Carbon Credits (Carbon Farming Initiative—Landfill Gas) Methodology Determination 2015

I, Greg Hunt, Minister for the Environment, make the following determination.

Dated 12 January 2015

Greg Hunt
Minister for the Environment

OPC60654 - B

Contents

Part 1—Preliminary

1 Name of determination

This determination is the *Carbon Credits (Carbon Farming Initiative—Landfill Gas) Methodology Determination 2015*.

2 Commencement

This determination commences on the day after it is registered.

3 Authority

This determination is made under subsection 106(1) of the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

4 Duration

This determination remains in force for the period that:

(a) begins when the determination commences; and

(b) ends on the day before this determination would otherwise be repealed under subsection 50(1) of the *Legislative Instruments Act 2003*.

5 Definitions

In this determination:

Act means the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

appropriate measuring requirements has the meaning given by subsection 33(3).

carbon tax waste, in relation to a landfill, means waste that was deposited in the landfill between 1 July 2012 and 30 June 2014.

collection efficiency, of a landfill gas collection system at a landfill, means the proportion of landfill gas generated by the landfill that is collected and combusted by the landfill gas collection system, expressed as a percentage.

combustion device means:

(a) a flare, boiler or internal combustion engine that is operated in accordance with the manufacturer's instructions; or

(b) a device:

(i) that combusts landfill gas with a destruction efficiency of at least 98%; and

(ii) that is operated in accordance with the manufacturer's instructions; and

(iii) the combustion process of which can be monitored on a minute-by-minute basis.

daily cover/operational area, in relation to a landfill, means the area of the landfill normally covered by material used to cover a day's deposition of waste in active landfill waste disposal areas of the landfill.

final cover area, in relation to a landfill, means the area of the landfill normally covered by material used to cover previously active landfill waste disposal areas of the landfill that have reached final height and are unlikely to be used for waste disposal again.

intermediate cover area, in relation to a landfill, means the area of the landfill normally covered by material used to cover previously active landfill working areas that won't be used for waste disposal for an extended period of time (typically a few weeks to a few months).

landfill means a site where waste is or was buried under a permission (however described) given under the law of a State or Territory.

landfill gas means gas generated from anaerobic decomposition of biological material at a landfill.

landfill gas collection system means a system to collect and combust landfill gas.

landfill gas project has the meaning given by subsection 7(2).

monitoring and control system, for a flare, means a system that consists of:

(a) a monitoring system that detects the flame of a flare and monitors if the flare is operating at the manufacturer's specifications for the complete combustion of methane; and

(b) an associated control system that shuts down landfill gas flow to the flare either when no flame is detected or when the flare is not operating at the manufacturer's specifications for the complete combustion of methane.

Note: An example of a monitoring and control system for a flare is a flare management system that incorporates a UV detection sensor.

monitoring requirements means the requirements set out in section 33.

new project has the meaning given by section 9.

NGER (Measurement) Determination means the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*.

NGER Regulations means the *National Greenhouse and Energy Reporting Regulations 2008.*

non-monitored period has the meaning given by subsection 34(1).

recommencing project has the meaning given by section 10.

regulatory guidelines for landfill means guidelines that:

(a) establish policy and regulatory requirements for sustainable waste management and landfill performance; and

(b) are applied by environment agencies and environmental protection agencies (including such agencies in States and Territories).

Note: These guidelines typically cover the topics of siting, design, management or operation of landfills.

sub-facility zone has the meaning as in section 5.22A of the NGER (Measurement) Determination.

transitioning project has the meaning given by section 12.

upgrade project has the meaning given by subsection 11(1).

6 References to factors and parameters from external sources

(1) If a calculation in this determination includes a factor or parameter that is defined or calculated by reference to another instrument or writing, the factor or parameter to be used for a reporting period is the factor or parameter referred to in, or calculated by reference to, the instrument or writing as in force at the end of the reporting period.

(2) Subsection (1) does not apply if:

(a) the determination specifies otherwise; or

(b) it is not possible to define or calculate the factor or parameter by reference to the instrument or writing as in force at the end of the reporting period.

Part 2—Landfill gas projects

7 Landfill gas projects

(1) For paragraph 106(1)(a) of the Act, this determination applies to an offsets project that aims to reduce emissions of greenhouse gases by collecting and combusting landfill gas from a landfill.

(2) A project covered by subsection (1) is a ***landfill gas project***.

(3) A landfill gas project may be:
  (a) a new project; or
  (b) a recommencing project; or
  (c) an upgrade project; or
  (d) a transitioning project.

Part 3—Project requirements

8 Operation of this Part

(1) For paragraph 106(1)(b) of the Act, sections 9 to 12 set out requirements that must be met for a landfill gas project to be an eligible offsets project.

(2) For subparagraph 27(4A)(a)(ii) of the Act, subsection 13(1) sets out a requirement in lieu of the newness requirement.

(3) For subparagraph 27(4A)(b)(ii) of the Act, subsection 13(2) sets out a requirement in lieu of the regulatory additionality requirement.

9 Requirements for a new project

A ***new project*** must:

(a) collect landfill gas by installing a landfill gas collection system at a landfill for which no such system has previously been installed; and

(b) combust the gas using a combustion device.

10 Requirements for a recommencing project

A ***recommencing project*** must:

(a) recommence landfill gas collection, using either a new or existing landfill gas collection system, at a landfill that meets both of the following requirements:

(i) no landfill gas collection system has operated at the landfill since 24 April 2014;

(ii) no landfill gas collection system has operated at the landfill during the 3 years before the application for the declaration of the project as an eligible offsets project is made; and

(b) combust the gas using a combustion device.

11 Requirements for an upgrade project

(1) An ***upgrade project*** must:

(a) upgrade an existing landfill gas collection system at a landfill to increase its collection efficiency; and

(b) combust the gas collected using a combustion device.

