

**METROPOLITAN HEALTH DEPARTMENT
POLLUTION CONTROL DIVISION**

REGULATION NO. 16

Regulation For Control of Municipal Solid Waste Landfills

**As provided for in the Code of Laws of the Metropolitan
Government of Nashville and Davidson County, Tennessee,
Chapter 10.56, Section 10.56.090**

**Adopted: November 12, 1996
By the Metropolitan Board of Health
Nashville and Davidson County**

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Regulation No. 16

Regulation For Control of Municipal Solid Waste Landfills

This Regulation establishes emission standards for existing municipal solid waste landfills.

Section 16-1: Definitions

The terms used in this Regulation should have the following definitions. Terms used but not defined herein shall have the same meaning given to them in Chapter 10.56, "Air Pollution Control" of the Metropolitan Code of Laws.

- (a) **"Active Collection System"** - means a gas collection system that uses gas mover equipment.
- (b) **"Active Landfill"** - means a landfill in which solid waste is being placed or a landfill that is planned to accept waste in the future.
- (c) **"Closed Landfill"** - means a landfill in which solid waste is no longer being placed, and in which no additional solid wastes will be placed without first filing a notification of modification as prescribed under Section 60.7(a)(4) of 40 CFR Part 60. Once a notification of modification has been filed, and additional solid waste is placed in the landfill, the landfill is no longer closed. A landfill is considered closed after meeting the criteria of Subpart F - "Closure and Post Closure Care" of 40 CFR Part 250.
- (d) **"Closure"** - means that point in time when a landfill becomes a closed landfill.
- (e) **"Commercial Solid Waste"** - means all types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding residential and industrial wastes.
- (f) **"Controlled Landfill"** - means any landfill at which collection and control systems are required under this Regulation as a result of the nonmethane organic compounds emission rate. The landfill is considered controlled at the time either (1) a notification of intent to install a collection and control system or (2) a collection and control system design plan is submitted in compliance with Paragraph (b)(2)(i) of Section 16-3 of this Regulation.
- (g) **"Design Capacity"** - means the maximum amount of solid waste a landfill can accept, as specified in the construction or operating permit issued by the State or local agency responsible for regulating the landfill.
- (h) **"Disposal Facility"** - means all contiguous land and structure, other appurtenances, and improvements on the land used for the disposal of solid waste.
- (i) **"Emission Rate Cutoff"** - means the threshold annual emission rate to which a landfill compares its estimated emission rate to determine if control under the regulation is required.
- (j) **"Enclosed Combustor"** - means an enclosed firebox which maintains a relatively constant limited peak temperature generally using a limited supply of combustion air. An enclosed flare is considered an enclosed combustor.

- (k) **“Flare”** - means an open combustor without enclosure or shroud.
- (l) **“Gas Mover Equipment”** - means the equipment (i.e., fan, blower, compressor) used to transport landfill gas through the header system.
- (m) **“Household Waste”** - means any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including, but not limited to, single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).
- (n) **“Industrial Solid Waste”** - means solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of the Resource Conservation and Recovery Act, 40 CFR Part 264 and Part 265. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.
- (o) **“Interior Well”** - means any well or similar collection component located inside the perimeter of the landfill. A perimeter well located outside the landfilled waste is not an interior well.
- (p) **“Landfill”** - means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile as those terms are defined under Section 257.2 of 40 CFR Part 250.
- (q) **“Lateral Expansion”** - means a horizontal expansion of the waste boundaries of an existing MSW landfill. A lateral expansion is not a modification unless it results in an increase in the design capacity of the landfill.
- (r) **“Municipal Solid Waste Landfill”** or **“MSW Landfill”** - means an entire disposal facility in a contiguous geographical space where household waste is placed in or on land. An MSW landfill may also receive other types of RCRA Subtitle D wastes (Section 257.2 of 40 CFR Part 250) such as commercial solid waste, nonhazardous sludge, conditionally exempt small quantity generator waste, and industrial solid waste. Portions of an MSW landfill may be separated by access roads. An MSW landfill may be publicly or privately owned. An MSW landfill may be a new MSW landfill, an existing MSW landfill, or a lateral expansion.
- (s) **“Municipal Solid Waste Landfill Emissions”** or **“MSW Landfill Emissions”** - means gas generated by the decomposition of organic waste deposited in an MSW landfill or derived from the evolution of organic compounds in the waste.
- (t) **“NMOC”** - means nonmethane organic compounds, as measured according to the provisions of Section 16-5 of this Regulation.
- (u) **“Nondegradable Waste”** - means any waste that does not decompose through chemical breakdown or microbiological activity. Examples are, but are not limited to, concrete, municipal waste combustor ash, and metals.

- (v) **“Passive Collection System”** - means a gas collection system that solely uses positive pressure within the landfill to move the gas rather than using gas mover equipment.
- (w) **“Sludge”** - means any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility, exclusive of the treated effluent from a wastewater treatment plant.
- (x) **“Solid Waste”** - means any garbage, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges that are point sources subject to permits under 33 U.S.C. 1342, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.).
- (y) **“Sufficient Density”** - means any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this Regulation.
- (z) **“Sufficient Extraction Rate”** - means a rate sufficient to maintain a negative pressure at all wellheads in the collection system without causing air infiltration, including any wellheads connected to the system as a result of expansion or excess surface emissions, for the life of the blower.

Section 16-2: Affected Facility

- (a) The provisions of this Regulation apply to each existing municipal solid waste landfill that meet the following criteria:
 - (1) The landfill commenced construction, reconstruction or modification before May 30, 1991; and
 - (2) The landfill accepted waste any time after November 8, 1987, or has additional design capacity available for future waste deposition.

