Comply with the requirements of sections 95464 through 95476, or

(B) Demonstrate to the satisfaction of the Executive Officer that after four consecutive quarterly monitoring periods there is no measured concentration of methane of 200 parts per million by volume (ppmv) or greater using the instantaneous surface monitoring procedures specified in sections 95471(c)(1) and 95471(c)(2), including

monitoring performed in response to a remotely detected emission plume pursuant to section 95469(b)(3). Based on the monitoring results, the owner or operator ~~must~~shall do one of the following:

1. If there is any measured concentration of methane of 200 ppmv or greater from the surface of an active, inactive, or closed MSW landfill, comply with sections 95464 through 95476;

2. If there is no measured concentration of methane of 200 ppmv or greater from the surface of an active MSW landfill, comply with section 95463(b), comply with section 95469(b), and ~~recalculate the landfill gas heat input capacity~~ annually ~~as required in section 95463(b)~~submit an Annual Uncontrolled Landfill Report until such time the owner or operator submits a Closure Notification pursuant to section 95470(b)(1); or

3. If there is no measured concentration of methane of 200 ppmv or greater from the surface of a closed or inactive MSW landfill, the requirements of sections 95464 through 95470 no longer apply provided that the following information is submitted to and approved by the Executive Officer within 90 days:

    a. A ~~Waste-in-Place Report~~Closure Notification pursuant to section 95470(b)(41); and

    b. All instantaneous surface monitoring records.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600~~ and~~, 39601, and 39730.5 Health and Safety Code.

§ 95464. Gas Collection and Control System Requirements.

(a) Design Plan and Installation.

(1) *Design Plan for MSW Landfills:* If a gas collection and control system which meets the requirements of ~~either sections~~section 95464(b)(1)~~,~~ and either section 95464(b)(2) or ~~95464(b)~~(3) has not been installed, the owner or operator of a MSW landfill ~~must~~shall submit a Design Plan to the Executive Officer within one year after the effective date of this subarticle, or within one year of detecting any leak on the landfill surface exceeding a

methane concentration of 200 ppmv pursuant to section 95463(b)(2)(B). The Executive Officer ~~must~~shall review and either approve or disapprove the Design Plan within 120 days. The Executive Officer may request that additional information be submitted as part of the review of the Design Plan. At a minimum, the Design Plan ~~must~~shall meet the following requirements:

(A) The Design Plan ~~must~~shall be prepared and certified by a professional engineer.

(B) The Design Plan ~~must~~shall provide for the control of the collected gas through the use of a gas collection and control system meeting the requirements of ~~either sections~~section 95464(b)(1)~~,~~ and either section 95464(b)(2) or ~~95464(b)~~(3).

(C) The Design Plan ~~must~~shall include any proposed alternatives to the requirements, test methods, procedures, compliance measures, monitoring, and recordkeeping or reporting requirements pursuant to section 95468.

(D) A description of potential mitigation measures to be used to prevent the release of methane or other pollutants into the atmosphere during the installation or preparation of wells, piping, or other equipment; during repairs or the temporary shutdown of gas collection system components; or, when solid waste is to be excavated and moved.

(E) For active MSW landfills, the design plan ~~must~~shall identify areas of the landfill that are closed ~~or inactive~~.

(F) Design the gas collection and control system to handle the expected gas ~~generation~~recovery flow rate from the entire area of the MSW landfill and to collect gas at an extraction rate to comply with the surface methane emission limits in section 95465 and component leak standard in section 95464(b)(1)(B). The expected gas ~~generation~~recovery flow rate from the MSW landfill ~~must~~shall be calculated pursuant to section 95471(~~e~~h).

1. Any areas of the landfill that contain only asbestos-containing waste, inert waste, or non-decomposable solid waste may be excluded from collection provided that the owner or operator submits documentation to the Executive Officer containing the nature, date of deposition, location and amount of asbestos or non-decomposable solid waste deposited in the area. This documentation may be included as part of the Design Plan.

(2) *Design Plan for Gas Control Systems:* The owner or operator of a gas control system shall submit a Design Plan to the Executive Officer at least 6 months before accepting landfill gas. This requirement only applies to gas control systems that begin accepting landfills gas after July 1, 2027. The Executive Officer shall review and either approve or disapprove the Design Plan within 120 days. The Executive Officer may request that additional information be submitted to substantiate the requirements below as part of the review of the Design Plan. The Design Plan shall meet the following requirements:

(A) The Design Plan shall be prepared and certified by a professional engineer.

(B) The Design Plan shall provide for the control of the collected gas through the use of a control system meeting the requirements of section 95464(b)(1) and either section 95464(b)(2) or (3).

(C) The Design Plan shall include any proposed alternatives to the requirements, test methods, procedures, compliance measures, and monitoring requirements pursuant to section 95468.

(D) Design the gas control system to handle the expected gas acceptance rate.

~~(2)~~(3) Any owner or operator of an active MSW landfill ~~must~~shall install and operate a gas collection and control system within ~~18~~six months after approval of the Design Plan.

~~(3)~~(4) Any owner or operator of a closed or inactive MSW landfill ~~must~~shall install and operate a gas collection and control system within ~~30~~18 months after approval of the Design Plan.

(5) Any owner or operator of an MSW landfill that accepted at least 200,000 tons of solid waste per year in any of the prior three calendar years shall install horizontal collectors or caisson wells in areas of new waste

placement. The operation of the horizontal collectors and caisson wells shall begin after both of the following conditions have been met:

(A) At least 15 vertical feet of solid waste has been placed over the horizontal collector or the bottom of the caisson well.

(B) Positive pressure has been detected in the horizontal collector or caisson well based on monthly measurements of gauge pressure using the methods provided in section 95471(l).

~~(4)~~(6) If an owner or operator is modifying an existing gas collection and control system to meet the requirements of this subarticle, the existing Design Plan ~~must~~shall be amended to include any necessary updates or addenda, and ~~must~~shall be certified by a professional engineer.

~~(5)~~(7) An amended Design Plan ~~must~~shall be submitted to the Executive Officer within 90 days of any event that requires a change to the Design Plan.

~~(6)~~(8) The gas collection system ~~must~~shall be operated, maintained, and expanded in accordance with the procedures and schedules in the approved Design Plan.

(b) Gas Collection and Control System Requirements.

(1) *General Requirements.* The owner or operator ~~must~~shall satisfy the following requirements when operating a gas collection and control system:

(A) Route the collected gas to a gas control device or devices, and operate the gas collection and control system continuously except as provided for individual collection system components in section~~s 95464(d) and~~ 95464(e). The following two conditions shall also be met:

1. In the event the gas collection or control system is not operating, the gas mover system shall be shut down and all valves in the gas collection and control system contributing to venting of the gas to the atmosphere shall be closed immediately using an automatic gas mover shutdown and valve closing; and,

2. Gas control system downtime shall not exceed 120 hours in a calendar year.

(B) Operate the gas collection and control system so that there is no landfill gas leak that exceeds 500 ppmv, measured as methane, at any component under positive pressure, other than non-repeatable, momentary readings.

(C) The gas collection system ~~must~~shall be designed and operated to draw all the gas toward the gas control device or devices.

(D) Equip each gas control device with at least one gas flow rate measuring device capable of recording the gas flow rate at least every 15 minutes. The device shall be installed, calibrated, maintained, and operated according to the manufacturer's specifications.

(E) Equip the gas collection system with at least one pressure measuring device capable of recording the system pressure on the vacuum (negative pressure) side of the blower at least every 15 minutes. The device shall be installed, calibrated, maintained, and operated according to the manufacturer's specifications.

(2) *Requirements for Flares.* An ~~MSW landfill~~ owner or operator who operates a flare ~~must~~shall satisfy the following requirements:

(A) Route the collected gas to an enclosed flare that meets the following requirements:

1. Achieves a methane destruction efficiency of at least 99 percent by weight.

2. Is equipped with automatic dampers, an automatic shutdown device, a flame arrester, and continuous recording temperature sensors. The temperature sensors shall have an accuracy of plus or minus (±) 1 percent of the temperature being measured and shall record the temperature at least every 15 minutes. The sensors shall be installed, calibrated, maintained, and operated according to the manufacturer's specifications.

3. During restart or startup there ~~must~~shall be a sufficient flow of ~~propane or commercial natural gas~~supplemental fuel to the burners to prevent unburned collected methane from being emitted to the atmosphere.

4. The gas control device ~~must~~shall be operated within the parameter ranges established during the ~~initial or~~ most recent source test.

(B) Route the collected gas to an open flare that meets the requirements of 40 CFR § 60.18 (as last amended 73 Fed.Reg. 78209 (December 22, 2008)), which is incorporated by reference herein. The operation of an open flare is not allowed except under the following conditions:

1. An open flare installed and operating prior to August 1, 2008, may operate until January 1, 2018.

2. Operation of an open flare on or after January 1, 2018, may be allowed if the owner or operator can demonstrate to the satisfaction of the Executive Officer that the landfill gas heat input capacity is less than 3.0 MMBtu/hr pursuant to section 95471(b) and is insufficient to support the continuous operation of an enclosed flare or other gas control device.

3. 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 an enclosed flare, or to address offsite gas migration issues.

    a. Any owner or operator seeking to temporarily operate an open flare ~~must~~shall submit a written request to the Executive Officer pursuant to section 95468.

(3) *Requirements for Gas Control ~~Devices~~Systems other than Flares.* An ~~MSW landfill~~ owner or operator who operates a gas control device or system other than a flare ~~must~~shall satisfy one of the following requirements:

(A) Route the collected gas to an energy recovery device, or series of devices that meets the following requirements:

1. Achieves a methane destruction efficiency of at least 99 percent by weight. Lean burn internal combustion engines ~~must~~shall reduce the outlet methane concentration to less than 3,000 ppmv, dry basis, corrected to 15 percent oxygen.

2. If a boiler or a process heater is used as the gas control device, the landfill gas stream ~~must~~shall be introduced into the flame zone. Where the landfill gas is not the primary fuel for the boiler or process heater, introduction of the landfill gas stream into the flame zone is not required.

3. If an internal combustion engine or gas turbine is used as the gas control device, it shall be equipped with an oxygen sensor and a temperature sensor in the exhaust gas stream upstream of any add-on exhaust treatment equipment. The sensors shall record the oxygen content (in percent by volume) and temperature at least every 15 minutes and shall be installed, calibrated, maintained, and operated according to the manufacturers' specifications.

~~3.~~4. The gas control device ~~must~~shall be operated within the parameter ranges ~~established during the initial or most recent source test~~provided in the manufacturer's specifications.

(B) Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. ~~All emissions vented~~ Venting of landfill gas to the ~~atmosphere from the gas treatment system are~~ambient air is not allowed. Landfill gas that cannot be routed for subsequent sale or use is subject to the requirements of section~~s~~ 95464(b)(2), including raw landfill gas, treated gas, and tail gas.

1. Gas measurement points shall be located at each inlet and outlet of the treatment system, including to any control devices, and all data shall be electronically archived (manual recording is not acceptable). Equip each measurement point with at least one measuring device capable of recording the gas flow at standard conditions at least every 15 minutes. Equip each measurement point with at least one measuring device capable of recording methane content in percent by volume at least every three hours. Measurement devices shall be installed, calibrated, maintained, and operated according to the manufacturer's specifications.

(4) *Source Test Requirements:* The owner or operator ~~must~~shall conduct an annual source test for any gas control device(s) subject to the requirements of sections 95464(b)(2)(A) or 95464(b)(3)(A) using the test methods identified in 95471(f). An initial source test ~~must~~shall be conducted within 180 days of initial start up of the gas collection and control system. Each succeeding complete annual source test ~~must~~shall be conducted no later than 45 days after the anniversary date of the initial source test.

(A) If a gas control device remains in compliance after three consecutive source tests the owner or operator may conduct the source test every three years. If a subsequent source test shows the gas collection and control system is out of compliance the source testing frequency will return to annual.

(5) *Component Leak Monitoring Plans:* By <90 days after the effective date of the amendments – OAL to insert> or within 90 calendar days of initial start up of the gas collection and control system, the owner or operator shall develop a component leak monitoring plan for the monitoring required pursuant to section 95469(c). The plan shall be updated within 90 calendar days of any changes made to the gas collection and control system that would impact the plan. The plan shall include the following elements:

(A) Procedures and timelines for conducting monitoring and repairs to ensure compliance with the requirements of this subarticle.

(B) Sitemap or diagram showing where all components to be monitored are located.

(C) List of all components to be monitored, including an identification number or name, a brief description of the component, and the

method for determining the location of each component (e.g., tagging, identification on a process and instrumentation diagram, etc.).

(6) *Cover Monitoring Plan*: By <90 days after the effective date of the amendments – OAL to insert>, the MSW landfill owner or operator shall implement a plan to monitor cover integrity and implement any necessary cover repairs or maintenance monthly.

(A) The cover integrity monitoring plan shall include protocols and procedures to identify and address issues such as exposed waste, leachate breakouts, and erosion gullies.

(B) The cover shall conform with the requirements approved for the landfill by the California Department of Resources Recycling and Recovery (CalRecycle) pursuant to California Code of Regulations, Title 27, Division 2, Subdivision 1, Chapter 3, Subchapters 4 and 5.

(c) *Wellhead Gauge Pressure Requirement:* Each wellhead ~~must~~shall be operated under a vacuum (negative pressure), except as provided in section~~s 95464(d) and~~ 95464(e), or under any of the following conditions:

(1) Use of a geomembrane or synthetic cover. The owner or operator ~~must~~shall develop acceptable pressure limits for the wellheads and include them in the Design Plan~~; or~~.

(2) A decommissioned well. A well can be permanently decommissioned only if it meets one of the following criteria, and provided that surface emissions monitoring is performed within 30 calendar days after disconnecting the well from vacuum that shows no exceedances of the standards in section 95465 in the grid in which the well is located:

(A) The wellhead methane content exhibits a long-term (at least 60 month) declining trend and is below 20 percent by volume.

(B) The full radius of influence of the decommissioned well is covered by the radii of influence of other wells such that active gas extraction is maintained in the area.

(3) A fire or elevated wellhead gas temperature. The owner or operator shall record instances when positive pressure occurs in efforts to avoid a fire.