(2) An application for declaration of an upgrade project as an eligible offsets project must include operational records that:

(a) support the calculation of the collection efficiency of the existing landfill gas collection system; and

(b) cover at least the 2-year period before the application is made.

(3) The first reporting period for an upgrade project must end not less than 12 months after the landfill gas collection system, as upgraded, begins to collect landfill gas.

Section 12

12 Requirements for a transitioning project

A ***transitioning project*** must:

(a) collect landfill gas by continuing to operate a landfill gas collection system that was operated as part of a project that was operating under:

(i) the Carbon Farming (Capture and Combustion of Methane in Landfill Gas from Legacy Waste) Methodology Determination 2012; or

(ii) the Carbon Credits (Carbon Farming Initiative) (Capture and Combustion of Methane in Landfill Gas from Legacy Waste: Upgrade Projects) Methodology Determination 2012; and

(b) combust the gas using a combustion device.

13 Additionality requirements

(1) For subparagraph 27(4A)(a)(ii) of the Act, a requirement in lieu of the newness requirement for a recommencing project is that the project complies with subparagraph 27(4A)(a)(i) of the Act, disregarding any operation of the landfill gas collection system before the earliest of the following:

(a) the beginning of the period of 3 years before the application for the declaration of the project as an eligible offsets project was made;

(b) the end of the day that is 24 April 2014.

(2) For subparagraph 27(4A)(b)(ii) of the Act, a requirement in lieu of the regulatory additionality requirement is that the project is a landfill gas project.

Part 4—Net abatement amounts

Division 1—Operation of this Part

14 Operation of this Part

For paragraph 106(1)(c) of the Act, this Part specifies the method for working out the carbon dioxide equivalent net abatement amount for a reporting period for a landfill gas project that is an eligible offsets project.

15 Overview of gases accounted for in abatement calculations

The following table provides an overview of the greenhouse gas abatement and emissions that are relevant to working out the carbon dioxide equivalent net abatement amount for a landfill gas project.

Greenhouse gas abatement and emissions

Item	Relevant calculation	Emissions source	Greenhouse gas
1	Baseline abatement	Destruction of methane in landfill gas by combustion	Methane (CH_4)
2	Baseline abatement	Destruction of methane in landfill gas by oxidation in the near surface conditions of the landfill	Methane (CH_4)
3	Project abatement	Destruction of methane in landfill gas by combustion	Methane (CH_4)
4	Project emissions	Combustion of landfill gas	Methane (CH_4)

16 Inputs and parameters

(1) Inputs for this method must cover the whole landfill.

Note: This subsection prevents a proponent from operating a project only in relation to a selected portion of a landfill where, for example, gas might be easier to extract.

(2) If a parameter in an equation is worked out, or determined, in a particular way for a reporting period, then, it must be worked out, or determined, in the same way for all other equations in which it is used for the reporting period.

Division 2—Method for calculating net abatement amount

17 Summary

Net abatement is calculated as project abatement minus baseline abatement.

18 Net abatement amount

The carbon dioxide equivalent net abatement amount for the reporting period, in tonnes CO_2-e, is worked out using the formula (***equation 1***):

$$A = A_P - A_B$$

where:

A means the carbon dioxide equivalent net abatement amount for the reporting period, in tonnes CO_2-e.

$\boldsymbol{A_P}$ means the project abatement for the reporting period, in tonnes CO_2-e, worked out using equation 2.

$\boldsymbol{A_B}$ means the baseline abatement for the reporting period, in tonnes CO_2-e, worked out using equation 12.

Division 3—Method for calculating project abatement

19 Summary

Project abatement is calculated as the amount of methane combusted by the project that was not generated by carbon tax waste minus the amount that would have been oxidised in the near surface conditions of the landfill had it not been collected during the project.

20 Project abatement

The project abatement for the reporting period, in tonnes CO_2-e, is worked out using the formula (***equation 2***):

$$A_P = M_{Com,NCT} - M_{Com,Ox}$$

where:

A_P means the project abatement for the reporting period, in tonnes CO_2-e.

$M_{Com,NCT}$ means the methane combusted during the reporting period that was not generated from carbon tax waste, in tonnes CO_2-e, worked out using equation 3.

$M_{Com,Ox}$ means the methane combusted during the reporting period that was not generated from carbon tax waste and that, without the project, would have been oxidised in near surface conditions of landfill, in tonnes CO_2-e, worked out using equation 11.

21 Methane combusted that was not generated from carbon tax waste

The methane combusted during the reporting period that was not generated from carbon tax waste, in tonnes CO_2-e, is worked out using the formula (***equation 3***):

$$M_{Com,NCT} = \gamma \times W_{NCT} \times M_{Com}$$

where:

$M_{Com,NCT}$ means the methane combusted during the reporting period that was not generated from carbon tax waste, in tonnes CO_2-e.

γ means the factor to convert cubic metres of methane at standard conditions to tonnes of CO_2-e worked out using subsection 5.4(1) of the NGER (Measurement) Determination.

W_{NCT} means the proportion of the methane combusted during the reporting period that was not generated from carbon tax waste worked out using equation 4.

M_{Com} means the methane that was combusted during the reporting period, in cubic metres, worked out using equation 5.

Section 22

22 Proportion of methane combusted that was not generated from carbon tax waste

(1) The proportion of the methane combusted during the reporting period that was not generated from carbon tax waste, in cubic metres, is worked out using the formula (***equation 4***):

$$W_{NCT} = \sum_{y} \frac{M_{Com,y}}{M_{Com}} \left(1 - \frac{M_{CTW,y}}{M_{Gen,y}} \right)$$

where:

W_{NCT} means the proportion of the methane combusted during the reporting period that was not generated from carbon tax waste.

$M_{Com,y}$ means the methane combusted in financial year y, in cubic metres, worked out using equation 5 as if a reporting period were a financial year.