Section 16-3: Emission Standards

- (a) Each owner or operator of an affected facility having a design capacity less than 2.5 million megagrams by mass or 2.5 million cubic meters by volume shall submit an initial design capacity report to the Director as provided in Paragraph (a) of Section 16-8 of this Regulation. The landfill may calculate design capacity in either megagrams or cubic meters for comparison with the exemption values. Any density conversions shall be documented

and submitted with the report. For purposes of Part 70 permitting, a landfill with a design capacity less than 2.5 million megagrams or 2.5 million cubic meters does not require an operating permit under Regulation No. 13, "Part 70 Operating Permit Program." Submittal of the initial design capacity report shall fulfill the requirements of this Regulation except as provided for in Paragraphs (a)(1) and (a)(2) of this Section.

- (1) The owner or operator shall submit to the Director an amended design capacity report, as provided for in Paragraph (a)(3) of Section 16-8 of this Regulation, when there is any increase in the design capacity of a landfill subject to the provisions of this Regulation, whether the increase results from an increase in the area or depth of the landfill, a change in the operating procedures of the landfill, or any other means.
 - (2) If any increase in the maximum design capacity of a landfill exempted from the provisions of Paragraph (b) of this Section through Section 16-11 of this Regulation on the basis of the design capacity exemption in Paragraph (a) of this Section results in a revised maximum design capacity equal to or greater than 2.5 million megagrams or 2.5 million cubic meters, the owner or operator shall comply with the provision of Paragraph (b) of this Section.
- (b) Each owner or operator of an MSW landfill having a design capacity equal to or greater than 2.5 million megagrams or 2.5 million cubic meters, shall either comply with Paragraph (b)(2) of this Section or calculate an NMOC emission rate for the landfill using the procedures specified in Section 16-5 of this Regulation. The NMOC emission rate shall be recalculated annually, except as provided in Paragraph (b)(1)(ii) of Section 16-8 of this Regulation. The owner or operator of an MSW landfill subject to this Regulation with a design capacity greater than or equal to 2.5 million megagrams or 2.5 million cubic meters is subject to the Part 70 permitting requirements of Regulation No. 13, "Part 70 Operating Permit Program". When a landfill is closed, and either never needed control or meets the conditions for control system removal specified in Paragraph (b)(2)(v) of this Section, a Part 70 operating permit is no longer required.
- (1) If the calculated NMOC emission rate is less than 50 megagrams per year, the owner or operator shall:
 - (i) Submit an annual emission report to the Director, except as provided for in Paragraph (b)(1)(ii) of Section 16-8; and
 - (ii) Recalculate the NMOC emission rate annually using the procedures specified in Paragraph (a)(1) of Section 16-5 until such time as the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, or the landfill is closed.
 - (A) If the NMOC emission rate, upon recalculation required in Paragraph (b)(1)(ii) of this Section, is equal to or greater than 50 megagrams per year, the owner or operator shall install a collection and control system in compliance with Paragraph (b)(2) of this Section.
 - (B) If the landfill is permanently closed, a closure notification shall be submitted to the Director and the Administrator as provided for in Paragraph (d) of Section 16.8 of this Regulation.

- (2) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, the owner or operator shall:
- (i) Submit a collection and control system design plan prepared by a professional engineer to the Director within 1 year of the effective date of this Regulation for all uncontrolled landfills and within 90 days for all controlled landfills:
 - (A) The collection and control system as described in the plan shall meet the design requirements of Paragraph (b)(2)(ii) of this Section.
 - (B) The collection and control system design plan shall include any alternatives proposed by the owner or operator to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions of Sections 16-4 through 16-9 of this Regulation.
 - (C) The collection and control system design plan shall either conform with specifications for active collection systems outlined in Section 16-10 or include a demonstration to the Director's satisfaction of the sufficiency of the alternative provisions to Section 16-10 of this Regulation.
 - (D) The Director shall review the information submitted under Paragraphs (b)(2)(i)(A), (B) and (C) of this Section and either approve it, disapprove it, or request that additional information be submitted. Because of the many site-specific factors involved with landfill gas system design, alternative systems may be necessary. A wide variety of system designs are possible, such as vertical wells, combination horizontal and vertical collection systems, or horizontal trenches only, leachate collection components, and passive systems.
 - (ii) Install a collection and control system at all uncontrolled landfills within 18 months of the submittal of the design plan under Paragraph (b)(2)(i) of this Section that effectively captures the gas generated within the landfill.
 - (A) An active collection system shall:
 - 1) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system;
 - 2) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of:
 - (aa) 5 years or more if active; or
 - (bb) 2 years or more if closed or at final grade;
 - 3) Collect gas at a sufficient extraction rate;
 - 4) Be designed to minimize off-site migration of subsurface gas.
 - (B) A passive collection system shall:
 - 1) Comply with the provisions specified in Paragraphs (b)(2)(ii)(A) 1) 2) & 4) of this Section.

- 2) Be installed with liners on the bottom and all sides in all areas in which gas is to be collected. The liners shall be installed as required under Section 258.40 of 40 CFR Part 250.
- (iii) Route all the collected gas to a control system that complies with the requirements in either Paragraphs (b)(2)(iii)(A), (B) or (C) of this Section.
- (A) An open flare designed and operated in accordance with Section 60.18 of 40 CFR Part 60;
 - (B) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The reduction efficiency or parts per million by volume shall be established by an initial performance test using the test methods specified in Paragraph (c) of Section 16-5 of this Regulation.
 - 1) If a boiler or process heater is used as the control device, the landfill gas stream shall be introduced into the flame zone.
 - 2) The control device shall be operated within the parameter ranges established during the initial or most recent performance test. The operating parameters to be monitored are specified in Section 16-7.
 - (C) Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All emissions from any atmospheric vent from the gas treatment system shall be subject to the requirements of Paragraph (b)(2)(iii)(A) or (B) of this Section.
- (iv) Operate the collection and control device installed to comply with this subpart in accordance with the provisions of Sections 16-4, 16-6 and 16-7 of this Regulation.
- (v) The collection and control system may be capped or removed provided that all the conditions of Paragraphs (b)(2)(v)(A), (B), and (C) of this Section are met:
- (A) The landfill shall be no longer accepting solid waste and shall be permanently closed under the requirements of Section 258.60 of 40 CFR Part 250. A closure report shall be submitted to the Director and Administrator as provided in Paragraph (d) of Section 16-8 of this Regulation.
 - (B) The collection and control system shall have been in operation a minimum of 15 years; and
 - (C) Following the procedures specified in Paragraph (b) of Section 16-5 of this Regulation, the calculated NMOC gas produced by the landfill shall be less than 50 megagrams per year on three successive test dates. The test dates shall be no less than 90 days apart, and no more than 180 days apart.