(d) *Wellhead Gas Temperature Requirement*: Each wellhead shall be operated with an interior wellhead landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit).

~~(d) *Well Raising:* The requirements of sections 95464(b)(1)(A), 95464(b)(1)(B), and 95464(c), do not apply to individual wells involved in well raising provided the following conditions are met:~~

~~(1) New fill is being added or compacted in the immediate vicinity around the well.~~

~~(2) Once installed, a gas collection well extension is sealed or capped until the raised well is reconnected to a vacuum source.~~

(e) *Repairs and Temporary Shutdown of Gas Collection System Components:* The requirements of sections 95464(b)(1)(A), 95464(b)(1)(B), and 95464(c), do not apply to individual landfill gas collection system components that must be temporarily shut down in order to repair the components, due to catastrophic events such as earthquakes, to connect new landfill gas collection system components to the existing system, to extinguish landfill fires, ~~or~~ to perform construction activities ~~pursuant to section 95466~~, or to perform well raising provided the following requirements are met:

~~(1) Any new gas collection system components required to maintain compliance with this subarticle must be included in the most recent Design Plan pursuant to section 95464(a)(4).~~

~~(2)~~(1) Methane emissions are minimized during shutdown pursuant to section 95464(a)(1)(D). Potential mitigation measures may include, but are not limited to: using a synthetic membrane or spray-applied mortar; limiting the size of the construction or fill area; completing and capping work within a day; and use of vacuum box during drilling.

(2) Efforts to return the shut down component to operation are initiated and completed to minimize downtime, and the component is returned to operation no more than five calendar days following initial shutdown. In the event the component cannot be returned to operation within five calendar days following initial shutdown, the owner or operator shall submit a notification to the Executive Officer as specified in section 95470(b)(8) with the reason the component cannot be returned to operation within five calendar days, surface emissions monitoring records demonstrating the shutdown is not resulting in excess methane emissions, the estimated date of return to operation, and a description of the methane emissions minimization measures being used. This limitation does not apply to a well that is reconnected to vacuum at the end of each work day.

(3) No more than five wells or five percent of the total number of wells at the MSW landfill, whichever is greater, are offline at any one time, except in

cases where wells are being shut down to prevent or extinguish fire. Decommissioned wells do not count toward this limit or the total number of wells.

(4) For well raising, new fill is being added or compacted in the immediate vicinity around the well, all valves are closed to isolate the well, and once installed, a gas collection well extension is sealed or capped until the raised well is reconnected to a vacuum source.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

§ 95465. Surface Methane Emission Standards.

(a) ~~Except as provided in sections 95464(d), 95464(e), and 95466, b~~Beginning January 1, 2011, or upon commencing operation of a newly installed gas collection and control system or modification of an existing gas collection and control system pursuant to 95464(a)(1), whichever is later, no location on the MSW landfill surface may exceed either of the following methane concentration limits:

(1) 500 ppmv, other than non-repeatable, momentary readings, as determined by instantaneous surface emissions monitoring.

(2) An average methane concentration limit of 25 ppmv as determined by integrated surface emissions monitoring.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

§ 95466. ~~Construction Activities.~~[RESERVED].

~~(a) The requirements of section 95465 do 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, or for law enforcement activities requiring excavation.~~

~~Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 39003, 39500, 39600 and 39601, Health and Safety Code.~~

§ 95467. Semi-continuous Operation and Permanent Shutdown ~~and Removal~~ of the Gas Collection and Control System.

(a) *Semi-continuous Operation Criteria:* The owner or operator of a gas collection and control system at a closed MSW landfill with robust final cover and low methane generation (as demonstrated through the criteria below) may submit a to the Executive Officer a request for semi-continuous operation as described in section 95467(b), provided all the following requirements are met:

(1) *Collection System Assessment.* For the purpose of demonstrating gas collection system functionality and that declining gas recovery is due to low methane generation, the owner or operator has performed a collection system assessment as described in section 95471(j) and has corrected any issues identified through the assessment.

(2) *Cover Integrity Assessment.* For the purpose of demonstrating robust final cover, the owner or operator has performed a cover integrity assessment as described in section 95471(k) and has corrected any deficiencies identified through the assessment.

(3) *Surface Emissions History.* There have been no exceedances of the surface methane concentration limits specified in section 95465 for the previous three years, including during compliance inspections.

(4) *Declining Gas Generation.* For the purpose of demonstrating low methane generation, the owner or operator has measured the methane content (in percent by volume) to the inlet of each control device at least every three hours for a minimum of one year after remediating any issues identified in section 95467(a)(1) and (2), and determined that the measured methane collection is less than 275 metric tons per year of methane using the calculation procedure in section 95471(g). Alternatively, the owner or operator may demonstrate that the annual average composition of the collected landfill gas did not exceed 30 percent methane by volume for a minimum of five consecutive years.

(5) *Control Device Assessment.* A professional engineer has certified that there are no available modifications to any control device available onsite that would allow any control device to operate continuously at the methane flow rate and gas composition being collected. Additionally, there

is no adjacent facility with a continuously operating control device that will accept the landfill gas.

(6) Compliance with all federal, state, and local requirements can be maintained during periods of semi-continuous operation.

(b) *Semi-continuous Operation Request:* A semi-continuous operation request shall demonstrate that all the requirements in sections 95467(a)(1)-(6) are met. At a minimum, the request shall include the following:

(1) A copy of the Closure Notification submitted pursuant to section 95470(b)(1).

(2) A description of the methods, results, and any issues corrected for the analyses required in sections 95467(a)(1) and (2).

(3) Records, as described in section 95470(a)(1)(D), of all surface emissions monitoring performed in the previous three years, including during compliance inspections, and an attestation that no exceedances of the surface methane concentration limits specified in section 95465 were found over that period.

(4) Methane collection records supporting the requirements in section 95467(a)(4).

(5) Documentation supporting the requirements in section 95467(a)(5).

(6) A description of all federal, state, and local requirements that apply to the landfill and a description of how compliance with those requirements can be maintained during periods of semi-continuous operation.

(7) A description of proposed monitoring, recordkeeping, and reporting appropriate to demonstrate on an ongoing basis that semi-continuous operation does not increase methane emissions.

(8) A proposed initial operational schedule and performance indicators that will dictate when to temporarily shut down and restart the gas collection and control system. Indicators may include gas system pressure, gas composition, or other measurable parameters as proposed by the owner or operator.

(c) *Semi-continuous Operation Approval:* The Executive Officer shall approve or disapprove a request for semi-continuous operation within 120 calendar days based on whether the request includes all the minimum elements required in section 95467(b), substantiates all the requirements in sections 95467(a)(1)-(6),

and has an operational schedule and adjustment performance indicators that maximizes system operation time. The Executive Officer shall disapprove the request if it does not provide equivalent levels of enforceability and methane emission control.

(1) The Executive Officer may review a previously approved semi-continuous operation request for conformance with the standards in 95467(c). If the Executive Officer determines that the semi-continuous operation request does not comply with the standards in 95467(c), the Executive Officer shall revoke the semi-continuous operation approval.

~~(a)~~(d) *Conditional Permanent Shutdown Criteria:* The owner or operator of a gas collection and control system at a closed MSW landfill ~~can be~~ may submit to the Executive Officer a conditional request to permanently shut down, cap~~ped~~ or remove~~d~~ the gas collection and control system as described in section 95467(e), provided all the ~~following~~ requirements in (1)-(4) below are met.~~:~~ The conditional request is the first of two requests (the second being the final request) that shall be approved before the owner or operator can permanently shut down, cap, or remove the gas collection and control system.

(1) The gas collection and control system was in operation for at least 15 years after the MSW landfill last accepted waste, unless the owner or operator can demonstrate to the satisfaction of the Executive Officer that due to declining methane rates the MSW landfill will be unable to operate the gas collection and control system for a 15-year period.

(2) No other federal, state, or local requirements necessitate operation of the gas collection system.

(3) The owner or operator has measured the methane content (in percent by volume) to the inlet of each control device at least every three hours; has performed the actions described in sections 95467(a)(1), (2), and (5); and the measured methane collection is below 125 metric tons per year of methane for at least three years after correcting any issues or deficiencies discovered. The measured methane collection shall be determined according to section 95471(g).

~~(2)~~(4) There were no exceedances of the ~~S~~surface methane concentration ~~measurements do not exceed the~~ limits specified in section 95465 for the previous five years, including during compliance inspections.

~~(3) The owner or operator submits an Equipment Removal Report to the Executive Officer pursuant to section 95470(b)(2).~~

(e) *Conditional Permanent Shutdown Request:* A conditional request to permanently shut down, cap, or remove the gas collection and control system shall demonstrate that all the requirements in section 95467(d)(1)-(4) are met. At a minimum, the request shall include the following:

(1) A copy of the Closure Notification submitted pursuant to section 95470(b)(1).

(2) A copy of the initial source test report or other documentation demonstrating when the gas collection and control system began operating.

(3) The methods, results, and any issues corrected for the assessments required in section 95467(d)(3).

(4) The annual measured methane collection required pursuant to section 95467(d)(3), including supporting data.

(5) Records, as described in section 95470(a)(1)(D), of all surface emissions monitoring performed in the time period described in section 95467(d)(4) which shows that no exceedances of the surface methane concentration limits specified in section 95465 were found over that period.

(f) *Permanent Shutdown Approval:* The Executive Officer shall approve or disapprove a conditional request to permanently shut down, cap, or remove the gas collection and control system within 120 calendar days based on whether the request meets the requirements of section 95467(e) and substantiates all the requirements in sections 95467(d)(1)-(4).

(1) If the Executive Officer approves a conditional request to permanently shut down, cap, or remove the gas collection and control system, the owner or operator shall perform a simulated shutdown surface emissions monitoring demonstration. This demonstration shall consist of quarterly surface emissions monitoring following the requirements in section 95469(a) for eight quarters at a 25-foot spacing interval. The owner or operator shall provisionally shut down the gas collection and control system for at least five days before each monitoring event. Upon discovering an exceedance of the surface methane concentration limits specified in section 95465, whether in the quarterly monitoring, in monitoring following a remotely detected emission plume notification pursuant to section 95469(b), or during a compliance inspection, the gas collection and control system shall be restarted.

(2) If the simulated shutdown surface emission monitoring demonstration is completed without any exceedances of the methane emission standards

in section 95465, the owner or operator may submit a final request to permanently shut down, cap, or remove the gas collection and control system.

(A) The request shall demonstrate that all the requirements in section 95467(d)(1)-(4) are met, that the simulated shutdown surface emissions monitoring was performed in accordance with the requirements in section 95467(f)(1), and that no exceedances were found during the demonstration period. To support the simulated shutdown surface emissions monitoring demonstration, at a minimum, the request shall include records (as described in section 95470(a)(1)(D)) of all surface emissions monitoring performed for the demonstration in section 95467(f)(1), an attestation that no exceedances were found over that period, and the dates of gas collection and control system temporary shutdowns and startups. An Equipment Removal Report pursuant to section 95470(b)(2) shall also be submitted along with the final request.

(B) The Executive Officer shall approve or disapprove a final request to permanently shut down, cap, or remove the gas collection and control system within 120 calendar days based on whether the request demonstrates the requirements in section 95467(f)(2)(A). If the Executive Officer approves the request the requirements of sections 95464 through 95470 no longer apply.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 and, 39601, and 39730.5 Health and Safety Code.

§ 95468. Alternative Compliance Options.

(a) The owner or operator may request alternatives to the compliance measures, monitoring requirements, test methods and procedures of sections 95464, 95469, and 95471. Any alternatives requested by the owner or operator mustshall be submitted in writing to the Executive Officer. as specified in section 95470(b)(8). Alternative compliance option requests may include, but are not limited to, the following:

(1) Semi-continuous operation of the gas collection and control system due to insufficient landfill gas flow rates.

(2)(1) Requests for Aadditional time allowance for leak repairs for landfills having consistent, which shall demonstrate issues related to the procurement and

delivery of necessary parts to complete the repair, or adverse weather conditions that impede repair work, demonstrate that efforts were promptly initiated, and include the expected timeline to complete the repair.

~~(3)~~(2) Requests for ~~A~~alternative wind speed or precipitation requirements ~~for landfills~~ , which shall demonstrate that the landfill consistently ~~having~~experiences winds or precipitation in excess of the limits specified in this subarticle.

~~(4) Alternative walking patterns to address potential safety and other issues, such as: steep or slippery slopes, monitoring instrument obstructions, and physical obstructions.~~

~~(5) Exclusion of construction areas and other dangerous areas from landfill surface inspection.~~

~~(6) Exclusion of paved roads that do not have any cracks, pot holes, or other penetrations from landfill surface inspection.~~

(b) Criteria that the Executive Officer may use to evaluate alternative compliance option requests include, but are not limited to: compliance history; documentation containing the landfill gas flow rate and measured methane concentrations for individual gas collection wells or components; permits; component testing and surface monitoring results; gas collection and control system operation, maintenance, and inspection records; and historical meteorological data.

(c) The Executive Officer will review the requested alternatives and either approve or disapprove the alternatives within 120 days. The Executive Officer may request that additional information be submitted as part of the review of the requested alternatives.

(1) If a request for an alternative compliance option is denied, the Executive Officer will provide written reasons for the denial.

(2) The Executive Officer ~~must~~shall deny the approval of any alternatives not providing equivalent levels of enforceability or methane emission control.

(3) Pending alternative requests do not become effective until approved in writing.

(d) The Executive Officer may review a previously approved alternative compliance option for conformance with the standard in section 95468(c)(2) or to determine if it provides alternatives to requirements in sections other than those referenced in section 95468(a) using the criteria in section 95468(c).

(1) If the Executive Officer determines that the alternative compliance option does not comply with the standard in section 95468(c)(2) or provides alternatives to requirements in sections other than those referenced in section 95468(a), the Executive Officer shall revoke the alternative compliance option.

(e) By April 1, 2027, any owner or operator with an alternative compliance option that was in effect on <effective date of the amendments – OAL to insert> shall submit to the Executive Officer any approval documentation in their possession and all documents submitted as part of the original alternative compliance option request. If the owner or operator does not submit any documentation, the alternative compliance option becomes invalid as of January 1, 2028.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

§ 95469. Monitoring Requirements.