M_{Com} means the methane combusted during the reporting period, in cubic metres, worked out using equation 5.

$M_{CTW,y}$ means the methane generated by the landfill from carbon tax waste in financial year y in tonnes of CO_2-e calculated in accordance with subsection (2).

$M_{Gen,y}$ means the methane generated by the landfill in financial year y, in tonnes CO_2-e, calculated in accordance with subsection (3).

y means a financial year covered (either partly or fully) by the reporting period.

Note: The summation of this equation over financial years is to cover circumstances where reporting periods span financial years.

Methane generated from carbon tax waste in financial year y

(2) The methane generated by the landfill from carbon tax waste in financial year y, in tonnes of CO_2-e, is equivalent to parameter CH_{4gen} calculated:

(a) under Part 5.2 of the NGER (Measurement) Determination; and

(b) in accordance with the following:

(i) the year y for working out $M_{CTW,y}$ is a financial year that the reporting period partially or fully covers;

(ii) the calculation is based only on carbon tax waste.

Note: See section 6 for the version of NGER (Measurement) Determination that must be used.

Methane generated in year y

(3) The methane generated by the landfill in year y, in tonnes CO_2-e, is equivalent to parameter CH_{4gen} calculated:

(a) under Part 5.2 of the NGER (Measurement) Determination; and

(b) with methane generation determined for the whole landfill as if it were a single sub-facility zone; and

(c) in accordance with subsection (4), (5), (6) or (7), as required, and subsection (8), as required.

(4) For working out $M_{Gen,y}$ for equation 4, financial year y is a financial year covered (either partly or fully) by the reporting period.

(5) For working out $M_{Gen,y}$ for equation 18, year y is the 12 month period immediately after the upgrade undertaken in the project is completed.

(6) For working out $M_{Gen,y}$ for equation 20 and clause 5 of Schedule 1, year y is the 12 month period immediately before the project begins.

(7) For working out $M_{Gen,y}$ for clause 2 of Schedule 1 (for the purposes of items 1 and 2 of the table in subclause 6(2) of Schedule 1) and items 5 and 6 of the table in subclause 6(2) of Schedule 1, year y is the 12 month period immediately before the advice is given by the environmental regulator.

(8) For subsections (5), (6) and (7), if the 12 month period covers 2 financial years, CH_{4gen} is calculated by:

(i) calculating CH_{4gen} for each financial year covered by the 12 month period; and

(ii) multiplying the amount of CH_{4gen} for each financial year by the proportion of days in the financial year covered by the 12 month period; and

(iii) summing the results.

23 Methane combusted

(1) The methane combusted during a reporting period, in cubic metres, is worked out using the formula (***equation 5***):

$$M_{Com} = \sum_{h} M_{Com,h}$$

where:

M_{Com} means the methane combusted during the reporting period, in cubic metres.

$M_{Com,h}$ means the methane combusted during the reporting period by combustion device h, in cubic metres, worked out using equation 6 or 7 as required.

Methane combusted by combustion device h—boiler or flare with monitoring and control system or internal combustion engine

(2) If combustion device h is a boiler, a flare with monitoring and control system or an internal combustion engine, the methane combusted during the reporting period by the device, in cubic metres, is worked out using the formula (***equation 6***):

$$M_{Com,h} = DE \times M_{Sent,h}$$

where:

$M_{Com,h}$ means the methane combusted during the reporting period by combustion device h, in cubic metres.

DE means the default methane destruction efficiency for a combustion device, which for an internal combustion engine is 1 and for any other combustion device is 0.98.

$M_{Sent,h}$ means the methane sent to combustion device h during the reporting period, in cubic metres, worked out using equation 8, 9 or 10.

Methane combusted by combustion device h—other combustion devices

(3) If combustion device h is not a boiler, a flare with monitoring and control system or an internal combustion engine, the methane combusted during the reporting period by the device, in cubic metres, is worked out using the formula (***equation 7***):

$$M_{Com,h} = DE \times \sum_{a} \left(O_{h,a} \times M_{Sent,h,a} \right)$$

where:

$M_{Com,h}$ means the methane combusted during the reporting period by combustion device h, in cubic metres.

DE means the default methane destruction efficiency for a combustion device, which for an internal combustion engine is 1 and for any other combustion device is 0.98.

$O_{h,a}$ means the operation of combustion device h in hour a, which is either 0 or 1, worked out in accordance with the monitoring requirements.

$M_{Sent,h,a}$ means the methane sent to combustion device h in hour a, in cubic metres, worked out using equation 8 or 9.

24 Methane sent to combustion device

(1) Methane sent to a combustion device h during a particular period may be worked out using:

(a) equation 8; or
(b) equation 9; or
(c) equation 10 (if applicable).

Option 1—using landfill gas sent to combustion device

(2) Using the volume of the landfill gas sent to the combustion device (***$Q_{LFG,h}$***), the methane sent to the combustion device during the period is worked out using the formula (***equation 8***):

$$M_{Sent,h} = Q_{LFG,h} \times W_{LFG,CH_4}$$

where:

$M_{Sent,h}$ means the methane sent to the combustion device h during the period, in cubic metres.

$Q_{LFG,h}$ means the landfill gas sent to the combustion device h during the period, in cubic metres, worked out in accordance with the monitoring requirements.

W_{LFG,CH_4} means the proportion of the volume of the landfill gas that is methane, which is:

(a) set out in section 5.14C of the NGER (Measurement) Determination; or

(b) worked out in accordance with the monitoring requirements.

(3) If, at any time during which this determination is the applicable methodology for the project, the monitoring requirements are used to work out W_{LFG,CH_4}, then, the monitoring requirements must be used for that purpose for the remainder of the project.

(4) Subsection (3) has effect subject to section 33.