Section 16-4: Operational Standards for Collection and Control Systems

Each owner or operator of an MSW landfill gas collection system used to comply with the provisions of Paragraph (b)(2)(ii) of Section 16-3 of this Regulation shall:

- (a) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:
 - (1) 5 years or more if active; or
 - (2) 2 years or more if closed or at final grade;
- (b) Operate the collection system with negative pressure at each wellhead except under the following conditions:
 - (1) A fire or increased well temperature. The owner or operator shall record instances when positive pressure occurs in efforts to avoid a fire. These records shall be submitted with the annual reports as provided in Paragraph (f)(1) of Section 16-8 of this Regulation;
 - (2) Use of a geomembrane or synthetic cover. The owner or operator shall develop acceptable pressure limits in the design plan;
 - (3) A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes shall be approved by the Director.
- (c) Operate each interior wellhead in the collection system with a landfill gas temperature less than 55° C and with either a nitrogen level less than 20 percent or an oxygen level less than 5 percent. The owner or operator may establish a higher operating temperature, nitrogen, or oxygen value at a particular well. A higher operating value demonstration shall show supporting data that the elevated parameter does not cause fires or significantly inhibit anaerobic decomposition by killing methanogens.
 - (1) The nitrogen level shall be determined using Method 3C, unless an alternative test method is established as allowed by Paragraph (b)(2)(i) of Section 16-3 of this Regulation.
 - (2) Unless an alternative test method is established as allowed by Paragraph (b)(2)(i) of Section 16-3 of this Regulation, the oxygen shall be determined by an oxygen meter using Method 3A except that:
 - (i) The span shall be set so that the regulatory limit is between 20 and 50 percent of the span;
 - (ii) A data recorder is not required;
 - (iii) Only two calibration gases are required, a zero and span, and ambient air may be used as the span;
 - (iv) A calibration error check is not required;
 - (v) The allowable sample bias, zero drift, and calibration drift are ± 10 percent.

- (d) Operate the collection system so that the methane concentration is less than 500 parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area along a pattern that traverses the landfill at 30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks and seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan shall be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.
- (e) Operate the system such that all collected gases are vented to a control system designed and operated in compliance with Paragraph (b)(2)(iii) of Section 16-3. In the event the collection or control system is inoperable, the gas mover system shall be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere shall be closed within 1 hour.
- (f) Operate the control or treatment system at all times when the collected gas is routed to the system.
- (g) If monitoring demonstrates that the operational requirement in Paragraphs (b), (c), or (d) of this Section are not met, corrective action shall be taken as specified in Paragraphs (a)(3) through (5) or Paragraph (c) of Section 16-6 of this Regulation. If corrective actions are taken as specified in Section 16-6, the monitored exceedance is not a violation of the operational requirements in this Section.

Section 16-5: Test Methods and Procedures

- (a)(1) The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in Paragraph (a)(1)(i) of this Section or the equation provided in Paragraph (a)(1)(ii) of this Section. The values to be used in both equations are 0.05 per year for k, 170 cubic meters per megagram for L_o, and 4,000 parts per million by volume as hexane for the C_{NMOC}.
- (i) The following equation shall be used if the actual year-to-year solid waste acceptance rate is known.

$$M_{NMOC} = \sum_{i=1}^n 2 k L_o M_i (e^{-kt_i}) (C_{NMOC}) (3.6 \times 10^{-9})$$

where,

M_{NMOC} = Total NMOC emission rate from the landfill, megagrams per year
k = Methane generation rate constant, year⁻¹

- L_O = Methane generation potential, cubic meters per megagram solid waste
- M_i = Mass of solid waste in the i^{th} section, megagrams
- t_i = Age of the i^{th} section, years
- C_{NMOC} = Concentration of NMOC, parts per million by volume as hexane
- 3.6×10^{-9} = Conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for M_i if the documentation provisions of Paragraph (d)(2) of Section 16-9 of this Regulation are followed.

- (ii) The following equation shall be used if the actual year-to-year solid waste acceptance rate is unknown.

$$M_{\text{NMOC}} = 2L_O R (e^{-kc} - e^{-kt}) (C_{\text{NMOC}}) (3.6 \times 10^{-9})$$

where,

- M_{NMOC} = Mass emission rate of NMOC, megagrams per year
- L_O = Methane generation potential, cubic meters per megagram solid waste
- R = Average annual acceptance rate, megagrams per year
- k = Methane generation rate constant, year⁻¹
- t = Age of landfill, years
- C_{NMOC} = Concentration of NMOC, parts per million by volume as hexane
- c = Time since closure, years. For active landfill $c = 0$ and $e^{-kc} = 1$
- 3.6×10^{-9} = Conversion factor

The mass of nondegradable solid waste may be subtracted from the average annual acceptance rate when calculating a value for R , if the documentation provisions of Paragraph (d)(2) of Section 16-9 are followed.

- (2) Tier 1. The owner or operator shall compare the calculated NMOC mass emission rate to the standard of 50 megagrams per year.
 - (i) If the NMOC emission rate calculated in Paragraph (a)(1) of this Section is less than 50 megagrams per year, then the landfill owner shall submit an emission rate report as provided in Paragraph (b)(1) of Section 16-8 and shall recalculate the NMOC mass emission rate annually as required by Paragraph (b)(1) of Section 16-3.
 - (ii) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, then the landfill owner shall either comply with Paragraph (b)(2) of Section 16-3 or determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the procedures provided in Paragraph (a)(3) of this Section.