(a) *Surface Emissions Monitoring Requirements:* Any owner or operator of a MSW landfill with a gas collection and control system ~~must~~shall conduct instantaneous and integrated surface monitoring of the landfill surface quarterly using the procedures specified in section 95471(c) or an alternative procedure (including potentially a different monitoring frequency) approved pursuant to section 95471(e). Unsafe-to-walk surface areas, as defined in section 95475(a)(40), that cannot be safely monitored using the procedures specified in section 95471(c) for an entire calendar quarter shall be monitored within the same quarter using the procedures specified in section 95471(d), unless those areas are monitored using an alternative surface emissions monitoring procedure approved pursuant to section 95471(e).

(1) *Instantaneous Surface Monitoring:* Any reading exceeding the limit specified in section 95465(a)(1) ~~must~~shall be recorded as an exceedance and the following actions ~~must~~shall be taken:

(A) The owner or operator ~~must~~shall record the date, location coordinates, and value of each exceedance, along with re-test dates and results. ~~The location of each exceedance must be clearly marked and identified 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.~~

(B) Corrective action ~~must~~shall be ~~taken~~initiated by the owner or operator within three calendar days of a measured exceedance

such as, but not limited to, cover maintenance or repair, or well vacuum adjustments and the location ~~must~~shall be re-monitored within ~~ten~~10 calendar days of ~~a~~the measured exceedance.

1. If the re-monitoring ~~of the location~~performed pursuant to section 95469(a)(1)(B) shows a second exceedance, additional corrective action ~~must~~shall be ~~taken~~initiated within three calendar days after the second exceedance and the location ~~must~~shall be re-monitored again no later than 10 calendar days after the second exceedance.

    a. If the re-monitoring shows that there is no longer an exceedance at the location, the location shall be re-monitored one month from the initial exceedance.

2. If the re-monitoring performed pursuant to section 95469(a)(1)(B) shows that there is no longer an exceedance at the location, the location shall be re-monitored one month from the initial exceedance.

    a. If the one-month re-monitoring shows a second exceedance, additional corrective action shall be initiated within three calendar days after the second exceedance and the location shall be re-monitored again no later than 10 calendar days after the second exceedance.

~~2.~~3. If the re-monitoring shows a third exceedance, the owner or ~~owner or~~ operator ~~must~~shall notify the Executive Officer as specified in section 95470(b)(8) within 30 calendar days after detecting the third exceedance, and shall install a new or replacement well, unless an alternative remedy is approved pursuant to section 95469(a)(3), as determined to achieve compliance and as confirmed through re-monitoring no later than 120 calendar days after detecting the ~~third~~initial exceedance, or it is a violation of this subarticle.

(C) ~~Any closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that has~~If all closed areas with final cover have no monitored exceedances of the limit specified in section 95465(a)(1) after four consecutive quarterly monitoring periods, the closed area with final cover may be monitored ~~annually~~every three quarters (i.e., each monitoring event occurs three quarters after the previous monitoring event). Any exceedances of the limit specified

in section 95465(a)(1) detected ~~during the annual monitoring that can not be remediated within 10 calendar days~~in the area being monitored every three quarters will result in a return to quarterly monitoring of the entire landfill surface.

(D) Any exceedances of the limit specified in section 95465(a)(1) detected during any compliance inspections will result in a return to quarterly monitoring of the landfill.

(2) *Integrated Surface Monitoring:* Any reading exceeding the limit specified in section 95465(a)(2) ~~must~~shall be recorded as an exceedance and the following actions ~~must~~shall be taken:

(A) The owner or operator ~~must~~shall record the average surface concentration measured as methane for each grid along with re-test dates and results. ~~The location of the grids and the gas collection system must be clearly marked and identified on a topographic map of the MSW landfill drawn to scale.~~

(B) ~~Within 10 calendar days of a measured exceedance, c~~Corrective action ~~must~~shall be ~~taken~~initiated by the owner or operator within three calendar days of a measured exceedance such as, but not limited to, cover maintenance or repair, or well vacuum adjustments and the grid ~~must~~shall be re-monitored within 10 calendar days of the measured exceedance.

1. If the re-monitoring of the grid performed pursuant to section 95469(a)(2)(B) shows a second exceedance, additional corrective action ~~must~~shall be ~~taken~~initiated within three calendar days after the second exceedance and the ~~location~~grid ~~must~~shall be re-monitored again no later than 10 calendar days after the second exceedance.

    a. If the re-monitoring of the grid shows that there is no longer an exceedance, the grid shall be re-monitored one month from the initial exceedance.

2. If the re-monitoring of the grid performed pursuant to section 95469(a)(2)(B) shows that there is no longer an exceedance, the grid shall be re-monitored one month from the initial exceedance.

    a. If the one-month re-monitoring of the grid shows a second exceedance, additional corrective action shall be initiated within three calendar days after the second exceedance and the grid shall be re-monitored again no later than 10 calendar days after the second exceedance.

~~2.~~3. If the re-monitoring ~~in section 95469(a)(2)(B)1.~~ shows a third exceedance, the owner or operator ~~must~~shall notify the Executive Officer as specified in section 95470(b)(8) within 30 calendar days after detecting the third exceedance, and shall install a new or replacement well, unless an alternative remedy is approved pursuant to section 95469(a)(3), as determined to achieve compliance and as confirmed through re-monitoring no later than 120 calendar days after detecting the ~~third~~initial exceedance, or it is a violation of this subarticle.

(C) ~~Any~~If all closed ~~or inactive MSW landfill, or any closed or inactive~~ areas ~~on an active MSW landfill that has~~with final cover have no monitored exceedances of the limit specified in section 95465(a)(2) after ~~4~~four consecutive quarterly monitoring periods, the closed area with final cover may be monitored ~~annually~~ every three quarters. Any exceedances of the limit~~s~~ specified in section 95465(a)(2) detected ~~during the annual monitoring that can not be remediated within 10 calendar days~~ in the area being monitored every three quarters will result in a return to quarterly monitoring of the entire landfill surface.

(D) Any exceedances of the limits specified in section 95465(a)(2) detected during any compliance inspections will result in a return to quarterly monitoring of the landfill.

~~(3) An owner or operator of a closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that can demonstrate that in the three years before the effective date of this subarticle that there were no measured exceedances of the limits specified in section 95465 by annual or quarterly monitoring may monitor annually. Any exceedances of the limits specified in section 95465 detected during the annual monitoring that can not be remediated within 10 calendar days will result in a return to quarterly monitoring of the landfill.~~

(3) If an owner or operator that is obligated to install a new or replacement well by section 95469(a)(1)(B)3. or (2)(B)3. concludes that an alternative corrective action would be more effective, they may submit a request for an alternative corrective plan to the Executive Officer as specified in section 95470(b)(8) within 30 calendar days after the third exceedance.

(A) The request shall include a proposal for an alternative corrective plan, an explanation of why the alternative corrective plan would be more effective than a new or replacement well to repair the exceedance, a timeline for completing the plan that shall be no longer than 120 days after the initial exceedance, and the reason why that timeline is necessary to carry out the alternative corrective plan.

(B) The Executive Officer shall approve or disapprove within 30 calendar days of receiving the request based on whether the owner or operator demonstrates that the proposed alternative corrective plan will be more effective to repair the exceedance than a new or replacement well and the timeline proposed is no longer than necessary based on the actions in the plan and not longer than 120 days after the initial exceedance.

(C) If the Executive Officer approves, the owner or operator shall perform the actions outlined in their alternative corrective plan within their proposed timeline.

(D) If the Executive Officer disapproves, the owner or operator shall install a new or replacement well according to 95469(a)(1)(B)3. or (2)(B)3.

(4) *Recurring Surface Exceedances*: The owner or operator of a MSW landfill that experiences either five initial (i.e., not including re-monitoring) instantaneous exceedances or three initial integrated exceedances within a single grid over a rolling 12 month period, including exceedances detected during monitoring pursuant to section 95469(a)(1) and (2) and compliance inspections, shall do the following in the grid that exceeded the threshold and all adjacent grids (i.e., grids that share an edge or corner):

(A) Complete a collection system assessment as described in section 95471(j) and a cover integrity assessment as described in section 95471(k) within 30 calendar days after reaching the threshold in section 95469(a)(4) and correct any issues identified in the assessments that could be contributing factors to the surface exceedances within 60 calendar days after reaching the threshold.

(B) Increase the frequency of surface emissions monitoring performed pursuant to section 95469(a) to monthly. The first monthly monitoring shall occur within 30 calendar days of reaching the threshold in section 95469(a)(4). The frequency can be reverted to quarterly after six consecutive monthly monitoring periods show no exceedances in the area in which the monitoring frequency was increased.

(b) *Remotely Detected Emission Plumes*: When notified by the Executive Officer of a methane emission plume detection pursuant to section 95469(b)(1), any owner or operator shall perform the actions specified in sections 95469(b)(2)-(4).

(1) The Executive Officer may notify an owner or operator of a methane emission plume remotely detected at their facility through remote monitoring data.

(A) The remote monitoring data shall be generated by a remote monitoring technology approved by the Executive Officer if, in their best engineering judgment, the technology demonstrates a capability to detect methane emission plumes and meets all the following requirements:

1. Spatial resolution of 30 meters by 30 meters or better.

2. Data available to CARB within 72 hours of collection.

3. Produces a visualization of the emission plume.

(B) The Executive Officer will send the notification to the email address supplied pursuant to section 95470(b) within seven business days of CARB receiving the remote monitoring data. The notification shall contain all the following information:

1. A CARB-issued identification number.

2. An estimate of the latitude and longitude coordinates where the emission plume appears to be originating.

3. A visualization of the emission plume.

4. The date and time of the emission plume detection.

(2) If the facility is a controlled MSW landfill or a landfill gas control system, the following requirements apply:

(A) Within five calendar days of receiving a notification pursuant to section 95469(b)(1), the owner or operator shall perform surface emissions and component leak monitoring using the following methods:

1. The monitoring area shall be a square with dimensions 600 feet by 600 feet centered on the coordinates provided by CARB as the estimated plume origin, excluding the areas described as excluded in sections 95471(c)(1) and 95471(c)(1)(A) (for the latter, only during the period described therein).

2. The surface emissions monitoring shall follow the procedures in section 95471(c)(1)(B) and (c)(2), using a walking pattern with a 25-foot spacing interval, or an alternative surface emissions monitoring procedure approved pursuant to section 95471(e). Unsafe-to-walk surface areas can be monitored according to the procedures in section 95471(d).

3. The component leak monitoring shall be performed according to the requirements of section 95471(f) and include monitoring of all components in the monitoring area, regardless of whether the components are expected to be under positive or negative pressure.

(B) Upon discovering an exceedance of the instantaneous surface emissions limit specified in section 95465(a)(1), the owner or operator shall perform the actions specified in section 95469(a)(1)(B).

(C) Upon discovering a component leak, the owner or operator shall perform the actions specified in section 95469(c)(1) and (2).

(3) If the facility is an uncontrolled MSW landfill subject to section 95463(b)(2)(B), the following requirements apply:

(A) Within 30 calendar days after receiving a notification pursuant to section 95469(b)(1), the owner or operator shall perform instantaneous surface emissions monitoring according to the procedures in section 95471(c)(1) and (2) across the entire landfill surface.

(4) Within the timelines identified therein, the owner or operator shall report the information required pursuant to section 95470(b)(7).

(c) *Component Leak Monitoring*: The owner or operator shall monitor components containing landfill gas under positive pressure quarterly for leaks using the procedures specified in section 95471(f) and in accordance with the plan described in section 95464(b)(5).

(1) Upon detection of a component leak, the owner or operator shall affix to the component a weatherproof readily visible tag that identifies the date and time of leak detection and the component identification number. Upon re-monitoring demonstrating that the component leak has been repaired, the tag shall be removed.

(2) The component leak shall be repaired and re-monitored to demonstrate it is below the leak standard in section 95464(b)(1)(B) within 10 calendar days, or it is a violation of this subarticle.

~~(b)~~(d) *Gas Control System Equipment Monitoring:* The owner or operator ~~must~~shall monitor the gas control system using the following procedures:

(1) Record the composition of the gas collected in percent methane, carbon dioxide, and oxygen by volume at least monthly.

~~(1) For enclosed flares the following equipment must be installed, calibrated, maintained, and operated according to the manufacturer's specifications:~~

~~(A) A temperature monitoring device equipped with a continuous recorder which has an accuracy of plus or minus (±) 1 percent of the temperature being measured expressed in degrees Celsius or Fahrenheit.~~

~~(B) At least one gas flow rate measuring device which must record the flow to the control device(s) at least every 15 minutes.~~

(2) Record the gas flow rate to each gas control device at least every 15 minutes using the equipment described in section 95464(b)(1)(D).

(A) If there is any 3-hour period of operation during which the total gas flow rate to all gas control devices changes by more than 20 percent over the average in the prior 12-month period (rolling), the cause shall be reported in the Annual Gas Collection and Control System Report.

(3) For enclosed flares, record the combustion temperature at least every 15 minutes using the equipment described in section 95464(b)(2)(A)2.

(A) Any 3-hour period of operation during which the average temperature difference was more than 28 degrees Celsius (or 50 degrees Fahrenheit) below the average combustion temperature during the most recent source test at which compliance with section 95464(b)(2) was determined is an exceedance of the combustion temperature parameter pursuant to section 95464(b)(2)(A)4. If the

cumulative duration of exceedances is greater than 120 hours in a calendar year it is a violation of this subarticle.

(4) For internal combustion engines and gas turbines, record the oxygen content and temperature of the exhaust gas stream every 15 minutes using the equipment described in section 95464(b)(3)(A)3.

(A) If there is any 3-hour period of operation during which the average oxygen content or temperature in the exhaust stream was outside the range of the manufacturer's specifications for those parameters, it is a violation of this subarticle.

(5) For gas treatment systems that process the collected gas for subsequent use or sale, record the gas flow at standard conditions at least every 15 minutes and the methane content (in percent by volume) at least every 3 hours at all the measurement points and using the equipment specified in section 95464(b)(3)(B)1.