Option 2—using energy content of landfill gas sent to combustion device

(5) Using the energy content of the landfill gas sent to the combustion device (***$Q_{En,h}$***), the methane sent to the combustion device during the period is worked out using the formula (***equation 9***):

$$M_{Sent,h} = \frac{Q_{En,h}}{EC_{LFG}}$$

where:

$M_{Sent,h}$ means the methane sent to the combustion device h during the period in cubic metres.

$Q_{En,h}$ means the energy content of the landfill gas sent to the combustion device h during the period, in gigajoules, worked out in accordance with the monitoring requirements.

EC_{LFG} means the energy content factor for landfill gas that is collected for combustion (methane only), in gigajoules per cubic metre, set out in Part 2 of Schedule 1 to the NGER (Measurement) Determination.

Option 3—using electricity produced by internal combustion engine

(6) If the combustion device is an internal combustion engine, using the electricity produced by the device (***$Q_{EG,h}$***), the methane sent to the combustion device during the period is worked out using the formula (***equation 10***):

$$M_{Sent,h} = \frac{Q_{EG,h} \times F_{MWh \rightarrow GJ}}{Eff_h \times EC_{LFG}}$$

where:

$M_{Sent,h}$ means the methane sent to the combustion device h during the period, in cubic metres.

$Q_{EG,h}$ means the electricity (supplied to the grid or used on-site) produced by internal combustion engine h during the period, in megawatt hours, worked out in accordance with the monitoring requirements.

$F_{MWh \rightarrow GJ}$ means the factor to convert megawatt hours to gigajoules, which is 3.6.

Eff_h means:

(a) the factor for the electrical efficiency of internal combustion engine h determined in accordance with:

(i) the manufacturer's specifications for the combustion of landfill gas; and

(ii) if the specifications set out a range of such efficiencies—the highest of those efficiencies; or

(b) if no such factor can be determined in accordance with the manufacturer's specifications—the amount set out in subparagraph 2.38(2)(a)(ii) of the NGER (Measurement) Determination.

EC_{LFG} means the energy content factor for landfill gas that is captured for combustion (methane only), in gigajoules per cubic metre, set out in Part 2 of Schedule 1 to the NGER (Measurement) Determination.

25 Methane combusted that was not generated from carbon tax waste and that would have been oxidised in near surface conditions

The methane combusted during the reporting period that was not generated from carbon tax waste and that, without the project, would have been oxidised in near surface conditions of landfill, in tonnes CO_2-e, worked out using the formula (***equation 11***):

$$M_{Com,Ox} = M_{Com,NCT} \times OF \times \left(1 - W_B\right)$$

where:

$M_{Com,Ox}$ means the methane combusted during the reporting period that was not generated from carbon tax waste and that, without the project, would have been oxidised in near surface conditions of landfill, in tonnes CO_2-e.

$M_{Com,NCT}$ means the methane combusted during the reporting period that was not generated from carbon tax waste, in tonnes CO_2-e, worked out using equation 3.

OF means the oxidation factor for near surface methane in landfill set out in the definition of ***OF*** in subsection 5.4(1) of the NGER (Measurement) Determination.

W_B means the proportion of the methane combusted in the reporting period that would have been combusted without the project worked out using whichever of equations 13 to 16 applies.

Division 4—Method for calculating baseline abatement

26 Summary

Baseline abatement is calculated as the amount of methane combusted by the project that was not generated by carbon tax waste multiplied by the proportion representing the amount of methane combusted during the project that would have been combusted without the project.

The determination of this proportion depends on the type of project.

27 Baseline abatement

The baseline abatement for the reporting period, in tonnes CO_2-e, is worked out using the formula (***equation 12***):

$$A_B = M_{Com,NCT} \times W_B$$

where:

A_B means the baseline abatement for the reporting period, in tonnes CO_2-e.

$M_{Com,NCT}$ means the methane combusted during the reporting period that was not generated from carbon tax waste, in tonnes CO_2-e, worked out using equation 3.

W_B means the proportion of the methane combusted during the reporting period that would have been combusted without the project worked out using whichever of equations 13 to 16 applies.

28 Proportion of methane that would have been combusted without the project

New or recommencing project

(1) If the project is a new project or a recommencing project, the proportion of the methane combusted during the reporting period that would have been combusted without the project is worked out using the formula (***equation 13***):

$$W_B = \text{Maximum}\left(W_{B,Reg}, W_{B,Def}\right)$$

where:

W_B means the proportion of the methane combusted during the reporting period that would have been combusted without the project.

$W_{B,Reg}$ means the regulatory proportion of the methane combusted during the reporting period that would have been combusted without the project as determined using Schedule 1 to this determination.

$W_{B,Def}$ means the default proportion of the methane combusted during the reporting period that would have been combusted without the project, which is as follows:

(a) 0% if the project proponent can demonstrate that, since 24 March 2011, the landfill concerned has not been subject to:

(i) legislation or regulatory guidelines for landfill; or

(ii) a licence condition or development approval that includes any form of general or specific qualitative requirement to collect, control, manage or limit landfill gas, methane odour or greenhouse gases;

(b) otherwise—30%.

Upgrade project

(2) If the project is an upgrade project, the proportion of the methane combusted during the reporting period that would have been combusted without the project is worked out using the formula (***equation 14***):

$$W_B = \text{Maximum}\left(W_{B,Reg}, W_{B,Def}, W_{B,Ex} \right)$$

where:

W_B means the proportion of the methane combusted during the reporting period that would have been combusted without the project.

$W_{B,Reg}$ means the regulatory proportion of the methane combusted during the reporting period that would have been combusted without the project determined using Schedule 1 to this determination.

$W_{B,Def}$ has the same meaning as in subsection (1).

$W_{B,Ex}$ means the proportion of the methane combusted during the reporting period that would have been combusted without the upgrade project worked out using equation 17.