- (3) Tier 2. The landfill owner or operator shall determine the NMOC concentration using the following sampling procedure. The landfill owner or operator shall install at least two sample probes per hectare of landfill surface that has retained waste for at least 2 years. If the landfill is larger than 25 hectares in area, only 50 samples are required. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator shall collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using Method 25C of Appendix A of 40 CFR Part 60 or Method 18 of Appendix A. If using Method 18 of Appendix A, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). If composite sampling is used, equal volumes shall be taken from each sample probe. If more than the required number of samples are taken, all samples shall be used in the analysis. The landfill owner or operator shall divide the NMOC concentration from Method 25C of Appendix A of 40 CFR Part 60 by six to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.
- (i) The landfill owner or operator shall recalculate the NMOC mass emission rate using the equations provided in Paragraph (a)(1)(i) or (a)(1)(ii) of this Section and using the average NMOC concentration from the collected samples instead of the default value in the equation provided in Paragraph (a)(1) of this Section.
 - (ii) If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than 50 megagrams per year, then the landfill owner or operator shall either comply with Paragraph (b)(2) of Section 16-3, or determine the site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the procedure specified in Paragraph (a)(4) of this Section.
 - (iii) If the resulting NMOC mass emission rate is less than 50 megagrams per year, the owner or operator shall submit a periodic estimate of the emission rate report as provided in Paragraph (b)(1) of Section 16-8 and retest the site-specific NMOC concentration every 5 years using the methods specified in this Section.
- (4) Tier 3. The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of Appendix A of 40 CFR Part. 60. The landfill owner or operator shall estimate the NMOC mass emission rate using equations in Paragraph (a)(1)(i) or (a)(1)(ii) of this Section and using a site-specific methane generation rate constant k , and the site-specific NMOC concentration as determined in Paragraph (a)(3) of this Section instead of the default values provided in Paragraph (a)(1) of this Section. The landfill owner or operator shall compare the resulting NMOC mass emission rate to the standard of 50 megagrams per year.
- (i) If the NMOC mass emission rate as calculated using the site-specific methane generation rate and concentration of NMOC is equal to or greater than 50 megagrams per year, the owner or operator shall comply with Paragraph (b)(2) of Section 16-3 of this Regulation.

- (ii) If the NMOC mass emission rate is less than 50 megagrams per year, then the owner or operator shall submit a periodic emission rate report as provided in Paragraph (b)(1) of Section 16-8 and shall recalculate the NMOC mass emission rate annually, as provided in Paragraph (b)(1) of Section 16-8 using the equations in Paragraph (a)(1) of this Section and using the site-specific methane generation rate constant and NMOC concentration obtained in Paragraph (a)(3) of this Section. The calculation of the methane generation rate constant is performed only once, and the value obtained is used in all subsequent annual NMOC emission rate calculations.
- (5) The owner or operator may use other methods to determine the NMOC concentration or a site-specific k as an alternative to the methods required in Paragraphs (a)(3) and (a)(4) of this Section if the method has been approved by the Director as provided in Paragraph (b)(2)(i)(B) of Section 16-3 of this Regulation.
- (b) After the installation of a collection and control system in compliance with Section 16-6, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in Paragraph (b)(2)(v) of Section 16-3 using the following equation:

$$M_{\text{NMOC}} = 1.89 \times 10^{-3} Q_{\text{LFG}} C_{\text{NMOC}}$$

where,

- M_{NMOC} = mass emission rate of NMOC, megagrams per year
- Q_{LFG} = flow rate of landfill gas, cubic meters per minute
- C_{NMOC} = NMOC concentration, parts per million by volume as hexane

- (1) The flow rate of landfill gas, Q_{LFG} , shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of Section 4 of Method 2E of Appendix A of 40 CFR Part 60.
- (2) The average NMOC concentration, C_{NMOC} , shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18 of Appendix A of 40 CFR Part 60. If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C by six to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the Director as provided in Paragraph (b)(2)(i)(B) of Section 16-3 of this Regulation.

(c) For the performance test required in Paragraph (b)(2)(iii)(B) of Section 16-3 of this Regulation, Method 25, 25A, 25B, or 18 of Appendix A of 40 CFR Part 60 shall be used to determine compliance with the 98 weight-percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Director as provided by Paragraph (b)(2)(i)(B) of Section 16-3 of this Regulation. If using Method 18 of Appendix A of 40 CFR Part 60, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The following equation shall be used to calculate efficiency:

$$\text{Control Efficiency} = \frac{(\text{NMOC}_{\text{in}} - \text{NMOC}_{\text{out}})}{(\text{NMOC}_{\text{in}})}$$

where,

NMOC_{in} = Mass of NMOC entering control device

NMOC_{out} = Mass of NMOC exiting control device

Section 16-6: Compliance Provisions

(a) Except as provided in Paragraph (b)(2)(i)(B) of Section 16-3, the specified methods in Paragraphs (a)(1) through (a)(6) of this Section shall be used to determine whether the gas collection system is in compliance with Paragraph (b)(2)(ii) of Section 16-3.

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with Paragraph (b)(2)(ii)(A) 1) of Section 16-3, one of the following equations shall be used. The k and L_0 kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Director. If k has been determined as specified in Paragraph (a)(4) of Section 16-5, the value of k determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

$$Q_M = 2L_0 R (e^{-kc} - e^{-kt})$$

where,

Q_M = Maximum expected gas generation flow rate, cubic meters per year

L_0 = Methane generation potential, cubic meters per megagram solid waste

R = Average annual acceptance rate, megagrams per year

- k = Methane generation rate constant, year⁻¹
- t = Age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years
- c = Time since closure, years (for an active landfill c = 0 and e^{-kc} = 1)

(ii) For sites with known year-to-year solid waste acceptance rate:

$$Q_M = \sum_{i=1}^n 2 k L_O M_i (e^{-kt_i})$$

where,

- Q_M = Maximum expected gas generation flow rate, cubic meters per year
- k = Methane generation rate constant, year⁻¹
- L_O = Methane generation potential, cubic meters per megagram solid waste
- M_i = Mass of solid waste in the ith section, megagrams
- t_i = Age of the ith section, years

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in Paragraphs (a)(1)(i) and (ii) of this Section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using the equations in Paragraphs (a)(1)(i) or (ii) of this Section or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

- (2) For the purposes of determining sufficient density of gas collectors for compliance with Paragraph (b)(2)(ii)(A) 2) of Section 16-3, the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Director, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.
- (3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with Paragraph (b)(2)(ii)(A) 3) of Section 16-3, the owner or operator shall measure gauge pressure in the gas collection header at each individual well monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under Paragraph (b) of Section 16-4. If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial

measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards.