~~(2)~~(6) For a gas control device other than an enclosed flare, demonstrate compliance by providing information describing the operation of the gas control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. Alternatives to this section ~~must~~shall be submitted as specified in section 95468. The Executive Officer may specify additional monitoring procedures.

~~(3) Components containing landfill gas and under positive pressure must be monitored quarterly for leaks. Any component leak must be tagged and repaired within 10 calendar days, or it is a violation of this subarticle.~~

~~(A) Component leak testing at MSW landfills having landfill gas-to-energy facilities may be conducted prior to scheduled maintenance or planned outage periods.~~

(e) *Wellhead Monitoring:* The owner or operator ~~must~~shall monitor each individual wellhead monthly to determine the gauge pressure, temperature, flow rate, and gas composition in percent methane, carbon dioxide, and oxygen by volume of the landfill gas within the wellhead using the methods described in sections 95471(l)-(n).

~~(c)~~(1) If there is any positive pressure reading (including zero) other than as provided in section~~s~~ 95464(~~d) and 95464(e~~c), the owner or operator ~~must~~shall take the following actions:

~~(1)~~(A) Initiate corrective action within five calendar days of the positive pressure measurement. Re-monitor after 15 calendar days to demonstrate that the wellhead remains under vacuum.

~~(2)~~(B) If the problem cannot be corrected within 15 calendar days of the date the positive pressure was first measured, the owner or operator ~~must~~shall conduct a root cause analysis (which shall include a collection system assessment as described in section 95471(j)) and initiate further action, including, but not limited to, any necessary expansion of the gas collection system, to mitigate any positive pressure readings as soon as practicable, but not later than 60 calendar days after the positive pressure was first measured.

(C) If corrective actions cannot be fully implemented within 60 calendar days after the positive pressure was first measured, the owner or operator shall also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action as soon as practicable, but not later than 120 calendar days after the positive pressure was first measured. The owner or operator shall submit the root cause analysis, corrective action analysis, and corresponding implementation schedule to the Executive Officer as specified in section 95470(b)(8) as soon as practicable but not later than 75 calendar days after the positive pressure was first measured.

~~(3)~~(D) Corrective actions, including any expansion of the gas collection and control system, ~~must~~shall be completed and any new wells ~~must~~shall be operating within 120 calendar days of the date the positive pressure was first measured, or it is a violation of this subarticle.

(2) *Recurring Pressure Exceedances*: If, within any 12-month period, there are three positive pressure readings in the monthly monitoring at a particular well, excluding any months during which corrective action was being taken pursuant to section 95469(e)(1) or as provided in section 95464(c), the owner or operator shall do the following:

(A) Perform a collection system assessment according to section 95471(j) in a 200-foot radius around the well within 30 calendar days of the third positive pressure reading and correct any issues discovered within 60 calendar days of the third positive pressure reading.

(B) Monitor the wellhead pressure on at least a weekly basis. Monthly monitoring can resume following one year with positive pressure in no more than 15 percent of the weekly measurements, provided that all instances of positive pressure are able to be corrected within the same week (prior to the next weekly monitoring). If positive pressure is detected in more than 15 percent of the weekly (or more frequent) measurements over one year, install a system to continuously monitor pressure in the well.

(3) If a landfill gas temperature exceeds 55 degrees Celsius (131 degrees Fahrenheit), the owner or operator shall do the following:

(A) Perform a collection system assessment and cover integrity assessment according to sections 95471(j) and (k) in a 200-foot radius around the well within 30 calendar days of exceeding the temperature standard and correct any issues or deficiencies discovered within 60 calendar days of exceeding the temperature threshold.

(B) Reduce the oxygen content in the wellhead below the following values depending on the temperature of the gas:

1. For temperatures greater than 55 degrees Celsius (131 degrees Fahrenheit) but less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit), 5 percent oxygen by volume.

2. For temperatures greater than 62.8 degrees Celsius (145 degrees Fahrenheit) but less than or equal to 71.1 degrees Celsius (160 degrees Fahrenheit), 2.5 percent oxygen by volume.

3. For temperatures greater than 71.1 degrees Celsius (160 degrees Fahrenheit), 1 percent oxygen by volume.

(C) If the temperature remains over 55 degrees Celsius (131 degrees Fahrenheit) for at least 60 days, do the following:

1. Begin enhanced monitoring at that well and all other wells within 200 feet within seven calendar days and conduct enhanced monitoring weekly thereafter. If four consecutive weekly carbon monoxide readings are under 100 ppmv, then enhanced monitoring can be decreased to monthly. However, if carbon monoxide readings exceed 100 ppmv again, monitoring shall return to weekly. Enhanced monitoring can be ceased when the well is returned to below 55 degrees Celsius (131 degrees Fahrenheit). Enhanced monitoring shall be conducted according to the procedure in section 95471(o).

2. Monitor the downwell temperature of the landfill gas every 10 vertical feet in that well and all other wells within 200 feet within seven calendar days and conduct this monitoring monthly thereafter. This temperature can be monitored either with a removable thermometer or using temporary or permanent thermocouples installed in the well.

(4) If a landfill gas temperature exceeds 62.8 degrees Celsius (145 degrees Fahrenheit) measured at either the wellhead or at any point in the well, the owner or operator shall do the following:

(A) Begin enhanced monitoring and downwell temperature monitoring according to the same requirements as sections 95469(e)(3)(C)1. and 2. within seven calendar days of exceeding 62.8 degrees Celsius (145 degrees Fahrenheit).

(B) Initiate corrective action within five calendar days of exceeding 62.8 degrees Celsius (145 degrees Fahrenheit).

(C) If a landfill gas temperature less than 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 calendar days of the first measurement exceeding 62.8 degrees Celsius (145 degrees Fahrenheit), the owner or operator shall conduct a root cause analysis (which shall include a collection system assessment and cover integrity assessment as described in sections 95471(j) and (k)) and correct the temperature as soon as practicable, but not later than 60 calendar days after the first measurement exceeding 62.8 degrees Celsius (145 degrees Fahrenheit).

(D) If corrective actions cannot be fully implemented within 60 calendar days of the first measurement exceeding 62.8 degrees Celsius (145 degrees Fahrenheit) for which the root cause analysis was

required, the owner or operator shall also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action as soon as practicable, but not later than 120 calendar days after the first measurement exceeding 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator shall submit the root cause analysis, corrective action analysis, and corresponding implementation schedule to the Executive Officer as specified in section 95470(b)(8) as soon as practicable but not later than 75 calendar days after the first measurement 62.8 degrees Celsius (145 degrees Fahrenheit).

(E) Corrective actions shall be completed and the landfill gas temperature returned to below 62.8 degrees Celsius (145 degrees Fahrenheit) within 120 calendar days of the first measurement exceeding 62.8 degrees Celsius (145 degrees Fahrenheit), or it is a violation of this subarticle.

(F) If a landfill gas temperature measured at either the wellhead or at any point in the well is greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and the carbon monoxide concentration measured is greater than or equal to 1,000 ppmv the corrective action(s) shall be completed within 15 calendar days, or it is a violation of this subarticle. The owner or operator shall submit a 24-hour high temperature report to the Executive Officer as specified in section 95470(b)(8) within 24 hours of first measuring a landfill gas temperature greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and a carbon monoxide concentration greater than or equal to 1,000 ppmv. The 24-hour high temperature report shall include the date, time, well identification number, temperature, and carbon monoxide reading.

(5) If the oxygen content in landfill gas is measured at or above five percent by volume at a particular well, the owner or operator shall perform a collection system assessment and cover integrity assessment according to sections 95471(j) and (k) in a 200-foot radius around the well within 30 calendar days of the oxygen reading at or above five percent and correct any issues or deficiencies discovered within 60 calendar days of the oxygen reading at or above five percent. This requirement does not apply to wells that collect gas in areas where waste has been in place for less than two years.

(6) *Recurring High Oxygen*: If, within any 12-month period, there are three instances of oxygen content in landfill gas measured at or above five percent by volume in monthly monitoring at a particular well, the owner or

operator shall conduct enhanced monitoring and downwell temperature monitoring within seven calendar days of the third oxygen content reading at or above five percent and conduct enhanced monitoring weekly thereafter. If four consecutive weekly carbon monoxide readings are under 100 ppmv, and temperature is under 131 degrees Fahrenheit, then enhanced monitoring and downwell temperature monitoring can be ceased. Enhanced monitoring shall be conducted according to the procedure in section 95471(o). Downwell temperature monitoring shall be performed every 10 vertical feet and can be monitored either with a removable thermometer or using temporary or permanent thermocouples installed in the well. This requirement does not apply to wells that collect gas in areas where waste has been in place for less than two years.

(7) *Wellhead Parameter Trend Analysis*: The owner or operator shall examine monthly records for each well and take the following actions:

(A) If the temperature at a particular well increases by more than 20 degrees Fahrenheit (11 degrees Celsius) compared to the prior monthly measurement, begin enhanced monitoring and downwell temperature monitoring according to the same requirements as sections 95469(e)(3)(C)1. and 2. within seven calendar days.

(B) If the oxygen content at a particular well increases by more than two percentage points compared to the prior monthly measurement, perform a collection system assessment and cover integrity assessment in a 200-foot radius around the well according to sections 95471(j) and (k) within 30 calendar days.

(C) When the difference between the monthly parameter value and the average parameter value in the prior 12-month period (rolling) at a particular well is greater than the difference identified below, report the cause of the change in the Annual Gas Collection and Control System Report:

1. Gauge pressure changes (i.e., increases or decreases) by more than two inches of water at a well with a 12-month average vacuum of 10 inches of water or less, or by more than 20 percent at a well with a 12-month average vacuum of more than 10 inches of water.

2. Methane content changes by more than five percentage points at a well with a 12-month average methane content greater than 30 percent, or methane content changes by more than 10 percentage points at a well with a 12-month average methane content equal to or less than 30 percent.

3. The ratio of methane to carbon dioxide decreases by more than 10 percent or falls below 1.0.

4. Landfill gas flow rate changes by more than 30 percent.

(8) If any of the parameters required in section 95469(e) are monitored more frequently than weekly (e.g., wells equipped with a continuous wellhead monitoring system), the following apply:

(A) The conditions which require action to be taken in sections 95469(e)(1), (3), (4), and (5) are based on exceeding the parameter threshold in at least 15 percent of the readings over the prior 30 days (e.g., a positive pressure reading is established for purposes of section 95469(e)(1) when positive pressure is measured in at least 15 percent of the readings over the prior 30 days on a rolling basis) or an exceedance that persists for five consecutive days.

(B) The monthly parameter value used in sections 95469(e)(2), (6), and (7) is the average of all readings within each calendar month.

(f) *Semiannual Well Liquid Level Monitoring*: The owner or operator shall monitor the liquid level in each individual well twice per year, including one monitoring event between February and April and the other between September and November.

(1) If the liquid level exceeds 50 percent of the screened interval length, the owner or operator shall take corrective action to remove liquids or other obstructions, and re-monitoring shall demonstrate compliance within 120 calendar days. The frequency of liquid level monitoring at that well shall be increased to quarterly until four consecutive quarterly measurements do not exceed 50 percent of the screened interval length.

(A) If a well is determined to be pinched, broken, or otherwise compromised it shall be repaired or a replacement well shall be installed.

(2) If the liquid level in a well exceeds 50 percent of the screened interval length for three consecutive monitoring events or 75 percent of the screened interval length for two consecutive monitoring events, the owner or operator shall install and operate a liquids pump within 120 calendar days of the third consecutive reading over 50 percent or the second consecutive reading over 75 percent.

(g) *Gas Collection System Pressure Monitoring*: The owner or operator shall record the gas collection system gauge pressure on the vacuum (negative pressure) side of the blower at least every 15 minutes using the device described in section 95464(b)(1)(E).

(1) The owner or operator shall establish a gas collection system pressure setpoint. This setpoint can be changed as often as needed to respond to operational conditions. Each time the gas collection system pressure setpoint is changed, the owner or operator shall re-tune all wells within one calendar day of the system pressure change.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

§ 95470. Recordkeeping and Reporting Requirements.

(a) *Recordkeeping Requirements.*

(1) An owner or operator ~~must~~shall maintain the following records~~, whether~~ in ~~paper, e~~lectronic~~, or other~~ format~~,~~ for at least five years:

(A) All gas collection system downtime exceeding ~~five~~one calendar day~~s~~, including individual well shutdown and disconnection times, ~~and the~~ with records including the date, time, duration, and reason for the downtime; for individual well shutdown or disconnection, also including the well identification number.

(B) All gas control system downtime in excess of one hour, the reason for the downtime, and the length of time the gas control system was shut down.

(C) Expected gas ~~generation~~recovery flow rate calculated pursuant to section 95471(~~e~~h).

(D) All surface emissions monitoring data, including the concentration reading, location coordinates, and time and date of each measurement (i.e., each one hertz reading).

(E) All wind speed and barometric pressure readings for the duration of all surface emissions monitoring.

(F) All component leak monitoring data, including the concentration reading at each monitored component, the associated component identification number, and the time and date of each measurement (i.e., each one hertz reading).

~~(D)~~(G) *Surface and Component Emissions Exceedances*: Records of all ~~instantaneous surface readings of 200 ppmv or greater; all~~ exceedances of the limits in sections 95464(b)(1)(B) ~~or~~and 95465, including the ~~location of the leak (or affected~~component identification number (for component leaks), the location coordinates (for instantaneous exceedances), and grid~~),~~ identifier (for integrated exceedances); leak concentration (in ppmv~~,~~); date and time of measurement~~,~~; the action taken to repair the leak~~,~~; date of repair~~,~~; date of any required re-monitoring and the re-monitored concentration (in ppmv)~~, ;~~~~and wind speed during surface sampling; and the installation date and location of each well installed as part of a gas collection system expansion~~ and the CARB-provided identification number if notified through section 95469(b).

(H) Records of all monitoring performed using the surface emissions screening procedure for unsafe-to-walk areas in section 95471(d), including the date of the screening; identifier of the grids screened, the type of instrument (e.g., manufacturer and model name) and sensor technology (e.g., FID, NDIR, laser spectroscopy) used; the platform on which the instrument was deployed (e.g., a drone, rover, etc.); and for any points above the thresholds in section 95471(d)(5), the methane volumetric or column concentration, the location coordinates, and the date of follow-up monitoring with a hydrocarbon detector. If any areas could not be accessed within five calendar days and required specialized personnel as described in section 95471(d)(5)(A), records shall include a description of why the location was not accessible within five calendar days and a description of the specialized personnel or equipment that were needed.