Transitioning projects

(3) If the project is a transitioning project that was operating under the *Carbon Credits (Carbon Farming Initiative) (Capture and Combustion of Methane in Landfill Gas from Legacy Waste) Methodology Determination 2012* (the ***legacy determination***), the proportion of the methane combusted during the reporting period that would have been combusted without the project is worked out using the formula (***equation 15***):

$$W_B = R_P$$

where:

W_B means the proportion of the methane combusted during the reporting period that would have been combusted without the project.

R_P means R_P as worked out under the legacy determination.

(4) If the project is a transitioning project that was operating under the *Carbon Credits (Carbon Farming Initiative) (Capture and Combustion of Methane in Landfill Gas from Legacy Waste: Upgrade Projects) Methodology Determination 2012* (the ***legacy upgrade determination***), the proportion of the methane combusted during the reporting period that would have been combusted without the project is worked out using the formula (***equation 16***):

$$W_B = B_P$$

where:

W_B means the proportion of the methane combusted during the reporting period that would have been combusted without the project.

B_P means B_p as worked out under the legacy upgrade determination.

(5) The value given to W_B in subsection (1), (2), (3) or (4) must be the same throughout the crediting period.

29 Proportion of methane that would have been combusted without upgrade

(1) For an upgrade project, the proportion of the methane combusted during the reporting period that would have been combusted without the project is worked out using the formula (***equation 17***):

$$W_{B,Ex} = \frac{W_{Com,Bef}}{W_{Com,Aft}}$$

where:

$W_{B,Ex}$ means the proportion of the methane combusted during the reporting period that would have been combusted without the upgrade project.

$W_{Com,Bef}$ means the average proportion of the methane from the landfill that is collected and destroyed during the 2 years immediately before the upgrade is started, worked out using equation 19.

$W_{Com,Aft}$ means the average proportion of the methane from the landfill that is collected and destroyed during the 12 months immediately after the upgrade is completed, worked out using equation 18.

Methane collected and destroyed during 12 months after upgrade

(2) The average proportion of the methane from the landfill that is collected and destroyed during the 12 months immediately after the upgrade is completed is worked out using the formula (***equation 18***):

$$W_{Com,Aft} = \frac{\gamma \times \sum_{h} M_{Sent,h,y}}{M_{Gen,y}}$$

where:

$W_{Com,Aft}$ means the average proportion of the methane from the landfill that is collected and destroyed during the 12 months immediately after the upgrade is completed.

γ means the factor to convert cubic metres of methane at standard conditions to tonnes of CO_2-e set out in subsection 5.4(1) of the NGER (Measurement) Determination.

$M_{Sent,h}$ means the methane sent to the combustion device h during the reporting period, in cubic metres, worked out using equation 8, 9 or 10.

$M_{Gen,y}$ means the methane generated by the landfill in year y, in tonnes CO_2-e, worked out using subsection 22(3).

y means the 12 months immediately after the upgrade is completed.

Methane collected and destroyed during 2 years before upgrade

(3) The average proportion of the methane from the landfill that is collected and destroyed during the 2 years immediately before the upgrade is started is worked out using the formula (***equation 19***):

$$W_{Com,Bef} = \sum_{y} \left[\frac{\gamma\left(Q_{cap,y} + Q_{flared,y} + Q_{tr,y} \right)}{CH_4{}^{*}{}_{,y}} \right] \div 2$$

where:

$W_{Com,Bef}$ means the average proportion of the methane from the landfill that is collected and destroyed during the 2 years immediately before the upgrade is started.

γ means the factor to convert cubic metres of methane at standard conditions to tonnes of CO_2-e set out in subsection 5.4(1) of the NGER (Measurement) Determination.

$Q_{cap,y}$ means the quantity of methane in landfill gas collected for combustion from the landfill during year y, in cubic metres, measured as prescribed in Part 5.2 of the NGER (Measurement) Determination.

Note: The term ***collected for combustion*** in the NGER (Measurement) Determination is intended to mean landfill methane collected for combustion for electricity generation.

$Q_{flared,y}$ means the quantity of methane in landfill gas from the landfill that is flared or otherwise combusted for purposes other than electricity generation during year y, in cubic metres, measured as prescribed in Part 5.2 of the NGER (Measurement) Determination.

$Q_{tr,y}$ means the quantity of methane in landfill gas transferred out of the landfill during year y, in cubic metres, measured as prescribed in Part 5.2 of the NGER (Measurement) Determination.

$CH_4{}^{*}{}_{,y}$ means the estimated quantity of methane in landfill gas generated by the landfill during year y, in tonnes CO_2-e, measured and determined in accordance with subsection (4).

y means a year in the 2 years immediately before the upgrade.

(4) ***$CH_4{}^{*}{}_{,y}$*** is equivalent to $CH_4{}^{*}$ calculated:

(a) under Part 5.2 of the NGER (Measurement) Determination; and

(b) in accordance with the following:

(i) the reporting year is year y, where ***y*** means a year in the 2 years immediately before the upgrade;

(ii) methane generation must be determined for the whole landfill as if it were a single sub-facility zone.

(5) For subsection (4), if year y covers 2 financial years, use the method set out in subsection 22(8) (as if CH_{4gen} were CH_4^*).

Part 5—Reporting, record-keeping and monitoring requirements

Note: Other reporting, record-keeping and monitoring requirements are set out in regulations and rules made under the Act.

Division 1—Offsets report requirements

30 Operation of this Division

For paragraph 106(3)(a) of the Act, this Division sets out information that must be included in an offsets report about a landfill gas project that is an eligible offsets project.

31 Determination of certain factors and parameters

(1) If, in the circumstances described in paragraph 6(2)(b), a factor or parameter is defined or calculated for a reporting period by reference to an instrument or writing as in force from time to time, the offsets report about the project for the reporting period must include the following information for the factor or parameter:

(a) the versions of the instrument or writing used;

(b) the start and end dates of each use;

(c) the reasons why it was not possible to define or calculate the factor or parameter by reference to the instrument or writing as in force at the end of the reporting period.