- (4) Owners or operators are not required to install additional wells as required in Paragraph (a)(3) of this Section during the first 180 days after gas collection system start-up.
 - (5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in Paragraph (c) of Section 16-4. If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. Any attempted corrective measure shall not cause exceedances of other operational or performance standards.
 - (6) An owner or operator seeking to demonstrate compliance with Paragraph (b)(2)(ii)(A) 4) of Section 16-3 through the use of a collection system not conforming to the specifications provided in Section 16-10 shall provide information satisfactory to the Director as specified in Paragraph (b)(2)(i)(C) of Section 16-3 demonstrating that off-site migration is being controlled.
- (b) For purposes of compliance with Paragraph (a) of Section 16-4, each owner or operator of a controlled landfill shall place each well or design component as specified in the approved design plan as provided in Paragraph (b)(2)(i) of Section 16-3. Each well shall be installed within 60 days of the date in which the initial solid waste has been in place for a period of:
- (1) 5 years or more if active; or
 - (2) 2 years or more if closed or at final grade.
- (c) The following procedures shall be used for compliance with the surface methane operational standard as provided in Paragraph (d) of Section 16-4.
- (1) After installation of the collection system, the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a serpentine pattern spaced 30 meters apart (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in Paragraph (d) of this Section.
 - (2) The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.
 - (3) Surface emission monitoring shall be performed in accordance with Section 4.3.1 of Method 21 of Appendix A of 40 CFR Part 60, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.
 - (4) Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the actions specified in Paragraphs (c)(4)(i) through (v) of this Section shall be taken. As long as the specified actions are taken, the

exceedance is not a violation of the operational requirements of Paragraph (d) of Section 16-4.

- (i) The location of each monitored exceedance shall be marked and the location recorded.
 - (ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance shall be made and the location shall be re-monitored within 10 calendar days of detecting the exceedance.
 - (iii) If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in Paragraph (c)(4)(v) of this Section shall be taken, and no further monitoring of that location is required until the action specified in Paragraph (c)(4)(v) has been taken.
 - (iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in Paragraph (c)(4)(ii) or (iii) of this Section shall be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in Paragraph (c)(4)(iii) or (v) of this Section shall be taken.
 - (v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Director for approval.
- (5) The owner or operator shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.
- (d) Each owner or operator seeking to comply with the provisions in Paragraph (c) of this Section shall comply with the following instrumentation specifications and procedures for surface emission monitoring devices:
- (1) The portable analyzer shall meet the instrument specifications provided in Section 3 of Method 21 of Appendix A of 40 CFR Part 60, except that “methane” shall replace all references to VOC.
 - (2) The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air.
 - (3) To meet the performance evaluation requirements in Section 3.1.3 of Method 21 of Appendix A of 40 CFR Part 60, the instrument evaluation procedures of Section 4.4 of Method 21 of Appendix A shall be used.

- (4) The calibration procedures provided in Section 4.2 of Method 21 of Appendix A of 40 CFR Part 60 shall be followed immediately before commencing a surface monitoring survey.
- (e) The provisions of this Regulation apply at all times, except during periods of start-up, shutdown or malfunction, provided that the duration of start-up, shutdown or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices. A log of all start-ups, shutdown and malfunctions must be maintained on site in accordance with Section 10.56.280 of Chapter 10.56, "Air Pollution Control" of the Metropolitan Code of Laws.

Section 16-7: Monitoring of Operations

Except as provided in Paragraph (b)(2)(i)(B) of Section 16-3 of this Regulation:

- (a) Each owner or operator seeking to comply with Paragraph (b)(2)(ii)(A) of Section 16-3 for an active gas collection system shall install a sampling port and a thermometer or other temperature measuring device at each wellhead and:
 - (1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in Paragraph (a)(3) of Section 16-6; and
 - (2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as provided in Paragraph (a)(5) of Section 16-6; and
 - (3) Monitor temperature of the landfill gas on a monthly basis as provided in Paragraph (a)(5) of Section 16-6.
- (b) Each owner or operator seeking to comply with Paragraph (b)(2)(iii) of Section 16-3 by using an enclosed combustor shall calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment:
 - (1) A temperature monitoring device equipped with a continuous recorder and having an accuracy of ± 1 percent of the temperature being measured expressed in degrees Celsius or $\pm 0.5^\circ$ C, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity greater than 44 megawatts.
 - (2) A gas flow rate measuring device that provides a measurement of gas flow to or bypass of the control device. The owner or operator shall either:
 - (i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or
 - (ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.
- (c) Each owner or operator seeking to comply with Paragraph (b)(2)(iii) of Section 16-3 by using an open flare shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:
 - (1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame.
 - (2) A device that records flow to or bypass of the flare. The owner or operator shall either:
 - (i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least 15 minutes; or
 - (ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

- (d) Each owner or operator seeking to demonstrate compliance with Paragraph (b)(2)(iii) of Section 16-3 by using a device other than an open flare or an enclosed combustor shall provide information satisfactory to the Director as provided in Paragraph (b)(2)(i)(B) of Section 16-3 describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Director shall review the information and either approve it, or request that additional information be submitted. The Director may specify additional appropriate monitoring procedures.
- (e) Each owner or operator seeking to install a collection system that does not meet the specifications in Section 16-10 or seeking to monitor alternative parameters to those required by Section 16-4 through Section 16-7 shall provide information satisfactory to the Director as provided in Paragraph (b)(2)(i)(B) and (C) of Section 16-3 describing the design and operation of the collection system, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Director may specify additional appropriate monitoring procedures.
- (f) Each owner or operator seeking to demonstrate compliance with Paragraph (c) of Section 16-6 shall monitor surface concentrations of methane according to the instrument specifications and procedures provided in Paragraph (d) of Section 16-6. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