(I) Records of wellhead monitoring at each wellhead including the well identification number, the time and date of each measurement, gas flow rate (in standard cubic feet per minute), temperature (in degrees Celsius or Fahrenheit), pressure (in inches of water), gas composition (methane, carbon dioxide, and oxygen in percent by volume), and liquid level (in percent of the screened interval length).

~~(E)~~(J) Records of any positive wellhead gauge pressure measurements, including the well identification number, the date of the measurement~~s~~, the initial positive measurement (in inches of water),~~the well identification number, and~~ the corrective action taken, and the date and reading of any required re-monitoring including the final re-monitored corrected pressure reading.

(K) Records of any wellhead temperature exceedances pursuant to section 95469(e)(3) or (4) or an increase as specified in section 95469(e)(7)(A), including the well identification number, the date of the measurement, the initial temperature measurement (in degrees Celsius or Fahrenheit), any corrective action taken, and the date and reading of any required re-monitoring including the final re-monitored corrected temperature reading.

(L) Records of any wellhead oxygen content at or above five percent by volume or an increase as specified in section 95469(e)(7)(B), including the well identification number, the date of the measurement, the initial oxygen content measurement (in percent by volume), and a description of the corrective action taken or an explanation of why corrective action was not taken.

(M) For any root cause analysis required in section 95469(e), a record of the root cause analysis conducted, including a description of the recommended corrective actions taken, and the dates the corrective actions were completed.

(N) For any corrective action analysis required in section 95469(e), a record of the root cause analysis conducted, the corrective action analysis, the dates for corrective actions already completed, and, for actions not already completed, a schedule for implementation, including proposed commencement and completion dates.

(O) Records of any enhanced wellhead monitoring and downwell temperature monitoring required in section 95469(e).

(P) Records of monthly wellhead parameter trend analysis and the cause for any change as specified in section 95469(e)(7)(C).

(Q) Records of any well liquid level over 50 percent of the screened interval length, the date of the measurement, the well identification number, and any corrective actions taken.

(R) Records of each well installed as part of a gas collection system expansion, including the well identifier, date of installation, date of connection to vacuum, and location coordinates; the well material, diameter, depth, and perforated length; the date of initial waste placement (if the new well is not a replacement), reason for installation (e.g., third surface emissions exceedance, correcting positive wellhead pressure, expansion in accordance with the Design Plan), and deadline if installation was required as a corrective action.

~~(F)~~(S) Annual solid waste acceptance rate and the current amount of waste-in-place (in tons).

~~(G)~~(T) Records of the nature, location, amount, and date of deposition of non-degradable waste for any landfill areas excluded from the collection system.

(U) Total volume of leachate and all other liquids added or recirculated (in gallons per year), the surface area (in acres) over which the leachate or liquids are recirculated or otherwise applied.

~~(H)~~(V) Results of any source tests conducted pursuant to section 95464(b)(4) and the date the test was performed.

~~(I)~~(W) Records describing the mitigation measures taken to prevent the release of methane or other emissions into the atmosphere:

1. When solid waste was brought to the surface during the installation or preparation of wells, piping, or other equipment;

2. During repairs or the temporary shutdown of gas collection system components; or,

3. When solid waste was excavated and moved.

~~(J)~~(X) Records of any construction activities ~~pursuant to section 95466.~~. The records ~~must~~shall contain the following information:

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 taken to minimize methane emissions and other potential air quality impacts.

~~(K)~~(Y) Records of the equipment operating parameters specified to be monitored under sections 95469(~~b~~d)(1), (2), (3), and (6) ~~95469(b)(2)~~ as well as records for periods of operation during which the parameter boundaries established during the most recent source test are exceeded. The records ~~must~~shall include the following information:

1. For enclosed flares, all 3-hour periods of operation during which the average temperature difference was more than 28 degrees Celsius (or 50 degrees Fahrenheit) below the average combustion temperature during the most recent source test at which compliance with sections 95464(b)(2) and 95464(b)(3)(A) was determined. Records shall include the device identifier, start time, end time, average temperature, and temperature limit (i.e., 28 degrees Celsius or 50 degree Fahrenheit below the average source test temperature).

2. For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone pursuant to section 95464(b)(3)(A)2.

3. For any owner or operator who uses a boiler or process heater with a design heat input capacity of 44 megawatts (150 MMBtu/hr) or greater to comply with section 95464(b)(3), all periods of operation of the boiler or process heater (e.g., steam use, fuel use, or monitoring data collected pursuant to other federal, State, local, or tribal regulatory requirements).

4. For internal combustion engines and gas turbines, all 3-hour periods of operation during which the average oxygen content or temperature in the exhaust stream was outside the range of the manufacturer's specifications. Records shall include the device identifier, start time, end time, average oxygen content or temperature, and manufacturer's specified oxygen content or temperature range.

5. All 3-hour periods of operation during which the total gas flow rate to all gas control devices changed by more than 20 percent over the average in the prior 12-month period (rolling). Records shall include start time, end time, average gas flow rate during the deviation period, average gas flow rate over the prior 12-month period, and the cause of the change.

(Z) Records of any periods where the measured gas collection system pressure pursuant to section 95469(g) deviated (either increased or decreased) from the setpoint pressure by more than 20 percent for at least three hours. Records shall include the date, start time, duration, setpoint pressure (in inches of water), average pressure

during the deviation period (in inches of water), and reason for the deviation.

(AA) Records of any changes to the gas collection system pressure setpoint established pursuant to section 95469(g) including the date and time of each change, the new pressure setpoint value (in inches of water), the reason for the change, and the date that well re-tuning was completed.

(BB) Component leak monitoring plans required by section 95464(b)(5).

(CC) Records demonstrating compliance with the cover monitoring requirements of section 95464(b)(6), including a description of the monitoring procedures and records of repairs or maintenance completed under the plan.

(DD) Records of any required cover integrity assessments and collection system assessments.

(EE) Records of calibration of any instrument that requires calibration under this subarticle.

(2) The owner or operator ~~must~~shall maintain the following records, whether in paper, electronic, or other format, for the life of each gas control device, as measured during the initial source test or compliance determination:

(A) The control device vendor specifications.

(B) The expected gas ~~generation~~recovery flow rate as calculated pursuant to section 95471(~~e~~h).

(C) The percent reduction of methane achieved by the control device determined pursuant to section 95471(~~f~~i).

(D) 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.

(E) For an open flare: the flare type (i.e., steam-assisted, air-assisted, or non-assisted); 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 40 CFR § 60.18 (as last amended 73 Fed.Reg. 78209 (December 22, 2008), which is incorporated by reference herein; and records of the flare pilot flame or flare flame monitoring and

records of all periods of operations during which the pilot flame or the flare flame is absent.

(3) *Record Storage:* The owner or operator ~~must~~shall maintain copies of the records and reports required by this subarticle and provide them to the Executive Officer within five business days upon request. Records and reports ~~must~~shall be kept at a location within the State of California.

(b) *Reporting Requirements.*

(1) *Closure Notification:* Any owner or operator of a MSW landfill which has ceased accepting waste ~~must~~shall submit a Closure Notification to the Executive Officer within 30 days of waste acceptance cessation.

(A) The Closure Notification ~~must~~shall include the last day solid waste was accepted, the anticipated closure date of the MSW landfill, and the estimated waste-in-place.

(B) The Executive Officer may request additional information as necessary to verify that permanent closure has taken place in accordance with the requirements of any applicable federal, State, local, or tribal statues, regulations, and ordinances in effect at the time of closure.

(2) *Equipment Removal Report:* A gas collection and control system Equipment Removal Report ~~must~~shall be submitted to the Executive Officer 30 days prior to well capping, removal or cessation of operation of the gas collection, treatment, or control system equipment. The report ~~must~~shall contain all of the following information:

(A) A copy of the Closure Notification submitted pursuant to section 95470(b)(1).

(B) 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 Executive Officer that due to declining methane rates the landfill is unable to operate the gas collection and control system for a 15-year period.

(C) Surface emissions monitoring results needed to verify that landfill surface methane concentration measurements do not exceed the limits specified in section 95465.

(3) *Annual Gas Collection and Control System Report:* Any owner or operator subject to the requirements of this subarticle, except section 95463(b), ~~must~~shall prepare an annual report for the period of January 1 through December 31 of each year. Each annual report ~~must~~shall be submitted to the Executive Officer by March 15 of the following year. The annual report shall be submitted as described in section 95470(b)(8). The annual report ~~must~~shall contain the following information:

(A) ~~MSW landfill~~ Facility name, owner and operator, address, current email address, phone number,~~and~~ solid waste information system (SWIS) identification number, landfill operational status (active, inactive, or closed), year the landfill first and last accepted waste, the expected year of landfill final closure, and the year that the gas collection and control system was initially installed and in full operation.

~~(B)~~ Total volume ~~of landfill gas collected~~ (reported in standard cubic feet)~~.~~ and

~~(C)~~(B) ~~A~~average composition ~~of the landfill gas collected over the reporting period~~ (reported in percent methane and percent carbon dioxide by volume) of the landfill gas collected over the reporting period.

(C) Total volume of landfill gas supplied to a third-party, the composition of the gas (reported in percent methane and percent carbon dioxide by volume), and the recipient of the gas.

(D) For each gas control device or treatment system:

1. ~~Gas control d~~Device type and identifier, year of installation, and minimum and maximum rating (in standard cubic feet per minute or million British thermal units per hour).~~,~~

~~(D)~~2. ~~fuel type, and t~~Total amount of landfill gas combusted, sold, or otherwise used in each control device or other end use (in standard cubic feet).

3. Type and amount of supplemental fuel burned with the landfill gas, including any pilot or start-up fuel.

4. Percent methane destruction efficiency from the most recent source test, the date the test was performed, and the due date of the next source test.

5. The volume of landfill gas received (in standard cubic feet) from each MSW landfill (identified by landfill name and SWIS identification number) and the composition of the landfill gas received (in percent methane and percent carbon dioxide by volume).

6. End use application of landfill gas and any incentive program participation regarding the end use of the landfill gas.

~~(E) The date that the gas collection and control system was installed and in full operation.~~

~~(F) The percent methane destruction efficiency of each gas control device(s).~~

~~(G) Type and amount of supplemental fuels burned with the landfill gas in each device.~~

~~(H) Total volume of landfill gas shipped off-site, the composition of the landfill gas collected (reported in percent methane and percent carbon dioxide by volume), and the recipient of the gas.~~

(E) Most recent topographic map of the site in an electronic format compatible with viewing in a geographic information system (e.g., file formats of .shp or .kml) showing the following, with separate files as needed to show any changes during the calendar year:

~~(I)~~1. The perimeter of the permitted disposal area, the area of the landfill under which decomposable solid waste has been placed, and areas with daily, intermediate, and final cover, including the cover material type ~~and a geomembrane and the areas with final cover without a geomembrane with corresponding percentages~~ over the landfill surface.

2. As-built engineering plan view of the gas collection and control system with the location of wells labeled with well identification number, headers, and other gas collection and control system infrastructure.

3. Monitoring grids labeled with unique identifiers.

4. Unsafe-to-walk areas of the landfill surface monitored using the procedures in section 95471(d).

5. Areas of the landfill surface excluded from surface emissions monitoring and the reason for the exclusion (e.g., paved area). Areas where no waste has been placed are not part of the landfill surface as defined in section 95475.

6. Area of the working face with waste in place less than 180 days, the date when filling began and the date surface emissions monitoring is conducted.

(F) Description of any alternative compliance options that the facility operated under during the reporting period, including the sections of this subarticle that were altered by the alternative compliance options and the date of approval.

(G) Annual hours the gas collection system was operating normally and gas flow was sent to a destruction device. Do not include periods of shut down or poor operation, such as times when pressure, temperature, or other parameters indicative of operation are outside of normal variances.

~~(J)~~(H) The information required by sections 95470(a)(1)(A)-(C), (G), (H), (J)-(S), (U), (V), (Y), (Z), and (DD)~~, 95470(a)(1)(B), 95470(a)(1)(C), 95470(a)(1)(D), 95470(a)(1)(E), and 95470(a)(1)(F), 95470(a)(1)(H), and 95470(a)(1)(K)~~.

~~(4) *Waste-in-Place Report:* Any owner or operator subject to the requirements of sections 95463(a), or 95643(b)(2)(B)3. must report the following information to the Executive Officer:~~

~~(A) MSW landfill name, owner and operator, address, and solid waste information system (SWIS) identification number.~~

~~(B) The landfill's status (active, closed, or inactive) and the estimated waste-in-place, in tons.~~

~~(C) Most recent topographic map of the site showing the areas with final cover and a geomembrane and the areas with final cover without a geomembrane with corresponding percentages over the landfill surface.~~

(4) *Quarterly Monitoring Data Report:* Any owner or operator subject to the requirements of this subarticle, except section 95463(b), shall submit to the Executive Officer as described in section 95470(b)(8) the following monitoring data covering each calendar quarter within 15 calendar days of the end of each quarter (i.e., January 15, April 15, July 15, and October 15) in comma separated value (.csv) file format:

(A) Records of all surface emissions monitoring data as described in section 95470(a)(1)(D).

(B) Records of all component leak monitoring data as described in section 95470(a)(1)(F).

(C) Records of all wellhead monitoring data as described in section 95470(a)(1)(I).

(5) *Scheduled Surface Emissions Monitoring Notification:* Any owner or operator subject to the requirements of this subarticle shall report to the Executive Officer as specified in section 95470(b)(8) the scheduled date for each surface emissions monitoring event pursuant to section 95469(a) at least 15 calendar days prior to the event. This requirement does not apply to re-monitoring following the discovery of surface methane exceedances.

~~(5)~~(6) *Annual Uncontrolled Landfill ~~Gas Heat Input Capacity~~ Report:* Any owner or operator subject to the requirements of section 95463(b) ~~must~~shall ~~calculate the landfill gas heat input capacity using the calculation procedures specified in section 95471(b) and~~ submit an annual report ~~the results~~ to the Executive Officer as specified in section 95470(b)(8) annually by March 15, starting March 15, 2027~~within 90 days of the effective date of this subarticle or upon reaching 450,000 tons of waste-in-place~~. The annual report shall contain the following information:~~calculation, along with relevant parameters, must be provided as part of the report.~~

(A) MSW landfill name, owner and operator, address, current email address, phone number, solid waste information system (SWIS) identification number, the waste footprint (in acres), the landfill's operational status (active, closed, or inactive), the landfill's gas collection status (no collection, passive venting, or carbon adsorption), the year the landfill first and last accepted waste, and the expected year of landfill final closure.

(B) The total amount of solid waste (in tons) deposited each year the landfill was in operation. No adjustment can be made to account for inert waste, but areas of the landfill that contain only asbestos-containing waste, inert waste, or non-decomposable solid waste may be excluded provided that the owner or operator submits documentation to the Executive Officer containing the nature, date of deposition, location and amount of such wastes deposited in the area.

1. Annual solid waste disposal amounts shall be determined in accordance with California Code of Regulations, Title 14, Division 7, Chapter 9, Article 9.2, Section 18810.2 (January 1, 2006), which is incorporated by reference herein.

(C) Total area of the landfill surface (in acres) with each cover type (daily, intermediate, and final cover).

(D) All surface emissions monitoring data generated pursuant to section 95463(b)(2)(B), including concentration reading, location coordinates, and time and date of each measurement (i.e., each at least one hertz reading).

(E) The 100-year historical annual average precipitation (in inches), recorded at the County level or at the nearest weather station, and the volume (in gallons) of leachate or other liquid deposited or injected into the landfill, including separated wet waste with moisture content greater than 40 percent.

(F) The calculated landfill gas heat input capacity determined using the calculation procedures specified in section 95471(b) and the data inputs specified in sections 95470(b)(6)(B) and (E).

(G) For landfills with carbon adsorption or passive venting systems, all measurements of landfill gas flow rate (in scfm) and methane content used to calculate heat input capacity using the procedure in section 95471(b)(2) or (3).

(7) *Remotely Detected Emission Plumes*: Any owner or operator that receives a notification of a remotely detected emission plume pursuant to section 95469(b)(1) shall report the following information to the Executive Officer as specified in section 95470(b)(8):

(A) Within eight calendar days after receiving the notification at a controlled MSW landfill: the date of the CARB notification; identification number provided by CARB in the notification; date of the owner or operator follow-up monitoring; instrument model used; the number of exceedances of the surface emissions limit specified in section 95465(a)(1); the number of component leaks; the location and a brief description of the source of each exceedance and component leak; an initial mitigation plan for each exceedance and component leak; and a brief description of any activities that may have contributed to the plume within the monitoring area during the time of the remote detection. The initial mitigation plan shall consist of a statement of whether the source of each exceedance or component leak has already been successfully repaired and re-monitored and, if not, a description of what actions the owner or operator anticipates taking to complete each repair and the estimated date of completion of each repair.

(B) Within five calendar days after the re-monitoring that first shows each exceedance or component leak to be corrected: repair date, re-monitoring dates, and re-monitoring concentrations in ppmv.

(C) Within 35 calendar days after receiving the notification at an uncontrolled MSW landfill: the date of the CARB notification; identification number provided by CARB in the notification; date of the owner or operator follow-up monitoring; instrument model used; and records of all exceedances of the surface methane concentration value specified in section 95463(b)(2)(B), including the concentration and location of each exceedance.

(8) All reports, notifications, and requests to the Executive Officer shall be submitted electronically through the Landfill Methane Regulation reporting webpage at https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation/reporting.

~~(6)~~(9) Any report, or information submitted pursuant to this subarticle ~~must~~shall contain certification by a responsible official of truth, accuracy, and completeness. This certification, and any other certification required under this subarticle, ~~must~~shall state that, based on information and belief

formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 and, 39601, and 39730.5 Health and Safety Code.

§ 95471. Test Methods and Procedures.

(a) *Hydrocarbon Detector Specifications:* Any instrument used for the measurement of methane concentration mustshall be a gas detector or other equivalent instrument approved by the Executive Officer that meets the calibration, specifications, and performance criteria of EPA Reference Method 21, Determination of Volatile Organic Compound Leaks, 40 CFR Part 60, Appendix A-1 (as last amended 65 Fed.Reg. 61744 (October 17, 2000)), (May 30, 2023), which is incorporated by reference herein, except for the following:

(1) "Methane" replaces all references to volatile organic compounds (VOC).

(2) The calibration gas shall be methane.

(b) *Determination of Landfill Gas Heat Input Capacity:* The landfill gas heat input capacity mustshall be determined pursuant to sections 95471(b)(1), 95471(b)(2), or 95471(b)(3), as applicable:

(1) *MSW Landfills without Carbon Adsorption or Passive Venting Systems:* The modeled heat input capacity mustshall be calculated using the procedure as specified in Appendix I. The Executive Officer 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.

(2) *MSW Landfills with Carbon Adsorption Systems:* The landfill gas heat input capacity mustshall be determined pursuant to both of the following and is the higher of those determined values:

(A) Section 95471(b)(1); and

(2)(B) The owner or operator shall by measureing the actual total landfill gas flow rate, in standard cubic feet per minute (scfm), at the inlet to the carbon adsorption unit using a flow meter or other flow measuring device such as a standard pitot tube and methane concentrationcontent (percent by volume) using a hydrocarbon detector meeting the requirements of 95471(a). The flow rate and

methane content shall be measured at least monthly, under normal operational conditions of the gas collection system. The total landfill gas flow rate ~~must~~shall be multiplied by the methane ~~concentration~~content and then multiplied by the gross heating value (GHV) of methane of ~~1,012~~970 Btu/scf to determine the landfill gas heat input capacity.

(3) *MSW Landfills with Passive Venting Systems:* The landfill gas heat input capacity ~~must~~shall be determined pursuant to both of the following and is the higher of those determined values:

(A) Section 95471(b)(1); and

(B) The owner or operator ~~must~~shall measure actual landfill gas flow rates (in units of scfm) by using a flow measuring device such as a standard pitot tube and methane ~~concentration~~content (percent by volume) using a hydrocarbon detector meeting the requirements of 95471(a) from each venting pipe that is within the waste mass. The flow rate and methane content shall be measured at least monthly, under normal operational conditions. Each gas flow rate ~~must~~shall then be multiplied by its corresponding methane ~~concentration~~content to obtain the individual methane flow rate. The individual methane flow rates ~~must~~shall be added together and then multiplied by the GHV of methane of ~~1,012~~970 Btu/scf to determine the landfill gas heat input capacity.

(c) *Surface Emissions Monitoring Procedures:* The owner or operator ~~must~~shall measure the landfill surface concentration of methane using a hydrocarbon detector meeting the requirements of section 95471(a). The landfill surface ~~must~~shall be inspected using the following procedures:

(1) *Monitoring Area:* The entire landfill surface ~~must~~shall be divided into individually identified 50,000 square foot grids. The grids ~~must~~shall be used for both instantaneous and integrated surface emissions monitoring. The landfill surface areas with cover penetrations, distressed vegetation, cracks or seeps (including areas located away from the regularly spaced walking pattern) shall be inspected visually and with a hydrocarbon detector. Paved areas that do not have any cracks, pot holes, or other penetrations can be excluded from monitoring, and the landfill surface does not include areas of undisturbed native soil where no waste has been disposed.

(A) The working face of the landfill can be excluded from the monitoring area for the first 180 calendar days after initial waste placement at

that location where and so long as active filling and compacting operations are ongoing.

~~(A)~~(B) Testing ~~must~~shall be performed by holding the hydrocarbon detector's probe within 3 inches of the landfill surface while traversing the grid.

~~(B)~~(C) The walking pattern ~~must~~shall be no more than a 25-foot spacing interval and ~~must~~shall traverse each monitoring grid.

1. ~~If the owner or operator has~~If all closed areas with final cover have no exceedances of the limits specified in section 95465 after any four consecutive quarterly monitoring periods, the walking pattern spacing may be increased to 100-foot intervals~~.~~ in the closed area with final cover. The ~~owner or operator~~ walking paths shall be offset by 25 feet each monitoring period such that after four monitoring periods the entire surface has been monitored every 25 feet. The walking pattern ~~must~~shall return to a 25-foot spacing interval across the entire landfill surface upon detecting any exceedances of the limits specified in section 95465 ~~that cannot be remediated within 10 calendar days or upon any exceedances~~in the areas being monitored with a 100-foot spacing interval, whether detected by the owner or operator or during a compliance inspection.

~~2. If an owner or operator of a MSW landfill can demonstrate that in the past three years before the effective date of this subarticle that there were no measured exceedances of the limit specified in section 95465(a)(1) by annual or quarterly monitoring, the owner or operator may increase the walking pattern spacing to 100-foot intervals. The owner or operator must return to a 25-foot spacing interval upon any exceedances of the limits specified in section 95465 that cannot be remediated within 10 calendar days or upon any exceedances detected during a compliance inspection.~~

~~(C)~~(D) Surface testing ~~must~~shall be terminated when the average wind speed exceeds five miles per hour or the instantaneous wind speed exceeds 10 miles per hour. The Executive Officer may approve alternatives to this wind speed surface testing termination for MSW landfills consistently having measured winds in excess of these specified limits. Average wind speed ~~must~~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.

~~(D)~~(E) Surface emissions testing ~~must~~shall be conducted only when there has been no measurable precipitation in the preceding 72 hours.

(2) *Instantaneous Surface Emissions Monitoring Procedures.*

~~(A) The owner or operator must record any instantaneous surface readings of methane 200 ppmv or greater, other than non-repeatable, momentary readings.~~

(A) All surface concentration readings, associated location coordinates, and associated date and time shall be electronically recorded at a frequency of at least one hertz (i.e., one measurement every second).

(B) Upon detecting an exceedance of the concentration limit specified in section 95465(a)(1), the area around the point of detection shall be inspected in all directions with a hydrocarbon detector to establish the entire contiguous area exceeding the concentration limit.

~~(B)~~(C) Surface areas of the MSW landfill that exceed ~~a~~the methane concentration ~~of 500 ppmv~~specified in section 95465(a)(1) ~~must~~shall be recorded, marked, and remediated pursuant to section 95469(a)(1).

~~(C)~~(D) The wind speed and barometric pressure ~~must~~shall be recorded during the sampling period.

~~(D) The landfill surface areas with cover penetrations, distressed vegetation, cracks or seeps must also be inspected visually and with a hydrocarbon detector.~~

(3) *Integrated Surface Emissions Monitoring Procedures.*

(A) ~~Integrated~~All surface concentration readings, associated location coordinates, and associated date and time ~~must~~shall be recorded at a frequency of at least one hertz and then the surface concentration readings shall be averaged for each grid.

(B) Individual monitoring grids that exceed ~~an~~the average methane concentration ~~of 25 ppmv~~limit specified in section 95465(a)(2)

~~must~~shall be identified and remediated pursuant to section 95469(a)(2).

(C) The wind speed and barometric pressure ~~must~~shall be recorded during the sampling period.

(d) *Surface Emissions Screening Procedures for Unsafe-to-Walk Surface Areas:* In areas where the unsafe-to-walk surface emissions monitoring procedures are used pursuant to the allowance described in section 95469(a), the owner or operator shall perform surface emissions monitoring according to the following requirements:

(1) Screening may be performed using any type of sensor and platform that meets the requirements in section 95471(d)(2) while being used to detect and locate methane emissions in the inaccessible area. Examples include but are not limited to:

(A) A handheld instrument that measures methane column concentration between the user and a point on the landfill surface where the instrument is aimed.

(B) A drone-mounted instrument that measures methane column concentration in a downward-facing orientation.

(C) A rover-mounted instrument that measures methane volumetric concentration near ground-level.

(2) *Instrument Requirements:* The instrument shall satisfy the following requirements:

(A) *Type of Measurement*: The instrument shall measure either methane volumetric concentration or path-integrated methane column concentration.

(B) *Response Time:* The system response time, defined as the time interval from a step change in methane concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout, shall be equal to or less than 30 seconds.

(C) *Location and Sampling Rate*: The instrument shall have the capability to record the latitude and longitude of the points where measurements are taken with an accuracy of no worse than ±2 meters, date, time, and methane concentration at a frequency of least one hertz.

(D) An instrument measuring volumetric concentration shall be capable of measuring methane in the range from zero to above 500 ppmv. An instrument measuring path-integrated column concentration (in the unit of parts-per-million-meter, or ppm-m) shall be capable of measuring methane in the range from zero to above 500 ppm-m.

(E) An instrument measuring volumetric concentration (ppmv), shall have a scale readable to ±2.5 percent of the increased meter reading level of 200 ppmv methane. An instrument measuring methane column concentrations (in the unit of ppm-m) shall have a scale readable to ±2.5 percent of the increased meter reading level of 50 ppm-m methane.

(3) *Calibration Requirements*: Calibrate the instrument in accordance with the manufacturer's recommendations. The instrument shall be calibrated prior to operation on each day of use. The calibration precision shall be equal to or less than 10.0% of the calibration gas value.

(4) *Screening Procedure*: The survey shall be conducted by a technician who has completed training or has the proper accreditation required by the instrument manufacturer. The technician shall operate the instrument in accordance with the manufacturer's recommendations (including any manufacturer-recommended maximum distance between the equipment and the point being measured) and use the following procedure:

(A) Design a monitoring pathway such that the technician can measure the entire unsafe-to-walk area from nearby accessible areas.

(B) Measure the landfill surface along a pathway with a coverage density having no more than 25-foot spacing interval. The measurement points along the pathway shall be equal to or less than 5 feet apart.

(C) Measure all surface areas with cover penetrations, distressed vegetation, cracks, or seeps.

(D) If measuring volumetric concentration, the point where the sample is taken (e.g., probe tip, nozzle, etc.) shall be held within 3 inches of the landfill surface. If measuring column concentration, the measurement width or pixel size shall be no larger than 3 meters in any dimension.

(E) Surface testing shall be terminated when the average wind speed exceeds five miles per hour or the instantaneous wind speed exceeds 10 miles per hour. The Executive Officer may approve

alternatives to this wind speed surface testing termination 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.