(2) If a parameter is determined under section 34 for the purpose of working out the carbon dioxide equivalent net abatement amount for a landfill gas project for a reporting period, the offsets report about the project for the reporting period must include the following information for the parameter:

(a) the name of the parameter;

(b) the start and end dates of the non-monitored period for which the parameter was determined;

(c) the value of the parameter and how that value was calculated;

(d) the reasons why the project proponent failed to monitor the parameter as required by the monitoring requirements.

Division 2—Monitoring requirements

32 Operation of this Division

For paragraph 106(3)(d) of the Act, this Division sets out:

(a) requirements to monitor a landfill gas project that is an eligible offsets project (see section 33); and

(b) certain consequences if the project proponent fails to monitor the project as required (see section 34).

33 Requirements to monitor certain parameters

(1) The project proponent for a landfill gas project must monitor and determine a parameter set out in an item of the following table in accordance with the instructions in the item.

Monitored parameters

	Parameter	Description	Unit	Measurement procedure (including frequency as required)	Determination of parameter from measurements
1	$Q_{En,h}$	Energy content of the landfill gas sent to combustion device h	Gigajoules	Estimated under Division 2.3.6 of the NGER (Measurement) Determination or section 6.5 of that Determination using measurement criteria AAA.	Cumulative value for reporting period
2	$O_{h,a}$	Operation of combustion device h during hour a	1 or 0	If the combustion device is a flare, operation is determined for each minute using temperature measurement. If temperature is measured at 500 degrees Celsius or higher for 40 minutes or more in an hour, then $O_{h,a} = 1$. Otherwise $O_{h,a} = 0$. For all other combustion devices, operation for each minute is to be determined in accordance with manufacturer's specifications. If the device operates according to manufacturer's specifications for the	For the purpose of calculating $M_{com,h}$ in equation 7 (above), the value of $O_{h,a}$ determined for an hour based on the operation of the combustion device must be paired to the cumulative value of $M_{sent,h}$ for the same hour

Section 33

Monitored parameters

	Parameter	Description	Unit	Measurement procedure (including frequency as required)	Determination of parameter from measurements
				entire hour then $O_{h,a} = 1$. Otherwise $O_{h,a} = 0$. All measuring equipment must be used in accordance with appropriate measuring requirements	
3	$Q_{LFG,h}$	Landfill gas sent to combustion device h	Cubic metres	Estimated under Division 2.3.6 of the NGER (Measurement) Determination using measurement criteria AAA. Frequency—continuously	For equation 7, cumulative values for a time interval not greater than 1 hour must be paired to measurements of W_{LFG,CH_4} for the time interval. Otherwise, the measurements must be paired to measurements of W_{LFG,CH_4} for the same measurement interval
4	$Q_{EG,h}$	Electricity (supplied to the grid or used on-site) generated by internal combustion engine h	Megawatt hour	Estimated under Part 6.1 of the NGER (Measurement) Determination. Measure only the electricity produced from the combustion of landfill gas (not from the combustion of other fuel types)	Cumulative value for the reporting period
5	W_{LFG,CH_4}	Fraction of the volume of landfill gas that is methane	Fraction	Estimated under Division 2.3.6 of the NGER (Measurement) Determination. Frequency—continuously. Measured at the same conditions as $Q_{LFG,h}$	For the purpose of equation 7, average values for a time interval not greater than 1 hour must be paired to measurements of $Q_{LFG,h}$ for the time interval. Otherwise, the measurements must be paired to measurements of $Q_{LFG,h}$ for the same measurement interval

(2) Any equipment or device used to monitor a parameter must be calibrated by an accredited third party technician at intervals, and using methods, that are in accordance with the manufacturer's specifications.

(3) In this section:

appropriate measuring requirements, in relation to a measurement or estimate, means requirements that are consistent with:

(a) requirements that apply in relation to similar measurements or estimates under the NGER (Measurement) Determination; or

(b) relevant standards and other requirements under the *National Measurement Act 1960*.

34 Consequences of not meeting requirement to monitor certain parameters

(1) If, during a particular period (the ***non-monitored period***) in a reporting period, a project proponent for a landfill gas project fails to monitor a parameter mentioned in the following table as required by the monitoring requirements, the value of the parameter for the purpose of working out the net abatement amount for the reporting period is to be determined for the non-monitored period in accordance with the table.

Consequence of not meeting requirement to monitor certain parameters

Item	Parameter	Determination of parameter for non-monitored period
1	W_{LFG,CH_4}	The parameter is: (a) for any cumulative period of up to 3 months in any 12 months of a crediting period for the project—the amount set out in section 5.14C of the NGER (Measurement) Determination multiplied by 0.9; and (b) for any period in excess of that 3 months—the amount set out section 5.14C of the NGER (Measurement) Determination multiplied by 0.5
2	Each of the following: (a) $Q_{En,h}$; (b) $Q_{LFG,h}$; (c) $Q_{EG,h}$;	The project proponent must make a conservative estimate of the parameter having regard to: (a) any relevant measurement or estimation approaches or requirements that apply to the parameter under the NGER (Measurement) Determination; and (b) any relevant historical data for the project; and (c) any other data for the project that relates to the parameter; and (d) any other matter the project proponent considers relevant

(2) To avoid doubt, this section does not prevent the Regulator from taking action under the Act, or regulations or rules made under the Act, in relation to the project proponent's failure to monitor a parameter as required by the monitoring requirements.

Section 34

Note: Examples of action that may be taken include the following:

(a) if the failure constitutes a breach of a civil penalty provision in section 194 of the Act (which deals with project monitoring requirements), the Regulator may apply for a civil penalty order in respect of the breach;

(b) if false or misleading information was given to the Regulator in relation to the failure, the Regulator may revoke the project's section 27 declaration under regulations or rules made for the purposes of section 38 of the Act;

(c) if the giving of false or misleading information in relation to the failure led to the issue of Australian carbon credit units, the Regulator may require all or some of those units to be relinquished under section 88 of the Act.