Section 16-8: Reporting Requirements

Except as provided in Paragraph (b)(2)(i)(B) of Section 16-3 of this Regulation:

- (a) Each owner or operator subject to the requirements of this Regulation shall submit an initial design capacity report to the Director.
 - (1) The initial design capacity report shall be submitted no later than 90 days after the effective date of this Regulation.
 - (2) The initial design capacity report shall contain the following information:
 - (i) A map or plot of the landfill, providing the size and location of the landfill, and identifying all areas where solid waste has or may be landfilled according to the provisions of the State, local, or RCRA construction or operating permit;
 - (ii) The maximum design capacity of the landfill. Where the maximum design capacity is specified in the State or local construction or RCRA permit, a copy of the permit specifying the maximum design capacity may be submitted as part of the report. If the maximum design capacity of the landfill is not specified in the permit, the maximum design capacity shall be calculated using good engineering practices. The calculations shall be provided, along with such parameters as depth of solid waste, solid waste acceptance rate, and compaction practices as part of the

report. The Director may request other reasonable information as may be necessary to verify the maximum design capacity of the landfill.

- (3) An amended design capacity report shall be submitted to the Director providing notification of any increase in the design capacity of the landfill, whether the increase results from an increase in the permitted area or depth of the landfill, a change in the operating procedures, or any other means which results in an increase in the maximum design capacity of the landfill above 2.5 million megagrams or 2.5 million cubic meters. The amended design capacity report shall be submitted within 90 days of the issuance of an amended construction or operating permit, or the placement of waste in additional land, or the change in operating procedures which will result in an increase in maximum design capacity, whichever occurs first.
- (b) Each owner or operator subject to the requirements of this Regulation shall submit an NMOC emission rate report to the Director initially and annually thereafter, except as provided for in Paragraphs (b)(1)(ii) or (b)(3) of this Section. The Director may request such additional information as may be necessary to verify the reported NMOC emission rate.
- (1) The NMOC emission rate report shall contain an annual or 5-year estimate of the NMOC emission rate calculated using the formula and procedures provided in Paragraphs (a) or (b) of Section 16-5 as applicable.
 - (i) The initial NMOC emission rate report shall be submitted within 90 days of the effective date of this Regulation and may be combined with the initial design capacity report required in Paragraph (a) of this Section. Subsequent NMOC emission rate reports shall be submitted annually thereafter, except as provided for in Paragraphs (b)(1)(ii) and (b)(3) of this Section.
 - (ii) If the estimated NMOC emission rate as reported in the annual report to the Director is less than 50 megagrams per year in each of the next 5 consecutive years, the owner or operator may elect to submit an estimate of the NMOC emission rate for the next 5-year period in lieu of the annual report. This estimate shall include the current amount of solid waste-in-place and the estimated waste acceptance rate for each year of the 5 years for which an NMOC emission rate is estimated. All data and calculations upon which this estimate is based shall be provided to the Director. This estimate shall be revised at least once every 5 years. If the actual waste acceptance rate exceeds the estimated waste acceptance rate in any year reported in the 5-year estimate, a revised 5-year estimate shall be submitted to the Director. The revised estimate shall cover the 5-year period beginning with the year in which the actual waste acceptance rate exceeded the estimated waste acceptance rate.
 - (2) The NMOC emission rate report shall include all the data, calculations, sample reports and measurements used to estimate the annual or 5-year emissions.
 - (3) Each owner or operator subject to the requirements of this Regulation is exempted from the requirements of Paragraphs (b)(1) and (2) of this Section, after the installation of a collection and control system in compliance with Paragraph (b)(2) of Section 16-3,

during such time as the collection and control system is in operation and in compliance with Sections 16-4 and 16-6 of this Regulation.

- (c) Each owner or operator subject to the provisions of Paragraph (b)(2)(i) of Section 16-3 shall submit a collection and control system design plan to the Director within 1 year of the first report, required under Paragraph (b) of this Section, in which the emission rate equals or exceeds 50 megagrams per year, except as follows:
 - (1) If the owner or operator elects to recalculate the NMOC emission rate after Tier 2 NMOC sampling and analysis as provided in Paragraph (a)(3) of Section 16-5 and the resulting rate is less than 50 megagrams per year, annual periodic reporting shall be resumed, using the Tier 2 determined site-specific NMOC concentration, until the calculated emission rate is equal to or greater than 50 megagrams per year or the landfill is closed. The revised NMOC emission rate report, with the recalculated emission rate based on NMOC sampling and analysis, shall be submitted within 180 days of the first calculated exceedance of 50 megagrams per year.
 - (2) If the owner or operator elects to recalculate the NMOC emission rate after determining a site-specific methane generation rate constant (k) as provided in Tier 3 in Paragraph (a)(4) of Section 16-5, and the resulting NMOC emission rate is less than 50 megagrams per year, annual periodic reporting shall be resumed. The resulting site-specific methane generation rate constant (k) shall be used in the emission rate calculation until such time as the emissions rate calculation results in an exceedance. The revised NMOC emission rate report based on the provisions of Paragraph (a)(4) of Section 16-5 and the resulting site-specific methane generation rate constant (k) shall be submitted to the Director within 1 year of the first calculated emission rate exceeding 50 megagrams per year.
- (d) Each owner or operator of a controlled landfill shall submit a closure report to the Director and the Administrator within 30 days of waste acceptance cessation. The Director or the Administrator may request additional information as may be necessary to verify that permanent closure has taken place in accordance with the requirements of Section 258.60 of 40 CFR Part 250. If a closure report has been submitted to the Director and the Administrator, no additional wastes may be placed in the landfill without filing a notification of modification as described under Section 60.7 (a)(4) of 40 CFR Part 60.
- (e) Each owner or operator of a controlled landfill shall submit an equipment removal report to the Director 30 days prior to removal or cessation of operation of the control equipment.
 - (1) The equipment removal report shall contain all of the following items:
 - (i) A copy of the closure report submitted in accordance with Paragraph (d) of this Section;
 - (ii) A copy of the initial performance test report demonstrating that the 15 year minimum control period has expired; and
 - (iii) Dated copies of three successive NMOC emission rate reports demonstrating that the landfill is no longer producing 50 megagrams or greater of NMOC per year.
 - (2) The Director may request such additional information as may be necessary to verify that all of the conditions for removal in Paragraph (b)(2)(v) of Section 16-3 have been met.