(F) Surface emissions testing shall be conducted only when there has been no measurable precipitation in the preceding 72 hours.

(5) Upon detecting a location with a volumetric concentration measurement 200 ppmv or greater, or a column concentration 50 ppm-m or greater, monitor the location with a hydrocarbon detector meeting the requirements of 95471(a) within five calendar days.

(A) If personnel with specialized knowledge, experience, or equipment are needed to access the location and they are not available within the required timeline, monitoring shall occur within 10 calendar days and records shall be kept and included in the Annual Gas Collection and Control System Report as specified in section 9540(a)(1)(H).

(6) Upon detecting an exceedance of the standard in section 95465(a)(1) through the monitoring pursuant to section 95471(d)(5), perform the actions specified in section 95469(a)(1).

(e) *Alternative Surface Emissions Monitoring Procedures:* Any entity (e.g., a technology provider, owner, or operator) can apply for approval of an alternative surface emissions monitoring procedure that owners or operators can use in lieu of the monitoring procedures described in section 95471(c).

(1) The monitoring procedure shall be a screening approach that identifies locations to perform follow-up monitoring for surface methane concentration using a hydrocarbon detector meeting the requirements of section 95471(a). Surface emission exceedances shall be established using the concentration measurement in the follow-up monitoring and shall be repaired and re-monitored in accordance with the requirements in section 95469(a)(1).

(2) The monitoring procedure may consist of the use of one or more emissions monitoring technologies.

(3) The applicant shall provide information that is sufficient for demonstrating that the proposed alternative surface emissions monitoring procedure achieves methane emission reductions that are at least equivalent to the methane emission reductions that would be achieved by quarterly

monitoring complying with the procedures in section 95471(c). The following information shall be included in the application:

(A) A description of the alternative work practice, including the monitoring technology or technologies, the monitoring procedures, any criteria and restrictions on using the technology or technologies (such as minimum sensor specifications or capabilities, resolution, precision, and any climate, environmental, or topographic limitations), and detection thresholds to require follow-up monitoring as described in section 95471(e)(1).

(B) The method detection limit and probability of detection of the technology or technologies, and a description of the procedures used to determine the method detection limit and probability of detection. At a minimum, the applicant shall collect, verify, and submit field data encompassing seasonal variations to support these determinations. The field data may be supplemented with modeling analyses, controlled test site data, or other documentation.

(C) Quality assurance and quality control procedures necessary to ensure proper application of the alternative monitoring procedure, including but not limited to any technology calibration or maintenance requirements and any technology or method training requirements.

(D) The frequency of emissions monitoring that will be performed. For continuous monitoring techniques, the frequency of measurements.

(E) Data collection, logging, management, analysis, and data quality indicators for the alternative monitoring procedure.

(F) Compliance procedures, including recordkeeping and reporting.

(G) Whether the proposed alternative monitoring procedure, or the technology or technologies used in the procedure, has been approved for regulatory use for other emissions monitoring requirements or by other regulatory authorities.

(H) A demonstration (e.g., through field testing or modeling) that the methane emission reductions achieved by the alternative surface emissions monitoring procedure is at least equivalent to the emission reductions that would be achieved by quarterly monitoring complying with the procedures in section 95471(c).

(I) A discussion of any advantages and disadvantages of the alternative technology and procedure (including factors such as ease of use, cost, coverage, objectivity, transparency) and letters of support from at least three representatives of facilities that have utilized or observed the proposed procedure.

(4) The application shall be submitted to the Executive Officer as specified in section 95470(b)(8).

(5) If approved by the Executive Officer, the procedure is available to use by any owner or operator.

(A) When determining whether to approve or disapprove the application, the Executive Officer shall evaluate the application using their best engineering judgment to determine if the applicant has fully described each element required in sections 95471(e)(3)(A)-(G), that those descriptions sufficiently to support the demonstration in section 95471(e)(3)(H), that they have included the information in section 95471(e)(3)(I), and that they have successfully demonstrated that the methane emission reductions achieved by the alternative surface emissions monitoring procedure are at least equivalent to the emission reductions that would be achieved by quarterly monitoring complying with the procedures in section 95471(c).

(B) If approved, the Executive Officer will post the approval documentation to CARB's Landfill Methane Regulation webpage (https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation).

~~(d)~~(f) *Component ~~Gas Collection and Control System~~ Leak ~~Inspection~~ Monitoring Procedures~~.~~:* Leaks ~~must~~shall be measured using a hydrocarbon detector meeting the requirements of 95471(a).

(1) Monitoring shall be performed in accordance with the requirements of US EPA Reference Method 21 (40 CFR Part 60, Appendix A-1, May 30, 2023), except for the following:

(A) "Methane" replaces all references to volatile organic compounds (VOC).

(B) The calibration gas shall be methane.

(g) *Calculation of Measured Methane Collection for Section 95467:* For sections 95467(a)(4) and (d)(3), the annual quantity of methane collected in metric tons

shall be calculated for each one-year period using the following equation:

M_{CH4} = *LFG Volume x Average CH_4 Fraction x CH_4 Density x 0.454/1000*

Where:

M_{CH4} = Annual quantity of methane collected in metric tons of methane (MT CH_4)

LFG Volume = Annual volume of landfill gas collected in standard cubic feet (scf LFG)

Average CH_4 Fraction = Volume-weighted average fraction of methane in landfill gas (scf CH_4 / scf LFG)

CH_4 Density = 0.0423 pounds per standard cubic foot (lb./scf) (methane density at 60 degrees Fahrenheit and 1 atmosphere)

0.454/1000 = conversion factor, metric tons per pound (MT/lb)

~~(e)~~(h) *Determination of Expected Gas ~~Generation~~Recovery Flow Rate~~.~~:* The expected gas ~~generation~~recovery flow rate ~~must~~shall be determined as prescribed in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3, which is incorporated by reference herein, using a recovery rate of 75 percent.

~~(f)~~(i) *Control Device Destruction Efficiency Determination~~.~~:* The following methods of analysis ~~must~~shall be used to determine the efficiency of the control device in reducing methane:

(1) *Enclosed Combustors:* One of the following test methods~~, all of which are incorporated by reference herein (and all as promulgated in 40 CFR, Part 60, Appendix A, as last amended 65 Fed.Reg. 61744 (October 17, 2000) at the pages cited below~~ ~~must~~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 for lean burn engines to less than 3,000 ppmv, dry basis, corrected to 15 percent oxygen:

U.S. EPA Reference Method 18, Measurement of Gaseous Organic Compound Emissions By Gas Chromatography (40 CFR Part 60, Appendix A-6, December 7, 2020, which is incorporated by reference herein~~65 Fed.Reg. at 62007~~);

U.S. EPA Reference Method 25, Determination of Total Gaseous Nonmethane Organic Emissions as Carbon (40 CFR Part 60, Appendix A-7, May 30, 2023, which is incorporated by reference herein~~65 Fed.Reg. at 62044~~);

U.S. EPA Reference Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer (40 CFR Part 60, Appendix A-7, May 30, 2023~~65 Fed.Reg. at 62062~~); or

U.S. EPA Reference Method 25C, Determination of Nonmethane Organic Compounds in Landfill Gases (40 CFR Part 60, Appendix A-7, May 30, 2023~~65 Fed.Reg. at 62066~~).

The following equation ~~must~~shall be used to calculate destruction efficiency:

$$Destruction\ Efficiency = \left[1 - \left(\frac{Mass\ of\ Methane - Outlet}{Mass\ of\ Methane - Inlet}\right)\right] \times 100\%$$

(2) *Open Flares:* Open flares ~~must~~shall meet the requirements of 40 CFR § 60.18 (as last amended 73 Fed.Reg. 78209 (December 22, 2008)).

(j) *Collection System Assessment:* Wellhead monitoring data from the previous 12 months shall be analyzed and the gas collection system shall be physically investigated. The analysis shall identify any unusual changes (outside the range of each well's typical historical month-to-month variation) in gas flow rate, gas composition, and gauge pressure and determine the reasons for any changes. The investigation shall include checking for cracked, damaged, broken, pinched, plugged, watered-in, or otherwise impaired collection system components and wellbore seals. If a collection system component is determined to be pinched, broken, or otherwise compromised it shall be repaired or a replacement well shall be installed.

(k) *Cover Integrity Assessment:* The surface cover and all cover penetrations shall be closely investigated for signs of cover integrity deficiencies. Deficiencies include thickness, grain size, and other specifications that do not meet requirements set forth in California Code of Regulations, Title 27, Division 2, Subdivision 1, Chapter 3, Subchapters 4 and 5 (July 18, 2025), which are incorporated by reference herein (for daily, intermediate, and final covers, as applicable); visible cracks, signs of erosion including channels or rills; animal burrows; penetrations that lack seals or have cracked or broken seals; and for engineered or synthetic covers, deficiencies include punctures, tears, or seam failures. The cover integrity assessment shall include at least measuring the thickness of cover, grain size of all materials comprising the cover, and for soil covers, classifying the material using ASTM D2487-17 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (February 1, 2025), which is incorporated by reference herein.

(1) Deficiencies are considered corrected if one or more of the following actions are taken, as indicated by the finding of the cover integrity

assessment, within the timeline specified by the section that required the assessment:

(A) If material is added and compacted to achieve double the required minimum thickness and eliminate cracks, repair and prevent erosion, or other action taken to prevent disturbance by animals, or if well boot seals are installed or replaced around all cover penetrations.

(B) For daily cover, if alternative daily cover is replaced with a soil daily cover, or if daily cover is replaced with intermediate cover.

(C) For intermediate cover, if material is added and compacted to achieve a fines content (passing a 0.075-millimeter sieve) greater than 30 percent by weight with a maximum particle size of three inches or less, achieve permeability of 1×10^{-5} centimeters per second, and achieve a minimum of 24 inches thickness; or if intermediate cover is replaced with final cover.

(D) For final cover, if organic amendments such as compost or biochar are incorporated into the top (vegetative) layer of soil and soil moisture is maintained above 10 percent by volume measured 10 centimeters below the surface; or erosion control blankets, vegetation, or geosynthetic materials are added to areas prone to erosion.

~~(g)~~(l) *Determination of Wellhead Gauge Pressure~~.~~:* Gauge pressure ~~must~~shall be determined using a hand-held manometer, magnahelic gauge, or other pressure measuring device approved by the Executive Officer. The device ~~must~~shall be calibrated and operated in accordance with the manufacture's specifications.

(m) *Determination of Wellhead Temperature*: The temperature measuring device shall be calibrated annually using the procedure in EPA Method 2 section 10.3 (40 CFR Part 60, Appendix A-1, May 30, 2023).

(n) *Determination of Wellhead Gas Composition*: The composition of the gas in percent by volume shall be determined as follows:

(1) Oxygen content shall be determined as prescribed in 40 CFR § 62.16722(a)(2) (June 21, 2021), which is incorporated by reference herein.

(2) Methane content shall be determined with a methane meter using U.S. EPA Method 3C (40 CFR Part 60, Appendix A-2, October 31, 2016, which is incorporated by reference herein), U.S. EPA Method 18 (40 CFR Part

60, Appendix A-6, December 7, 2020), or a portable gas composition analyzer provided that the analyzer is calibrated and the analyzer meets all quality assurance and quality control requirements for U.S. EPA Method 3C (40 CFR Part 60, Appendix A-2, October 31, 2016) or U.S. EPA Method 18 (40 CFR Part 60, Appendix A-6, December 7, 2020).

(3) Carbon dioxide content shall be determined according to U.S. EPA Method 3A or U.S. EPA Method 3C (40 CFR Part 60, Appendix A-2, October 31, 2016), or a portable gas composition analyzer provided that the analyzer is calibrated and the analyzer meets all quality assurance and quality control requirements for U.S. EPA Method 3A or U.S. EPA Method 3C (40 CFR Part 60, Appendix A-2, October 31, 2016).

(o) *Enhanced Wellhead Monitoring Procedure:* Enhanced wellhead monitoring shall be performed according to the following:

(1) Perform visual observations for subsurface oxidation events (smoke, smoldering ash, damage to well) within the radius of influence of the well.

(2) Monitor temperature of the landfill gas at the wellhead as provided in section 95471(m).

(3) Monitor the oxygen, carbon dioxide, and methane content of the landfill gas at the wellhead as provided in section 95471(n).

(4) Monitor and determine carbon monoxide concentrations, as follows:

(A) Collect the sample from the wellhead sampling port in a passivated canister or multi-layer foil gas sampling bag (such as the Cali-5-Bond Bag) and analyze that sample using U.S. EPA Method 10 (40 CFR Part 60, Appendix A-4, May 30, 2023, which is incorporated by reference herein), or an equivalent method with a detection limit of at least 100 ppmv of carbon monoxide in high concentrations of methane; or

(B) Collect and analyze the sample from the wellhead using U.S. EPA Method 10 (40 CFR Part 60, Appendix A-4, May 30, 2023) to measure carbon monoxide concentrations.

(C) When sampling directly from the wellhead, you shall sample for 5 minutes plus twice the response time of the analyzer. These values shall be recorded. The five 1-minute averages are then averaged to give you the carbon monoxide reading at the wellhead.

(D) When collecting samples in a passivated canister or multi-layer foil sampling bag, you shall sample for the period of time needed to assure that enough sample is collected to provide five (5) consecutive, 1-minute samples during the analysis of the canister or bag contents, but no less than 5 minutes plus twice the response time of the analyzer. The five (5) consecutive, 1-minute averages are then averaged together to give you a carbon monoxide value from the wellhead.

~~(h)~~(p) *Alternative Test Methods~~.~~:* Alternative test methods may be used provided that they are approved in writing by the Executive Officer.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

* * * *

§ 95475. Definitions.

(a) For purposes of this subarticle, 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 a component source that exceeds 500 parts per million by volume (ppmv), other than non-repeatable, momentary readings. Measurements from any vault ~~must~~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.

(4) "Construction Activities" means operations within the facility boundary involving the removal of cover material resulting in refuse exposure for the purpose of installing, expanding, replacing, or repairing components of the landfill gas, leachate, or gas condensate collection and removal system, or for law enforcement activities requiring excavation.