Schedule 1—Determining regulatory proportion

Note: See subsections 28(1) and (2).

Part 1—Operation of this Schedule

1 Operation of this Schedule

(1) For subsections 28(1) and (2), the regulatory proportion of the methane combusted during the reporting period that would have been combusted without the project ($W_{B,Reg}$) is determined using an option set out in Parts 2 to 5.

No obligation on State and Territory environmental regulators

(2) To avoid doubt, this Schedule does not require the environmental regulator in a State or Territory to do anything.

Part 2—Regulatory proportion determined using regulatory guidelines for landfill

2 Regulatory proportion determined using regulatory guidelines for landfill

(1) If there is no permitted methane flux rates for a State or Territory set out in the tables in subclauses 4(2) and 4(3), then, for a project located in the State or Territory, $W_{B,Reg}$ is 0.

(2) Otherwise, $W_{B,Reg}$ may be worked out using the formula (***equation 20***):

$$W_{B,Reg} = 1 - \frac{M_{Reg}}{M_{Gen,y}}$$

where:

$W_{B,Reg}$ means the regulatory proportion of the methane combusted during the reporting period that would have been combusted without the project.

M_{Reg} means the annual amount of methane that is permitted to be emitted from the landfill, in tonnes CO_2-e, worked out using equation 21.

$M_{Gen,y}$ means the methane generated by the landfill in year y, in tonnes CO_2-e, worked out using subsection 22(3).

3 Annual amount of methane permitted to be emitted

The annual amount of methane that is permitted to be emitted from the landfill, in tonnes CO_2-e, is worked out using the formula (***equation 21***):

$$M_{Reg} = M_{Reg,FI} + M_{Reg,D}$$

where:

M_{Reg} means the annual amount of methane that is permitted to be emitted from the landfill, in tonnes CO_2-e.

$M_{Reg,FI}$ means the annual amount of methane that is permitted to be emitted from the final and intermediate cover of the landfill, in tonnes CO_2-e, worked using equation 22.

$M_{Reg,D}$ means the annual amount of methane that is permitted to be emitted from the daily/operational cover of the landfill, in tonnes CO_2-e, determined in accordance with clause 5.

4 Annual amount of methane permitted to be emitted from final and intermediate cover

(1) The annual amount of methane that is permitted to be emitted from the final and intermediate cover of the landfill, in tonnes CO_2-e, is worked using the formula (***equation 22***):

$$M_{Reg,FI} = \frac{8760 \times GWP_{CH_4}}{(1 - OF)} \times \sum_x (S_x \times C_x)$$

where:

***M*$_{Reg,FI}$** means the annual amount of methane that is permitted to be emitted from the final and intermediate cover of the landfill, in tonnes CO_2-e.

OF means the oxidation factor for near surface methane in landfill set out in the definition of ***OF*** in subsection 5.4(1) of the NGER (Measurement) Determination.

***GWP*$_{CH_4}$** means the global warming potential value for methane set out in regulation 2.02 of the NGER (Measurement) Determination.

***S*$_x$** means the area of the landfill that is cover type x, in square metres.

***C*$_x$** means the permitted methane flux rate for the landfill for cover type x, in tonnes of methane per square metre per hour, set out the applicable table in subsection (2) or (3).

x means the type of landfill cover, being either final cover or intermediate cover.

(2) The following table sets out permitted methane flux rates for final cover.

Permitted methane flux rates for final cover (C_x)

Item	State or Territory	Methane concentration limit (CH_4 ppm)	Permitted methane flux rate estimated from the methane concentration limit ($tCH_4/m^2/hr$)
1	New South Wales	500	2.5×10^{-6}
2	Victoria	100	0.3×10^{-6}
3	Queensland	500	2.5×10^{-6}
4	Western Australia	500	2.5×10^{-6}
5	South Australia	n/a	n/a
6	Tasmania	500	2.5×10^{-6}
7	Australian Capital Territory	100	0.3×10^{-6}
8	Northern Territory	n/a	n/a

(3) The following table sets out permitted methane flux rates for intermediate cover.

Permitted methane flux rates for intermediate cover (C_x)

Item	State or Territory	Methane concentration limit (CH_4 ppm)	Permitted methane flux rate estimated from the methane concentration limit ($tCH_4/m^2/hr$)
1	New South Wales	500	2.5×10^{-6}

Clause 5

Permitted methane flux rates for intermediate cover (C_x)

Item	State or Territory	Methane concentration limit (CH_4 ppm)	Permitted methane flux rate estimated from the methane concentration limit ($tCH_4/m^2/hr$)
2	Victoria	100	0.3×10^{-6}
3	Queensland	500	2.5×10^{-6}
4	Western Australia	500	2.5×10^{-6}
5	South Australia	n/a	n/a
6	Tasmania	500	2.5×10^{-6}
7	Australian Capital Territory	100	0.3×10^{-6}
8	Northern Territory	n/a	n/a

5 Annual amount of methane permitted to be emitted from daily/operational cover

The annual amount of methane that is permitted to be emitted from the daily/operational cover of the landfill ($M_{Reg,D}$) is equivalent to parameter $M_{Gen,y}$, in tonnes CO_2-e, worked out using subsection 22(3) where the calculation is based only on the waste sited vertically below the daily/operational cover.

Part 3—Regulatory proportion determined by asking environmental regulator

6 Regulatory proportion determined by asking environmental regulator

(1) $W_{B,Reg}$ may be determined by asking the environmental regulator, in the State or Territory in which the landfill is located, to provide in writing to the project proponent the gas collection rate that would be required for the landfill to meet the most stringent methane concentration limits for the landfill that have been in force since 24 March 2011.

(2) The term used by the environmental regulator to express this quantitative regulatory requirement must be converted to $W_{B,Reg}$ in accordance with the following table:

Converting quantitative regulatory requirements to collection efficiency

Item	Term used by environmental regulator	Conversion to $W_{B,Reg}$
1	Methane concentration limit, in parts per million methane	$W_{B,Reg}$ is worked out: (a) using Part 2; but (b) for final and intermediate cover—using the permitted methane flux rates, set out in the table in subclause (3), that correspond to the concentration limits advised by the environmental regulator
2	Permitted flux rate, in tonnes methane per square meter per hour	$W_{B,Reg}$ is worked out: (a) using Part 2; but (b) for the permitted flux rate for final and intermediate cover (C_x)—using the flux rates advised by the environmental regulator
3	Proportion of landfill gas generation required to be collected (collection efficiency)	No conversion necessary ($W_{B,Reg}$ is as advised by the environmental regulator)
4	Proportion of landfill gas generation allowed to be released to the atmosphere	$W_{B,Reg}$ is worked out as 1 minus the proportion advised by the environmental regulator
5	Annual amount of landfill gas required to be collected	$W_{B,Reg}$ is worked out as the amount advised by the environmental regulator, in tonnes CO_2-e, divided by the methane generated by the landfill in year y, in tonnes CO_2-e, which is equivalent to $M_{Gen,y}$ worked out using subsection 22(3)
6	Other	$W_{B,Reg}$ is worked out as the annual amount of landfill gas required to be collected, in tonnes CO_2-e, determined from the requirement advised by the environmental regulator, divided by the methane generated by the landfill in year y, in tonnes CO_2-e, which is equivalent to $M_{Gen,y}$ worked out

Clause 6

Converting quantitative regulatory requirements to collection efficiency		
Item	**Term used by environmental regulator**	**Conversion to $W_{B,Reg}$**
		using subsection 22(3)

(3) The following table sets out allowable flux rates for the purposes of item 1 in the table in subclause (2).

Determining allowable flux rates from allowable methane concentrations		
Item	**Methane concentration limit (CH_4 ppm)**	**Permitted methane flux rate estimated from the methane concentration limit ($tCH_4/m^2/hr$)**
1	0	0
2	50	0.1×10^{-6}
3	60	0.1×10^{-6}
4	70	0.2×10^{-6}
5	80	0.2×10^{-6}
6	90	0.2×10^{-6}
7	100	0.3×10^{-6}
8	110	0.3×10^{-6}
9	120	0.4×10^{-6}
10	130	0.4×10^{-6}
11	140	0.5×10^{-6}
12	150	0.6×10^{-6}
13	160	0.6×10^{-6}
14	170	0.7×10^{-6}
15	180	0.7×10^{-6}
16	190	0.8×10^{-6}
17	200	0.8×10^{-6}
18	210	0.9×10^{-6}
19	220	0.9×10^{-6}
20	230	1.0×10^{-6}
21	240	1.0×10^{-6}
22	250	1.0×10^{-6}
23	260	1.1×10^{-6}
24	270	1.2×10^{-6}
25	280	1.3×10^{-6}
26	290	1.3×10^{-6}
27	300	1.3×10^{-6}
28	310	1.3×10^{-6}
29	320	1.4×10^{-6}

Determining allowable flux rates from allowable methane concentrations

Item	Methane concentration limit (CH_4 ppm)	Permitted methane flux rate estimated from the methane concentration limit ($tCH_4/m^2/hr$)
30	330	1.4×10^{-6}
31	340	1.5×10^{-6}
32	350	1.6×10^{-6}
33	360	1.6×10^{-6}
34	370	1.8×10^{-6}
35	380	1.8×10^{-6}
36	390	1.8×10^{-6}
37	400	1.9×10^{-6}
38	410	1.9×10^{-6}
39	420	2.0×10^{-6}
40	430	2.0×10^{-6}
41	440	2.0×10^{-6}
42	450	2.2×10^{-6}
43	460	2.2×10^{-6}
44	470	2.2×10^{-6}
45	480	2.3×10^{-6}
46	490	2.3×10^{-6}
47	500	2.5×10^{-6}

Part 4—Regulatory proportion determined by asking environmental regulator and using collection efficiency of existing landfill gas system

7 Regulatory proportion determined by asking environmental regulator and using collection efficiency of existing landfill gas system

(1) $W_{B,Reg}$ may be determined by asking the environmental regulator in the State or Territory in which the landfill is located whether the current gas collection rate for the landfill complies with the most stringent methane concentration limits for the landfill that have been in force since 24 March 2011.

(2) If the environmental regulator advises the project proponent in writing that the current gas collection for the landfill does so comply, then $W_{B,Reg}$ is equivalent to $W_{Com,Bef}$ worked out using equation 19 where:
  (a) year y is the 12 months immediately before the advice is given; and
  (b) as if the division by 2 were not part of the equation.

(3) To avoid doubt, subclause (1) does not apply unless the specified limits for methane concentrations for the landfill have not changed since 24 March 2011.

Part 5—Regulatory proportion determined by independent expert

8 Regulatory proportion determined by independent expert

(1) $W_{B,Reg}$ may be determined by a person engaged by the project proponent to determine the parameter.

(2) The person must:
  (a) have no conflict of interest in determining $W_{B,Reg}$; and
  (b) possess a relevant university degree; and
  (c) have more than 3 years' experience in:
    (i) landfill management; and
    (ii) the design and operation of landfill gas collection systems; and
  (d) have extensive knowledge of the regulatory framework relevant to landfill gas management in the jurisdiction in which the landfill is located.

(3) In determining $W_{B,Reg}$, the person must use the most stringent methane concentration limits for the landfill that have been in force since 24 March 2011.

(4) The person must provide to the project proponent, in writing, evidence that verifies:
  (a) the matters in paragraphs (2)(a) to (d); and
  (b) the calculations, assumptions, information, inputs and references used to determine $W_{B,Reg}$.