- (f) Each owner or operator of a landfill seeking to comply with Paragraph (b)(2) of Section 16-3 using an active collection system designed in accordance with Paragraph (b)(2)(ii) of Section 16-3 shall submit to the Director annual reports of the recorded information required by Paragraphs (f)(1) through (f)(6) of this Section. The initial annual report shall be submitted within 180 days of installation and start-up of the collection and control system or within 180 days of the date of adoption of this Regulation for existing collection systems, and shall include the initial performance test report required under Section 16-3. For enclosed combustion devices and flares, reportable exceedances are defined under Paragraph (c) of Section 16-9.
- (1) Value and length of time for exceedance of applicable parameters monitored under Paragraphs (a), (b), (c), and (d) of Section 16-7.
 - (2) Description and duration of all periods when the gas stream is diverted from the control device through a bypass line or the indication of bypass flow as specified under Section 16-7.
 - (3) Description and duration of all periods when the control device was not operating for a period exceeding 1 hour and length of time the control device was not operating.
 - (4) All periods when the collection system was not operating in excess of 5 days.
 - (5) The location of each exceedance of the 500 parts per million methane concentration as provided in Paragraph (d) of Section 16-4 and the concentration recorded at each location for which an exceedance was recorded in the previous month.
 - (6) The date of installation and the location of each well or collection system expansion added pursuant to Paragraphs (a)(3), (b), and (c)(4) of Section 16-6.
- (g) Each owner or operator seeking to comply with Paragraph (b)(2)(i) of Section 16-3 shall include the following information with the initial performance test report required under Paragraph (b)(2)(iii)(B) of Section 16-3:
- (1) A diagram of the collection system showing collection system positioning including all wells, horizontal collectors, surface collectors, or other gas extraction devices, including the locations of any areas excluded from collection and the proposed sites for the future collection system expansion;
 - (2) The data upon which the sufficient density of wells, horizontal collectors, surface collectors, or other gas extraction devices and the gas mover equipment sizing are based;
 - (3) The documentation of the presence of asbestos or nondegradable material for each area from which collection wells have been excluded based on the presence of asbestos or nondegradable material;
 - (4) The sum of the gas generation flow rates for all areas from which collection wells have been excluded based on nonproductivity and the calculations of gas generation flow rate for each excluded area;
 - (5) The provisions for increasing gas mover equipment capacity with increased gas generation flow rate, if the present gas mover equipment is inadequate to move the maximum flow rate expected over the life of the landfill; and

- (6) The provisions for the control of off-site migration.

Section 16-9: Recordkeeping Requirements

- (a) Each owner or operator of an MSW landfill subject to the provisions of Paragraph (b) of Section 16-3 shall keep for at least 5 years up-to-date, readily accessible, on-site records of the maximum design capacity, the current amount of solid waste in-place, and the year-by-year waste acceptance rate. Off-site records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats are acceptable.
- (b) Each owner or operator of a controlled landfill shall keep up-to-date, readily accessible records for the life of the control equipment of the data listed in Paragraphs (b)(1) through (b)(4) of this Section as measured during the initial performance test or compliance determination. Records of subsequent tests or monitoring shall be maintained for a minimum of 5 years. Records of the control device vendor specifications shall be maintained until removal.
 - (1) Where an owner or operator subject to the provisions of this Regulation seeks to demonstrate compliance with Paragraph (b)(2)(ii) of Section 16-3:
 - (i) The maximum expected gas generation flow rate as calculated in Paragraph (a)(1) of Section 16-6. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the Director.
 - (ii) The density of wells, horizontal collectors, surface collectors, or other gas extraction devices determined using the procedures specified in Paragraph (a)(1) of Section 16-10.
 - (2) Where an owner or operator subject to the provisions of this Regulation seeks to demonstrate compliance with Paragraph (b)(2)(iii) of Section 16-3 through use of an enclosed combustion device other than a boiler or process heater with a design heat input capacity greater than 44 megawatts:
 - (i) The average combustion temperature measured at least every 15 minutes and averaged over the same time period of the performance test.
 - (ii) The percent reduction of NMOC determined as specified in Paragraph (b)(2)(iii)(B) of Section 16-3 achieved by the control device.
 - (3) Where an owner or operator subject to the provisions of this Regulation seeks to demonstrate compliance with Paragraph (b)(2)(iii)(B) 1) of Section 16-3 through use of a boiler or process heater of any size: a 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 testing.
 - (4) Where an owner or operator subject to the provisions of this Regulation seeks to demonstrate compliance with Paragraph (b)(2)(iii)(A) of Section 16-3 through use of an open flare: the flare type (i.e., steam-assisted, air-assisted, or nonassisted), all visible emission readings, heat content determination, flow rate or bypass flow rate

measurements, and exit velocity determinations made during the performance test as specified in Section 60.18 of 40 CFR Part 60, continuous records of the flare pilot flame or flare flame monitoring, and records of all periods of operations during which the pilot flame of the flare flame is absent.