~~(4)~~(5) "Construction and Demolition Wastes" means waste building materials, packaging and rubble resulting from construction, remodeling, repair and

demolition operations on pavements, houses, commercial buildings and other structures.

~~(5)~~(6) “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.

~~(6)~~(7) “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.

(8) “Controlled MSW Landfill” means a MSW landfill that uses a gas collection system and routes the collected landfill gas to a gas control system.

(9) “Corrective Action Analysis” means a description of all reasonable interim and long-term measures, if any, that are available, and an explanation of why the selected corrective action(s) is/are the best alternative(s), including, but not limited to, considerations of cost effectiveness, technical feasibility, safety, and secondary impacts.

(10) "Cover Material” means soils/earthen materials or alternative materials used in covering compacted solid wastes in a disposal site. Cover material may serve as daily, intermediate or final cover.

(A) "Daily Cover" means cover material placed on the entire surface of the active face at least at the end of each operating day in order to control vectors, fire, odors, blowing litter and scavenging.

(B) "Intermediate Cover" means cover material placed on all fill surfaces where additional cells are not to be constructed for 180 days or more to control vectors, fires, odors, blowing litter, scavenging, and drainage.

(C) "Final Cover" means cover material that represents the permanently exposed final surface of a fill.

(11) “Decommissioned Well” means a landfill gas collection well that has been permanently removed from service in accordance with the requirements in section 95464(c)(2).

~~(7) “District” means any air quality management district or air pollution control district in the State of California.~~

~~(8)~~(12) "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.

(13) "District" means any air quality management district or air pollution control district in the State of California.

~~(9)~~(14) "Enclosed Combustor" means an enclosed flare, steam generating boiler, internal combustion engine, or gas turbine.

~~(10)~~(15) "Energy Recovery Device" means any combustion device that 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.

~~(11) "Exceedance" means the concentration of methane measured within 3 inches above the landfill surface that exceeds 500 ppmv, other than non-repeatable, momentary readings, as determined by instantaneous surface emissions monitoring; or the average methane concentration measurements that exceed 25 ppmv, as determined by integrated surface emissions monitoring.~~

~~(12)~~(16) "Executive Officer" means the Executive Officer of the California Air Resources Board, or his or her delegate.

~~(13)~~(17) "Facility Boundary" means the boundary surrounding the entire area on which MSW landfill activities occur and are permitted.

~~(14)~~(18) "Gas Control Device" means any device used to dispose of or treat collected landfill gas, including, but not limited to, enclosed flares, internal combustion engines, boilers and boiler-to-steam turbine systems, fuel cells, and gas turbines.

~~(15)~~(19) "Gas Collection System" means any system that 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.

~~(16)~~(20) "Gas Control System" means any system that 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, including for transportation fuel and injection into the natural gas pipeline.

~~(17)~~(21) "Inactive MSW Landfill" means a MSW landfill that ~~is no longer accepting solid waste for disposal, or~~ can document that the landfill is no longer receiving solid waste.

~~(18)~~(22) "Inert Waste" means any material meeting the definition of "Inert Waste" as defined in Title 27, California Code of Regulations, Division 2, Subdivision 1, Chapter 3, Subchapter 2, Article 2, Section 20230(a) (effective July 18, 1997).

~~(19)~~(23) "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.

~~(20)~~(24) "Landfill Surface" means the area of the landfill under which decomposable solid waste has been placed~~, excluding the working face~~.

(25) "Location Coordinates" means the latitude and longitude in decimal degrees with at least five decimal places measured using an instrument with an accuracy of at least four meters.

~~(21)~~(26) "Municipal Solid Waste Landfill" or "MSW Landfill" means an entire disposal facility in a contiguous geographical space where solid waste is placed in or on land.

~~(22)~~(27) "Non-decomposable Solid Waste" means materials that do not degrade biologically to form landfill gas. Examples include, but are not limited to, earth, rock, concrete asphalt paving fragments, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, ceramics, clay products, inert slag, asbestos-containing waste, and demolition materials containing minor amounts (less than 10 percent by volume) of wood and metals. Materials that do not meet this definition are considered decomposable solid waste.

~~(23)~~(28) "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.

(29) "Offline Well" means a landfill gas collection well that has been temporarily disconnected from vacuum, such as to perform well raising or repairs.

~~(24)~~(30) "Operator" means any person or entity, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual that:

(A) Operates the MSW landfill;

(B) 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 subarticle;

(C) Operates any stationary equipment for the collection of landfill gas;

(D) ~~Purchases~~Receives landfill gas from ~~an owner or operator of a~~ MSW landfill and operates any stationary equipment for the treatment of landfill gas; or

(E) ~~Purchases~~Receives untreated landfill gas from ~~an owner or operator of~~ a MSW landfill and operates any stationary equipment for the combustion of landfill gas.

~~(25)~~(31) "Owner" means any person or entity, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual that:

(A) 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;

(B) 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 subarticle.

(C) Owns any stationary equipment for the collection of landfill gas;

(D) ~~Purchases the~~Receives landfill gas from ~~an owner or operator of a~~ MSW landfill and owns any stationary equipment for the treatment of landfill gas; or

(E) ~~Purchases~~Receives untreated landfill gas from ~~an owner or operator of~~ a MSW landfill and owns any stationary equipment for the combustion of landfill gas.

~~(26)~~(32) "Perimeter" means along the MSW landfill's permitted facility boundary.

~~(27)~~(33) "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 an engineer holding a valid certificate issued by a state offering reciprocity with California.

(34) "Remote Monitoring Data" means data obtained by CARB from a measurement technology capable of detecting methane plumes.

(35) "Root Cause Analysis" means an assessment conducted through a process of investigation to determine the primary cause, and any other contributing causes, of positive pressure or a temperature greater than the operating value at a wellhead.

~~(28)~~(36) "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 (as last amended 64 Fed.Reg 9262, Feb 24, 1999) as incorporated by reference herein.

(37) "Standard Cubic Feet" means cubic feet at a standard temperature and pressure of 60 degrees Fahrenheit and 1 atmosphere.

~~(29)~~(38) "Subsurface Gas Migration" means underground landfill gases that are detected at any point on the perimeter pursuant to California Code of Regulations title 27, section 20921.

(39) "Uncontrolled MSW Landfill" means a MSW landfill that is not a controlled MSW landfill. MSW landfills that use a passive venting or carbon adsorption system are uncontrolled MSW landfills.

(40) "Unsafe-to-Walk Surface Area" means an area of the MSW landfill surface with safety hazards that prevent performing walking surface emissions monitoring, such as hazards presented by physical features of the landfill surface (e.g., steep or slippery slopes) and hazards associated with operational activities (e.g., construction activities or filling operations).

~~(30)~~(41) "Waste-in-Place" means the total amount of solid waste placed in the MSW landfill estimated in tons. ~~The~~For purposes of converting from volumetric estimates, the refuse density is assumed to be ~~1,300 pounds~~0.65 tons per cubic yard ~~and the decomposable fraction is assumed to be 70 percent by weight.~~, unless the owner or operator has site-specific records of refuse density.

~~(31)~~(42) "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.

~~(32)~~(43) "Working Face" means the open area where solid waste is deposited daily and compacted with landfill equipment.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38562.2, 38566, 39003, 39500, 39600 ~~and~~, 39601, and 39730.5 Health and Safety Code.

* * * *

Appendix I

1.0 Calculate Heat Input Capacity

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

Where:

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

GHV (Gross Heating Value) = Gross heating value of methane, which is ~~1,012~~970 in units of British thermal units per standard cubic feet, or Btu/scf~~; source: http://epa.gov/lmop/res/converter.htm~~).

2.0 Methane Gas Generation: CH4 Generation is calculated using the following equation:

$$CH_4 \text{ Generation (Mg of } CH_4) = \{ANDOC_{year\text{-}start} \times [1\text{-}e^{-[k]^{-[k]}}] - ANDOC_{deposited\text{-}last\ year} \times [1/k \times (e^{-[k \times (1-M/12)]} - e^{-[k]}) - (M/12) \times e^{-[k]}] + ANDOC_{deposited\text{-}same\ year} \times [1-((1/k) \times (1-e^{-[k \times (1-M/12)]} + (M/12))]\} \times FCH_4$$

Where:

CH_4 Generation = CH_4 generated in the inventory year in question (Mg of CH_4) 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).

FCH_4 = Fraction of decomposing carbon converted into CH_4 (Default = 0.5)

$ANDOC_{year\text{-}start}$ = ANDOC in place at the beginning of the inventory year in question

$ANDOC_{deposited\text{-}last\ year}$ = ANDOC deposited during the previous inventory year

$ANDOC_{deposited\text{-}same\ year}$ = ANDOC deposited during the inventory year in question

3.0 To Convert Methane Generated from Mg of CH_4 to SCFM

CH_4 Gas Generated (scfm) = CH_4 Generation (Mg/year) x 1 year/ 525,600 minutes x 1,000,000 g/Mg x 1 mole CH_4/16.04246 g CH_4 x 0.83662 SCF/mole landfill gas

4.0 Define ANDOC%

$ANDOC\% = \Sigma\ WIPFRAC_i \times TDOC_i \times DANF_i$

Where:

$WIPFRAC_i$ = Fraction of the i^{th} component in the waste-in-place

$TDOC_i$ = Total Degradable Organic Carbon fraction of the i^{th} waste component (Mg of that component/Mg of Total waste-in-place)

$DANF_i$ =Decomposable Anaerobic Fraction of the i^{th} waste component, that fraction capable of decomposition in anaerobic conditions (Mg of decomposable carbon for that component/Mg $TDOC_i$ for that component)

5.0 Define ANDOC

ANDOC = WIP (Tons) x 0.9072 (Mg/Ton) x 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)

6.0 Calculate $ANDOC_{year\text{-}end}$

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

Where:

$ANDOC_{year\text{-}end}$ = ANDOC remaining undecomposed at the end of the inventory year in question

$ANDOC_{year\text{-}start}$ = ANDOC in place at the beginning of the inventory year in question

$ANDOC_{deposited\text{-}last\ year}$ = ANDOC deposited during the previous inventory year

$ANDOC_{deposited\text{-}same\ year}$ = 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") ~~must~~shall be used based on the County or nearest weather station's 100-year average precipitation rate, adjusted for leachate or other liquids addition:

Table 1. Average ~~Rainfall~~Precipitation Plus Liquids and k Values

Average ~~Rainfall~~Precipitation Plus Liquids (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/.~~

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

Table 21A. Waste Type (%) by Year Up to 1995

	~~Waste Type (%) by Year~~				
Waste Type	***Up to 1964***	***1965-1974***	***1975-1984***	***1985-1992***	***1993-1995***
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.~~					

Table 21B. Waste Type % by Year 1996-Present

~~Waste Type (%) by Year~~						
Waste Type	***1996-2002[1]***	***2003-2007~~present~~[2]***	***2008-2013***	***2014-2017***	***2018-2020***	***2021-present***
Newspaper	4.3%	2.2%	1.20%	1.50%	1.20%	0.70%
Office Paper	4.4%	2.0%	0.70%	0.70%	4.30%	4.10%
Corrugated Boxes	4.6%	5.7%	3.70%	3.10%	5.20%	4.10%
Coated Paper	16.9%	11.1%	11.20%	12.00%	5.90%	6.60%
Food	15.7%	14.6%	16.50%	18.10%	14.90%	10.90%
Grass	5.3%	2.8%	3.40%	3.80%	2.30%	2.20%
Leave	2.6%	1.4%	2.80%	3.10%	3.10%	2.80%
Branche	2.4%	2.6%	1.80%	1.70%	1.50%	1.00%
Lumber & Wood Products	4.9%	9.6%	13.70%	11.90%	11.00%	9.70%
Textiles	2.1%	4.4%	5.60%	5.80%	4.10%	4.90%
Diapers	6.9%	4.4%	3.70%	4.30%	2.30%	2.40%
Construction/Demolition	6.7%	12.1%	9.80%	8.00%	1.00%	0.90%
Medical Waste	0.0%	0.0%	0.10%	0.10%	0.10%	0.00%
Sludge/Manure	0.1%	0.1%	0.70%	0.60%	0.60%	0.70%
~~Source:~~						

[1]~~CIWMB Statewide Waste Characterization Study (1999).~~

[2]~~CIWMB Statewide Waste Characterization Study (2004).~~

Table 32. TDOC (%) and DANF by Waste Type

Waste Type	***TDOC***	***~~Source~~ DANF***
Newspaper	~~46.5%~~42.6%	~~EPA~~16.0%
Office Paper	~~39.8%~~29.1%	~~EPA~~88.0%
Corrugated Boxes	~~40.5%~~39.0%	~~EPA~~45.0%
Coated Paper	~~40.5%~~23.9%	~~EPA~~34.0%
Food	~~11.7%~~13.5%	~~EPA~~84.0%
Grass	~~19.2%~~8.1%	~~EPA~~47.0%
Leaves	~~47.8%~~28.5%	~~EPA~~15.0%
Branches	~~27.9%~~41.2%	~~EPA~~23.0%
Lumber & Wood Products	~~43.0%~~35.2%	~~IPCC~~10.0%
Textiles	24.0%	~~IPCC~~50.0%
Diapers	24.0%	~~IPCC~~50.0%
Construction/Demolition	4.0%	~~IPCC~~50.0%
Medical Waste	15.0%	~~IPCC~~50.0%
Sludge/Manure	5.0%	~~IPCC~~50.0%
~~Sources~~		

EPA *Solid Waste Management and Greenhouse Gasses: A Life-Cycle Assessment of Emissions and Sinks*, Exhibits 7-2, 7-3 (May 2002).

IPCC *Guidelines for National Greenhouse Gas Inventories*, Chapter 2, Table 2.4, 2.5 and 2.6 (2006).

Table 3

Waste Type	***DANF***	***Source***
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 *Solid Waste Management and Greenhouse Gasses: A Life-Cycle Assessment of Emissions and Sinks* Exhibits 7-2, 7-3 (May 2002).

CEC *Inventory of California Greenhouse Gas Emissions and Sinks: 1990-2004* (December 2006).

IPCC *Guidelines for National Greenhouse Gas Inventories*, Chapter 3, 3.13 (2006).