- (c) Each owner or operator of a controlled landfill subject to the provisions of this Regulation shall keep for 5 years up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored in Section 16-7 as well as up-to-date, readily accessible records for periods of operation during which the parameter boundaries established during the most recent performance test are exceeded.
 - (1) The following constitute exceedances that shall be recorded and reported under Paragraph (f) of Section 16-8:
 - (i) For enclosed combustors except for boilers and process heaters with design heat input capacity of 44 megawatts (150 million British thermal unit per hour) or greater, all 3-hour periods of operation during which the average combustion temperature was more than 28° C below the average combustion temperature during the most recent performance test at which compliance with Paragraph (b)(2)(iii) of Section 16-3 was determined.
 - (ii) For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone as required under Paragraph (b)(2)(iii)(B)(1) of Section 16-3.
 - (2) Each owner or operator subject to the provisions of this Regulation shall keep up-to-date, readily accessible continuous records of the indication of flow to the control device or the indication of bypass flow or records of monthly inspections of car-seals or lock-and-key configurations used to seal bypass lines, specified under Section 16-7.
 - (3) Each owner or operator subject to the provisions of this Regulation who uses a boiler or process heater with a design heat input capacity of 44 megawatts or greater to comply with Paragraph (b)(2)(iii) of Section 16-3 shall keep an up-to-date, readily accessible record of all periods of operation of the boiler or process heater. (Examples of such records could include records of steam use, fuel use, or monitoring data collected pursuant to other State, local, or Federal regulatory requirements.)
 - (4) Each owner or operator seeking to comply with the provisions of this Regulation by use of an open flare shall keep up-to-date, readily accessible continuous records of the flame or flare pilot flame monitoring specified under Paragraph (c) of Section 16-7, and up-to-date, readily accessible records of all periods of operation in which the flame or flare pilot flame is absent.
- (d) Each owner or operator subject to the provisions of this Regulation shall keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.
 - (1) Each owner or operator subject to the provisions of this Regulation shall keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under Paragraph (b) of Section 16-6.

- (2) Each owner or operator subject to the provisions of this Regulation shall keep readily accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or nondegradable waste excluded from collection as provided in Paragraph (a)(3)(i) of Section 16-10 as well as any nonproductive areas excluded from collection as provided in Paragraph (a)(3)(ii) of Section 16-10.
- (e) Each owner or operator subject to the provisions of this Regulation shall keep for at least 5 years up-to-date, readily accessible records of all collection and control system exceedances of the operational standards outlined in Section 16-4, the reading in the subsequent month whether or not the second reading is an exceedance, and the location of each exceedance.

Section 16-10: Specifications for Active Collection Systems

- (a) Each owner or operator seeking to comply with Paragraph (b)(2)(i) of Section 16-3 of this Regulation shall site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing areas using the following procedures unless alternative procedures have been approved by the Director as provided in Paragraph (b)(2)(i)(C) and (D) of Section 16-3 of this Regulation:
 - (1) The collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues shall be addressed in the design: depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat.
 - (2) The sufficient density of gas collection devices determined in Paragraph (a)(1) of this Section shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.
 - (3) The placement of gas collection devices determined in Paragraph (a)(1) of this Section shall control all gas producing areas, except as provided by Paragraphs (a)(3)(i) and (a)(3)(ii) of this Section.
 - (i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under Paragraph (d) of Section 16-9. The documentation shall provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and shall be provided to the Director upon request.
 - (ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material shall be documented and provided to the Director upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections shall be compared to the NMOC emissions estimate for the entire landfill. Emissions from each section shall be computed using the following equation:

$$Q_i = 2 k L_O M_i (e^{-kt_i}) (C_{NMOC}) (3.6 \times 10^{-9})$$

where,

Q_i = NMOC emission rate from the i^{th} section, megagrams per year

k = Methane generation rate constant, year⁻¹

L_O = Methane generation potential, cubic meters per megagram solid waste

M_i = Mass of the degradable solid waste in the i^{th} section, megagrams

t_i = Age of the solid waste in the i^{th} section, years

C_{NMOC} = Concentration of nonmethane organic compounds, parts per million by volume

3.6×10^{-9} = Conversion factor

(iii) The values for k , L_O , and C_{NMOC} determined in field testing shall be used, if field testing has been performed in determining the NMOC emission rate or the radii of influence. If field testing has not been performed, the default values for k , L_O and C_{NMOC} provided in Paragraph (a)(1) of Section 16-5 shall be used. The mass of nondegradable solid waste contained within the given section may be subtracted from the total mass of the section when estimating emissions provided the nature, location, age, and amount of the nondegradable material is documented as provided in Paragraph (a)(3)(i) of this Section.

- (b) Each owner or operator seeking to comply with Paragraph (b)(2)(i)(A) of Section 16-3 shall construct the gas collection devices using the following equipment or procedures:
- (1) The landfill gas extraction components shall be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to: convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system shall extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations shall be situated with regard to the need to prevent excessive air infiltration.
 - (2) Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices shall be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

- (3) Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.
- (c) Each owner or operator seeking to comply with Paragraph(b)(2)(i)(A) of Section 16-3 shall convey the landfill gas to a control system in compliance with Paragraph (b)(2)(iii) of Section 16-3 through the collection header pipe(s). The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:
 - (1) For existing collection systems, the flow data shall be used to project the maximum flow rate. If no flow data exists, the procedures in Paragraph (c)(2) of this Section shall be used.
 - (2) For new collection systems, the maximum flow rate shall be determined in accordance with Paragraph (a)(1) of Section 16-6 of this Regulation.

Section 16-11: Compliance Schedules

- (a) Except as provided for under Paragraph (b) of this Section, planning, awarding of contracts, and installation of MSW landfill air emission collection and control equipment capable of meeting the emission standards outlined in Section 16-3 shall be accomplished within 12 months after the effective date of this Regulation.
- (b) For each affected facility having a design capacity greater than or equal to 2.5 million megagrams or 2.5 million cubic meters whose NMOC emission rate is less than 50 megagrams per year on the effective date of this Regulation, installation of collection and control systems capable of meeting the emission standards outlined in Section 16-3 shall be accomplished within 30 months of the date of the first annual nonmethane organic compounds emission rate which equals or exceeds 50 megagrams per year.

Approved this _____ day of _____, 1996,
 by the members of the Metropolitan Board of Health:

