



CLINTON LANDFILL GAS COLLECTION AND COMBUSTION PROJECT



DOCUMENT PREPARED BY 3DEGREES GROUP, INC.

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Project activity is the capture and destruction of methane from the Clinton Landfill in Clinton, Illinois via combustion engines and flares. The generated electricity is sold to the local grid. However, the displacement of fossil fuels resulting from this activity is not included in this Project and emission reductions from the offsite use of electricity are not addressed in this Project Description (PD).

Originally permitted in 1989, the Clinton Landfill received approximately 200,000 metric tons of waste per year through 2009, including municipal solid waste and non-hazardous special waste. Landfill #2 reached capacity in 2009 and Landfill #3 was opened. Landfill #3 is due to reach capacity at around 20 million metric tons of waste in 2052.

In 1998, an active methane recovery and destruction system was constructed at Clinton Landfill to maintain compliance with federal and state standards regarding the control of non-methane organic compounds (NMOCs) and landfill gas (35 IAC, Part 220). This baseline methane capture and destruction included 40 wells and two flares (Flare #1 on Landfill #1 and Flare #2 on landfill #2) that preceded the development of the gas-to-energy Project.

The Project includes an active landfill gas collection system including wells, piping, blowers, meters and valves; a back-up open flare; two 1.6-MW Caterpillar 3520C engine generator sets; gas conditioning equipment; a building to house the generators; and associated interconnection and metering devices. Note that the gas collection system and an open flare were in place prior to the start of the Project in order to comply with regulation. This Project seeks credit for voluntary emissions reductions over and above those achieved by the gas collection system in the baseline scenario.

The Project's second crediting period spans from July 1, 2019 through June 30, 2029. This monitoring report covers the third reporting period of the second crediting period, January 1, 2023 through March 31, 2024. The total emission reductions generated during the current monitoring period are 142,584 metric tons of CO₂e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	1-July-2009 – 30-June-2019	VCS	First Environment, Inc.	Ten years
Verification	01-January-2010 – 31-December-2010	VCS	First Environment, Inc.	One year
Verification	01-January-2011 – 31-December-2011	VCS	First Environment, Inc.	One year

Verification	01-January-2012 – 31-December-2012	VCS	First Environment, Inc.	One year
Verification	01-January-2013 – 31-December-2013	VCS	First Environment, Inc.	One year
Verification	01-January-2014 – 31-October-2014	VCS	First Environment, Inc.	5/6 year
Verification	01-November-2014 – 30-April-2016	VCS	Ruby Canyon Engineering	1.5 years
Verification	01-May-2016 – 31-December-2016	VCS	Ruby Canyon Engineering	2/3 year
Verification	01-January-2017 – 31-December-2017	VCS	Ruby Canyon Engineering	One year
Verification	01-January-2018 – 31-December-2018	VCS	Ruby Canyon Engineering	One year
Verification	01-January-2019 – 30-June-2019	VCS	Ruby Canyon Engineering	½ year
Validation	01-July-2019 – 30-June-2029	VCS	Ruby Canyon Engineering	Ten years
Verification	01-July-2019 – 30-June-2021	VCS	First Environment, Inc.	Two years
Verification	01-July-2021 – 31-December-2022	VCS	First Environment, Inc.	1.5 years
Verification	01-January-2023 – 31-March-2024	VCS	Carbon Check (India) Private Ltd.	1.25 years

1.3 Sectoral Scope and Project Type

Sectoral scope	13
Project activity type	Waste Handling and Disposal

1.4 Project Proponent

Organization name	3Degrees Group, Inc.
Contact person	Nick Facciola
Title	Director, Carbon Projects
Address	235 Montgomery Street, Suite 320, San Francisco, CA 94104
Telephone	(415) 762-4727
Email	nick@3degrees.com

1.5 Other Entities Involved in the Project

Organization name	Wabash Valley Power Associations, Inc. dba Wabash Valley Alliance
Role in the project	Project Owner
Contact person	Vicki Meyers
Title	Manager, Power Supply
Address	4700 N Sterling Ave, Peoria, IL 61615
Telephone	(317) 481-2833
Email	vickim@wvpa.com

Organization name	Clinton Landfill, Inc. (owned by GFL Environmental)
Role in the Project	Landfill Owner
Contact person	Andrew Whelpley
Title	Hydrogeologist
Address	4700 N Sterling Ave, Peoria, IL 61615
Telephone	(309) 495-1580
Email	awhelpley@gflenv.com

1.6 Project Start Date

Project start date	24-January-2007
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Justification	The project start date is the day on which the Project began delivering electricity to the grid.
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1.7 Project Crediting Period

Crediting period	☒ Other
Start and end date of first or fixed crediting period	First: 01-July-2009 to 30-June-2019 Second: 01-July-2019 to 30-June-2029 The project was validated prior to Verra's most recent crediting period requirements, thus the crediting period reflects previously accepted crediting period requirements set by Verra.

1.8 Project Location

The Clinton Landfill is located at 9560 Heritage Road in Clinton, Illinois 61727, in DeWitt County, about 25 miles south of Bloomington, IL. The landfill occupies approximately 157 acres of a 266-acre permitted site. The Project is conducted within the property owned by Clinton Landfill, Inc. This property's GPS coordinates are 40° 6' 51.411" N and -88° 57' 28.7994" W. The engines are housed in free-standing building along the northern edge of the waste area.

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0001	Flaring or use of landfill gas	19.0
Tool	TOOL08	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	3.0
Tool	TOOL04	Emissions from solid waste disposal sites	8.0
Tool	TOOL06	Project emissions from flaring	3.0
Tool	TOOL05	Baseline, Project, and/or leakage emissions from electricity consumption and monitoring of electricity generation	3.0
Tool	TOOL03	Tool to calculate Project or leakage CO ₂ emissions from fossil fuel combustion	3.0
Tool	TOOL11	Assessment of the validity of the original/current baseline and update of	3.0.1

		the baseline at the renewal of the crediting period	
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1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☒ Yes ☐ No

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.12 Sustainable Development Contributions

The project activities implemented during this monitoring period include the capture and destruction of landfill gas. Approximately 7,000 people live in nearby Clinton, IL and are currently benefiting from improved air quality as a result of the Project. In addition to local air quality benefits, the project transmits approximately 20,000 MWh of renewable energy to the grid annually.

Table 1 below provides an overview of the project's contributions to Sustainable Development Goals and Indicators.

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	3.9	Reduction in household and ambient air pollution	Implemented activities to increase	1,156,934,105 SCF of landfill gas destroyed during this 15-month monitoring period	The total volume of gas destroyed by the project in its lifetime is 9,854,313,228 SCF.
2)	7.2	MWh renewable energy supplied to the grid (user-defined)	Implemented activities to increase	22,893 MWh generated by the project during this 15-month monitoring period	The total quantity of energy supplied to the grid in the project's lifetime is 261,496 MWh.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	Prevented the release of 142,584 tonnes of carbon into the atmosphere during the monitoring period	Prevented the release of 1,194,814 tonnes of carbon into the atmosphere across the project lifetime.

1.13 Commercially Sensitive Information

No commercially sensitive information has been excluded from the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder makeup has not changed since validation and the project takes place on private property, therefore this section is not applicable.

Stakeholder Identification	Not applicable.
Legal or customary tenure/access rights	Not applicable.
Stakeholder diversity and changes over time	Not applicable.
Expected changes in well-being	Not applicable.
Location of stakeholders	Not applicable.
Location of resources	Not applicable.

2.1.2 Stakeholder Consultation and Ongoing Communication

The project consulted with the Illinois Environmental Protection Agency as part of the environmental permitting process. Ongoing communication takes place with the Illinois Environmental Protection Agency to ensure compliance with all permits and relevant laws.

Ongoing consultation	The project proponent communicates with the Illinois EPA as needed to maintain compliance.
Date(s) of stakeholder consultation	No dates of formal consultations with the Illinois EPA were documented during validation. Consultation with the Illinois EPA occurs regularly to ensure the site's compliance with relevant regulations and permits.

	The facility consulted the Illinois EPA by submitting a permit revision on 09-November-2022, and on 10-November-2022 the Illinois EPA issued the CAAPP permit revision.
Communication of monitored results	Monitoring results do not need to be communicated to the Illinois EPA.
Consultation records	All outcomes of consultation with Illinois EPA are documented as permits.
Stakeholder input	The permitting process conducted prior to verification resulted in the issuance of relevant construction and environmental permits required to operate the landfill and gas collection and destruction system.

2.1.3 Free, Prior, and Informed Consent

The permitting process is required by U.S. law and therefore FPIC is not relevant to communication with the Illinois EPA.

Consent	Not applicable.
Outcome of FPIC	Not applicable.

2.1.4 Grievance Redress Procedure

This section is not applicable because no grievances were raised. According to GFL's human rights policy and whistleblower policy, employees can raise grievances anonymously via telephone, electronic filing, or contacting the chair of the Audit Committee.¹ Employees may also raise concerns with their manager. Grievances shall be reviewed by the Nomination, Governance, and Compensation Committee or the Audit Committee, depending on the nature of the grievance. The policy notes that corrective action shall be implemented promptly.

Grievances received	Resolution and outcome
N/A	N/A

2.1.5 Public Comments

No comments were received outside the public comment period.

¹ See Attachment 16 for GFL's human rights policy and whistleblower policy

Summary of comments received	Actions taken
N/A	N/A

2.2 Risks to Stakeholders and the Environment

No risks were identified at validation.

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	The project takes place on private property and is regulated by Illinois EPA; therefore, it does not impact stakeholder participation.
Working conditions	No risk identified	The project's standard operating procedures in place ensure safe working conditions.
Safety of women and girls	No risk identified	The project does not impact the safety of women and girls. The project's standard operating procedures in place ensure safe working conditions and the project's human rights policy protects against harassment, discrimination and forced labor.
Safety of minority and marginalized groups, including children	No risk identified	The project does not impact the safety of minority and marginalized groups, including children. The project's human rights policy protects against harassment, discrimination and forced labor.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	The project does not create any risks of pollution. The project destroys landfill gas, thereby reducing air pollution previously emitted in the baseline scenario.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	No discrimination or sexual harassment has occurred. GFL's code of ethics prohibits all forms of discrimination and harassment. ²
Management experience	No new entities are involved in the project design or implementation. All existing entities involved in the project have expertise in their respective fields of work, including carbon project management and operation of landfill gas collection and destruction systems.
Gender equity in labor and work	Equal opportunities have been provided in the context of gender equity and pay for labor and work, according to GFL's human rights policy. ³
Human trafficking, forced labor, and child labor	The project does not use victims of human trafficking, forced labor, and child labor. According to GFL's human rights policy, GFL prohibits all forms of forced labor, child labor, human trafficking, and slavery. ⁴

2.3.2 Human Rights

The project recognizes, respects, and promotes the protection of the rights of IPs, LCs, and customary rights holders in line with applicable international human rights law, and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples. The landfill is not located on federally recognized tribal land, and thus is not regulated by tribal law,⁵

Clinton Landfill complies with state and federal regulations, including labor rights under OSHA. There are no citations of violation for the landfill on the OSHA Integrated Management Information System, and no violations identified on EPA ECHO.⁶ Compliance with permits ensures that the facility protects local communities from undue harm.

² See Attachment 16 for GFL's code of ethics

³ See Attachment 16 for GFL's human rights policy

⁴ Ibid.

⁵ See the following link for a map of federally recognized tribe lands in the US: <https://www.bia.gov/sites/default/files/dup/assets/bia/ots/webteam/pdf/idc1-028635.pdf>

⁶ OSHA has not cited any violations at Clinton Landfill during the reporting period, according to the following search tool: <https://www.osha.gov/ords/imis/establishment.html>. See Attachment 4 for the EPA ECHO facility report.

Clinton Landfill follows labor laws set by the United States, which is a member of ILO and has signed several labor-related conventions:

- C105 – Abolition of Forced Labour Convention, 1957 (signed 1991)
- C182 – Worst Forms of Child Labour Convention, 1999 (signed 1999)
- C150 – Labour Administration Convention, 1978 (signed 1988)

2.3.3 Indigenous Peoples and Cultural Heritage

The project activity does not impact and is not relevant to cultural heritage.

2.3.4 Property Rights

The project activity is located on private property, therefore this section is not relevant.

Disputes over rights to territories and resources	N/A
Respect for property rights	N/A

2.3.5 Benefit Sharing

The project does not impact property rights, therefore this section is not applicable.

Summary of the benefit sharing plan	N/A
Benefit sharing during the monitoring period	N/A

2.4 Ecosystem Health

No risks to the environment were identified at validation.

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	The project has no impact on biodiversity and ecosystems.
Soil degradation and soil erosion	No risk identified	The project has no impact on soil degradation and soil erosion.
Water consumption and stress	No risk identified	The project has no impact on water consumption and stress.

Usage of fertilizers	No risk identified	The project activity does not involve fertilizer usage.
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2.4.1 Rare, Threatened, and Endangered species

According to the U.S. Fish and Wildlife Service's Critical Habitat web map, the project is not located in, or adjacent to habitats for rare, threatened, or endangered species.⁷ The table below is therefore not applicable.

Species or habitat	N/A
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2.4.2 Introduction of species

No planting or species introduction occurred as a result of the project activity, therefore this section is not applicable. The existence of any invasive species on the project area is not caused by or relevant to the project activity.

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
N/A	N/A

2.4.3 Ecosystem conversion

This is not an ARR, ALM, WRC or ACoGS project, therefore this section is not applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project was implemented and has been operational since 24-January-2007. In 2021, Flare 4 was installed with a new meter, and began recording valid flow data in September 2021. During this reporting period, LFG was sent to both the power plant and flares. Of the flares, gas was primarily sent to Flare 4, while the other project flares were either non-operational or only operated briefly for testing/maintenance purposes. Prior to the current reporting period, Flare 3 was transferred to another facility, and Flare 1 was disconnected from header and power. In April of 2023, no gas flow was recorded at the engine skid due to a failed PLC input card.

Given the above status of destruction equipment, routine operations at the project over this reporting period was for LFG to be delivered to any combination of the two gensets, Flare 4, and Flare 2 as needed. If either of the gensets requires downtime for maintenance, the other destruction devices (Flare 4, and Flare 2 if needed) can absorb the additional capacity. Similarly, should either or both of

⁷ See the following link for a map of critical habitat for threatened and endangered species, as identified by the U.S. Fish and Wildlife Service:
<http://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77>

the flares require any scheduled or unplanned downtime (with gas flow shut off), landfill gas can be routed to the other destruction devices (one or both engines) as well. Both engines share a gas flow meter and are equipped with shutoff valves, ensuring compliance with paragraph 33(a) of the methodology, which points to paragraph 5 (a) and (b) of the Appendix of CDM Tool 08. The presence of shutoff valves satisfies paragraph 5 (a). During downtime of one engine, the other engine is able to destroy the gas flow recorded during the period. This is shown in the calculator file which demonstrates that the output of gas flow corresponds to the site's energy production, satisfying paragraph 5 (b) of Tool 08. During the reporting period, Flare 2 was rarely used (only for brief testing and maintenance) and thus it was not included in the emission reductions calculations. During the reporting period, Flare 4 experienced twelve limited instances of downtime greater than 10 minutes due to a small variety of reasons including but not limited to maintenance on the flow meter and/or methane analyzer, or issues with the pilot or thermocouple that required attention. The aggregate duration observed in this reporting period during these downtime events totals roughly 199 hours. During these instances of downtime, the landfill operators would have to decide whether the gensets have capacity to destroy any excess gas or whether Flare 2 would need to be activated. Given that each instance was limited in duration (i.e. no instance necessitating more than a few days of flare downtime), all excess gas was routed to the two gensets and Flare 2 was not needed. As demonstrated in the correlation curve graph located in the "Engine Operating Hours" tab of the project calculator file, all gas delivered to the two gensets was destroyed and converted to electricity. No gas was vented during these downtime instances, and there are no other destruction devices monitored by this single flow meter used at Flare 4. There are measures in place to ensure destruction of all landfill gas during periods in which the flare is experiencing downtime.

Outside the above-noted downtime events at the flare when gas was rerouted to other destruction devices, there exists another scenario worth noting. That is when some volume of gas is measured at Flare 4 while the thermocouple records readings are too low to demonstrate actual destruction of methane (a temperature of 212°F has been the selected threshold for this project, inspired by the temperature at which water boils). This can occur when the thermocouple malfunctions, during high wind events when the flame waves away from the thermocouple sensor or blows out altogether and reignition is required. For this scenario in which gas was delivered to Flare 4 but not verified operational, 3Degrees ensures that that gas does not accrue emission reductions by excluding it from the calculated flow volumes $V_{\text{flare4,db}}$, consistent with CDM Tool 08 Data / Parameter table 19 (Status of biogas destruction device). By excluding such gas volumes from the amount of methane flared in the project activity, that gas is effectively modeled as though it reverted to its baseline (uncontrolled release) and was not affected by project activity.

The exigency plan around flare combustion is to have the operators shut off gas to the flare any time they identify any issues suggesting lack of combustion, which they take efforts to do for safety concerns as well as to comply with requirements of their air permit. 3Degrees will also alert landfill staff should this scenario be visibly persistent within the data files (notably, thermocouples may "burn out" and fail even when the flame continues to exist, though it did not happen during this reporting period). Furthermore, the flare is equipped with a propane-fired pilot to ensure reignition occurs as quickly as possible. The total instances during the reporting period of this Flare 4 receiving gas while

the thermocouple reported low temperature readings totals 52.6 hours across 78,551 SCF or 0.01% of all gas recorded at the flare and only 0.007% of total landfill gas measured across all destruction devices.

The engines are equipped with shutoff valves that prevent the flow of gas to the engines when the devices become non-operational. Redundant controls are implemented on-site that automatically control how hard the blower pulls gas to the flare; thus, if either of the gensets shut down, the variable frequency drive would automatically ramp up the blower to the flare to maintain high levels of gas collection and destruction.

The continuous methane analyzers on the engine skid and Flare 4 were sent to the manufacturer for servicing and repair in 2021 but supply chain issues related to the COVID-19 pandemic delayed their return to the facility. As a result, the methane analyzers were not reinstalled at Flare 4 until 20-April-2023 and at the engine skid until 13-October-2023. The methane analyzers began logging methane data at Flare 4 on 30-June-2023 and at the engine skid on 01-November-2023. In the interim, the site used handheld gas analyzers to take methane concentration readings at Flare 4 and the engines from July 2021 through the date of analyzer reinstallation.

3.2 Deviations

3.2.1 Methodology Deviations

The following deviation represents a deviation from criteria and procedures related to monitoring and measurement of GHG emission reductions set out in the methodology. The following deviation is provided because it is more appropriate than methodology defaults given the context of the Clinton Landfill Project. This deviation was also applied during the previous monitoring period from 01-July-2021 through 31-December-2022.

Current and previous (01-July-2021-31-December-2022) methodology deviations:

- 1- **Methane fraction monitoring frequency:** The project deviates from the methane fraction monitoring frequency stipulated in CDM Tool 08, section 6, Data/Parameter table 10 by monitoring the methane fraction of the gaseous stream non-continuously for part of the reporting period. No continuous measurement of methane was possible at Flare 4 until 30-June-2023 and at the engine skid until 01-November-2023, as pandemic-related supply chain issues delayed the return of the continuous analyzers to the facility following servicing and repair by the manufacturer. In the interim, the site used handheld gas analysers to take methane concentration readings at Flare 4 and the engines during part of the reporting period. This deviation serves as a temporary measure in the period before the continuous analyzers could begin logging methane concentration data upon reinstallation. The deviation shall be applied from 01-January-2023 through 30-November-2023. To monitor the methane content of landfill gas, the project applies the methane fraction monitoring process outlined in CDM Tool 08, Appendix A, section 3, paragraph 7. The following sections address the conditions listed in the Tool:

- a. **CDM Tool 08, Appendix A, paragraph 7(a):** With a maximum waste treatment capacity at the landfill exceeding the 200 tonnes per day specified in CDM Tool 08, Appendix A, paragraph 7(a), the project does not meet this condition of 7(a) and will instead conservatively apply a 10% deduction to all handheld methane readings used during the reporting period (but only where two weekly readings have been recorded, see paragraph b. below). CDM Tool 08, Appendix A, paragraph 7(a) lays out a requirement for the maximum landfill waste treatment capacity allowed to use a sampling plan for methane concentration; though no such requirement exists in other commonly used methane capture offset protocols like Climate Action Reserve's U.S. Landfill Protocol Version 6.0⁸. We understand that landfills have the potential for fluctuation in methane concentrations, therefore we apply a discount factor specifically selected to account for the potential fluctuation throughout the week. No deduction method is clearly laid out in ACM0001 or CDM Tool 08 for noncompliance with paragraph 7(a) of CDM Tool 08, therefore the project proposes a conservative deduction method for non-continuous methane sampling that can be applied to calculate credits while the project temporarily relied on handheld methane readings as opposed to a continuous analyzer. A 10% discount factor is best practice according to several other reputable methodologies, such as AMS-III.G. v10 and the Climate Action Reserve's U.S. Landfill Protocol.

To support our application of a 10% discount, we explore how these other methodologies justify the appropriateness of such a discount. Holding our project against the AMS-III.G framework, for example, though our project activity under review is a large-scale project, it would require a confidence/precision level of 95/10 according to the Standard for sampling and survey of CDM activities. Analysis of all handheld methane samples taken at the flare and engines throughout the reporting period indicates that a 10% deduction from the average of all methane samples is below the lower 95% confidence limits at both the flare and the engines. In other words, a 95% confidence interval of all methane sample data taken throughout the monitoring period suggest that the variation is unlikely to exceed 10% in either direction. Thus, the 10% deduction applied to methane readings should be considered sufficiently conservative. The Climate Action Reserve protocol allows landfills, regardless of their maximum waste treatment capacity, to use less than continuous and at least once-weekly measured methane concentration samples provided a 10% deduction is applied to those intervals, per the monitoring requirements in Section 6.1. Our methodology deviation actually exceeds this requirement by only crediting weeks with at least *twice*-weekly methane measurements. Although Section 6.1 notes that "Projects may not be eligible for crediting if methane concentration is not measured and recorded at least weekly," Appendix D: Data Substitution Guidelines clarifies that the Reserve recognizes that unexpected data gaps may arise and proposes measures

⁸ <https://www.climateactionreserve.org/how/protocols/waste/us-landfill/>

to address them. The protocol further describes in Appendix D that for outages of flow or methane exceeding one week, “No data may be substituted, and no credits may be generated.” In this vein, **we conservatively zero-out all emission reductions during any interval with less than twice-weekly methane readings.**

This 10% deduction reflects a conservative and compensatory discount put in place during the temporary reliance on CDM Tool 08, Appendix A, section 3, paragraph 7. While the Tool doesn’t expressly allow for handheld methane readings for landfills above the 200 tonne per day waste capacity, it is important to note that Verra accepted the validation of our Project Description Document which stipulated the use of twice-weekly handheld readings at both engines. It has subsequently been pointed out that the size of this landfill does not comply with the requirements of this section of the Tool, thereby necessitating this methodology deviation until such time as continuous monitoring equipment could be implemented.

- b. **CDM Tool 08, Appendix A, paragraph 7(b):** The project applies the methane sampling method outlined in CDM Tool 08, Appendix A, section 3, paragraph 7(b). The frequency of handheld readings taken at Flare 4 and the engines fluctuated from less than weekly to twice weekly across the reporting period. Twice-weekly methane sampling is defined as two or more methane readings taken within a seven-day period, and these seven-day periods do not have to line up consecutively. Each methane sample may only be considered within one seven-day period. As CDM Tool 8 does not prescribe a particular way of applying methane readings, we conducted an analysis comparing two approaches to applying the methane readings: 1) applying the first methane reading in a week to consecutive days until the next reading is taken, and 2) applying the average of all methane readings taken within a seven-day period across all days within the period. The first approach was determined to be more conservative, therefore we use this approach in the quantification of emissions reductions. For any seven-day period in which two methane samples were taken, we apply the methane concentration from the first sample reading for the engine skid and Flare 4 across consecutive days until the next methane sample reading within the seven-day period for the corresponding destruction device. **No emission reductions are claimed across any seven-day periods with fewer than two methane readings.** See Tables 2 and 3 below for a list of all handheld methane readings taken at the engine and Flare 4, respectively, during all weeks in which at least two samples were taken. These periodical, discounted handheld values retain accuracy, and Flare 4 and engine methane concentrations during the monitoring period varied by less than 2% on average from one reading to the next. With the 10% discount factor and low variability between samples, this deviation does not negatively impact the accuracy or conservativeness of the quantification of GHG emission reductions.
- c. **CDM Tool 08, Appendix A, paragraph 7(c):** The project adheres to CDM Tool 08, Appendix A, section 3, paragraph 7(c),

- d. **CDM Tool 08, Appendix A, paragraph 7(d):** We apply a deduction to methane readings for any weeks in which the total flow to all destruction devices fluctuates by more than +/- 20% compared to the following week to comply with paragraph 7(d). The flow analysis conducted in accordance with CDM Tool 08, Appendix A, section 3, paragraph 7(d) assesses total flow as opposed to the flow to each destruction device due to flow variability at individual destruction devices based on day-to-day operations at the site. This calculation method was implemented based on guidance from the landfill manager. Analyzing the total flow therefore accounts for the variability in flow sent to each destruction device.

Altogether this temporary deviation does not negatively impact the conservativeness of the quantification of GHG emission reductions. In fact, our omission of claiming emission reductions for weeks without two methane samples while applying a 10% discount to the eligible methane readings serves to provide a level of conservatism expected to be well beyond the actual values if the project had carried out continuous measurements throughout. As demonstrated above, the deviations are justified through cross-checks of other industry best practices, relate only to the criteria and procedures for monitoring and do not relate to any other part of the methodology. Furthermore, this deviation represents a temporary method for monitoring the fraction of methane in the gaseous stream while the project's continuous analyzers were unavailable. After finally receiving the equipment back from the manufacturer following a lengthy servicing and repair, the facility reinstalled its continuous methane analyzers at Flare 4 on 20-April-2023 and the engine skid on 13-October-2023. The continuous analyzers began logging methane concentration data at Flare 4 on 30-June-2023 and at the engine skid on 01-November-2023.

Table 2:

Engine Handheld Methane Readings			
Week	Readings	Week	Readings
04-January-2023 – 10-January-2023	04-January-2023 – 54.8% 06-January-2023 – 50.7%	17-July-2023 – 23-July-2023	17-July-2023 – 41.3% 21-July-2023 – 49.6%
11-January-2023 – 17-January-2023	12-January-2023 – 51.5% 13-January-2023 – 46.5%	24-July-2023 – 30-July-2023	24-July-2023 – 50.2% 26-July-2023 – 52.5%
18-January-2023 – 24-January-2023	18-January-2023 – 48.4% 20-January-2023 – 44.8%	31-July-2023 – 06-August-2023	31-July-2023 – 45.3% 03-August-2023 – 48.3%
01-February-2023 – 07-February-2023	01-February-2023 – 53.6% 02-February-2023 – 52.8%	07-August-2023 – 13-August-2023	07-August-2023 – 49.4% 10-August-2023 – 50.0%
14-February-2023 – 20-February-2023	15-February-2023 – 49.8% 16-February-2023 – 51.8%	14-August-2023 – 20-August-2023	14-August-2023 – 49.5% 17-August-2023 – 50.1%
21-February-2023 – 27-February-2023	21-February-2023 – 56.6% 22-February-2023 – 57.3%	21-August-2023 – 27-August-2023	21-August-2023 – 48.4% 24-August-2023 – 49.2%
08-March-2023 – 14-March-2023	08-March-2023 – 52.9% 09-March-2023 – 52.7%	28-August-2023 – 03-September-2023	28-August-2023 – 53.3% 30-August-2023 – 48.5% 01-September-2023 – 48.3%
15-March-2023 – 21-March-2023	15-March-2023 – 51.8% 16-March-2023 – 53.4% 20-March-2023 – 52.8%	04-September-2023 – 10-September-2023	07-September-2023 – 50.3% 08-September-2023 – 50.3%

22-March-2023 – 28-March-2023	22-March-2023 – 52.3% 27-March-2023 – 49.7%	11-September-2023 – 17-September-2023	11-September-2023 – 50.6% 13-September-2023 – 49.5%
29-March-2023 – 04-April-2023	31-March-2023 – 54.0% 03-April-2023 – 55.1% 04-April-2023 – 54.1%	18-September-2023 – 24-September-2023	19-September-2023 – 52.2% 20-September-2023 – 45.8%
10-April-2023 – 16-April-2023	10-April-2023 – 49.8% 12-April-2023 – 48.6%	03-October-2023 – 09-October-2023	04-October-2023 – 20.8% 06-October-2023 – 50.9%
18-April-2023 – 24-April-2023	19-April-2023 – 46.8% 20-April-2023 – 51.1%	10-October-2023 – 16-October-2023	10-October-2023 – 49.8% 13-October-2023 – 50.4%
25-April-2023 – 01-May-2023	25-April-2023 – 49.2% 26-April-2023 – 48.4%	17-October-2023 – 23-October-2023	17-October-2023 – 54.5% 18-October-2023 – 51.5%
02-May-2023 – 08-May-2023	02-May-2023 – 50.2% 03-May-2023 – 47.9%	24-October-2023 – 30-October-2023	26-October-2023 – 51.1% 27-October-2023 – 49.7%
09-May-2023 – 15-May-2023	09-May-2023 – 49.9% 10-May-2023 – 49.4%	01-November-2023 – 07-November-2023	01-November-2023 – 50.3% 02-November-2023 – 49.3% 06-November-2023 – 53.2% 07-November-2023 – 50.4%
16-May-2023 – 22-May/2023	16-May-2023 – 52.6% 17-May-2023 – 51.4%	10-November-2023 – 16-November-2023	15-November-2023 – 50.1% 16-November-2023 – 51.9%
26-May-2023 – 01-2023	26-May-2023 – 49.6% 30-May-2023 – 51.2%	17-November-2023 – 23-November-2023	21-November-2023 – 56.1% 22-November-2023 – 48.8%

05-June-2023 – 11-June-2023	05-June-2023 – 51.0% 08-June-2023 – 51.5%	26-November-2023 – 02-December-2023	30-November-2023 – 54.7% 01-December-2023 – 51.2%
12-June-2023 – 18-June-2023	13-June-2023 – 52.7% 14-June-2023 – 50.4%	09-December-2023 – 15-December-2023	11-December-2023 – 49.2% 12-December-2023 – 48.3%
19-June-2023 – 25-June-2023	20-June-2023 – 50.4% 21-June-2023 – 49.6%	12-January-2024 – 18-January-2024	12-January-2024 – 58.7% 18-January-2024 – 51.4%, 51.3%
26-June-2023 – 02-July-2023	26-June-2023 – 50.9% 27-June-2023 – 50.0%	01-February-2024 – 07-February-2024	01-February-2024 – 56.2%, 53.5% 02-February-2024 – 50.0%, 51.5% 05-February-2024 – 50.0%, 49.2%
03-July-2023 – 09-July-2023	05-July-2023 – 51.2% 06-July-2023 – 53.8%	22-February-2024 – 28-February-2024	22-February-2024 – 57.3% 26-February-2024 – 55.9%
10-July-2023 – 16-July-2023	11-July-2023 – 49.1% 12-July-2023 – 50.1%	01-March-2024 – 07-March-2024	01-March-2024 – 51.2%, 50.6% 04-March-2024 – 52.2%, 62.9% 05-March-2024 -50.8%, 51.3% 06-March-2024 – 50.3%, 50.6% 07-March-2024 – 50.1%

Table 3:

Flare 4 Handheld Methane Readings			
Week	Readings	Week	Readings
04-January-2023 – 10-January-2023	04-January-2023 - 48.5% 06-January-2023 - 45.3%	24-June-2023 – 30-June-2023	26-June-2023 – 43.7% 27-June-2023 – 43.6%

11-January-2023 – 17-January-2023	12-January-2023 - 44.8% 13-January-2023 - 41.9%	03-July-2023 – 09-July-2023	05-July-2023 – 44.5% 06-July-2023 – 45.8%
18-January-2023 - 24-January-2023	18-January-2023 - 42.7% 20-January-2023 - 39.5%	10-July-2023 – 16-July-2023	11-July-2023 – 45.1% 12-July-2023 – 45.5%
01-February-2023 – 07-February-2023	01-February-2023 - 43.5% 02-February-2023 - 42.3%	24-July-2023 – 30-July-2023	24-July-2023 – 46.3% 26-July-2023 – 47.8%
14-February-2023 – 20-February-2023	15-February-2023 - 44.4% 16-February-2023 - 45.4%	03-August-2023 – 09-August-2023	03-August-2023 – 42.5% 07-August-2023 – 43.3%
21-February-2023 – 27-February-2023	21-February-2023 - 47.4% 22-February-2023 - 47.9%	18-August-2023 – 24-August-2023	17-August-2023 – 43.2% 21-August-2023 – 42.6%
03-March-2023 – 09-March-2023	08-March-2023 - 48.7% 09-March-2023 - 48.4%	25-August-2023 – 31-August-2023	28-August-2023 – 43.6% 30-August-2023 – 44.7%
13-March-2023 – 19-March-2023	13-March-2023 - 47.2% 15-March-2023 - 47.7% 16-March-2023 - 49.3%	01-September-2023 – 07-September-2023	01-September-2023 – 44.5% 07-September-2023 – 43.2%
20-March-2023 – 26-March-2023	20-March-2023 - 48.6% 22-March-2023 - 47.2%	12-October-2023 – 18-October-2023	13-October-2023 – 44.1% 17-October-2023 – 43.0% 18-October-2023 – 45.1%
27-March-2023 – 02-April-2023	27-March-2023 - 45.4% 31-March-2023 - 49.0%	23-October-2023 – 29-October-2023	26-October-2023 – 43.7%

			27-October-2023 - 43.3%
03-April-2023 - 09-April-2023	03-April-2023 - 48.6% 04-April-2023 - 46.8%	30-October-2023 - 05-November-2023	01-November-2023 - 45.0% 02-November-2023 - 43.8%
10-April-2023 - 16-April-2023	10-April-2023 - 45.2% 12-April-2023 - 40.6%	06-November-2023 - 12-November-2023	06-November-2023 - 44.1% 06-November-2023 - 43.6% 08-November-2023 - 44.8% 08-November-2023 - 44.8%
19-April-2023 - 25-April-2023	20-April-2023 - 45.6% 25-April-2023 - 43.9%	15-November-2023 - 21-November-2023	15-November-2023 - 43.2% 21-November-2023 - 44.5%
26-April-2023 - 02-May-2023	26-April-2023 - 43.1% 02-May-2023 - 44.5%	30-November-2023 - 06-December-2023	30-November-2023 - 45.1% 01-December-2023 - 45.0%
03-May-2023 - 09-May-2023	03-May-2023 - 43.3% 09-May-2023 - 46.8%	11-December-2023 - 17-December-2023	11-December-2023 - 42.9%, 43.8% 12-December-2023 - 42.5%, 43.2%
10-May-2023 - 16-May-2023	10-May-2023 - 46.5% 16-May-2023 - 48.2%	01-February-2024 - 07-February-2024	01-February-2024 - 48.0%, 47.3% 02-February-2024 - 44.3%, 45.9% 05-February-2024 - 44.4%, 44.9%
17-May-2023 - 23-May-2023	17-May-2023 - 47.4% 22-May-2023 - 46.0%	22-February-2024 - 28-February-2024	22-February-2024 - 48.6% 26-February-2024 - 46.5%
24-May-2023 - 30-May-2023	26-May-2023 - 46.7% 30-May-2023 - 45.2%	04-March-2024 - 10-March-2024	06-March-2024 - 45.2%, 45.7%

			07-March-2024 – 45.4%, 47.7%
05-June-2023 – 11-June-2023	05-June-2023 – 44.5% 08-June-2023 – 45.5%	11-March-2024 – 17-March-2024	11-March-2024 – 48.1% 14-March-2024 – 47.0%
13-June-2023 – 19-June-2023	13-June-2023 – 46.5% 14-June-2023 – 44.3%	18-March-2024 – 24-March-2024	18-March-2024 – 46.2% 19-March-2024 – 50.7%

Methodology deviations applied at crediting period renewal and thereafter:

2. Destruction Efficiencies: We use a flare efficiency of 96% for the Project flares. This number is widely used in well-established carbon protocols for flares operated under US EPA 40CFR60.18, as is the case here. This deviation is expected to provide a closer estimate to the true quantity of emission reductions. This does not impact the conservativeness of quantification, because the flaring can exceed the 96% destruction efficiency in practice. By limiting the flare flow volumes only to those periods in which the thermocouple reads hotter than 500 °F, we ensure that only adequate combustion is taking place at all times in the quantified GHG emission reductions. Thus, the accuracy is not impacted negatively. This methodology deviation has been approved throughout the first crediting period.

3. Use of eGRID EF for Project electricity emissions: An alternate approach to the determination of the emission factor is used here based on annual total output emission rates published by the U.S. EPA eGRID 2022. The use of the most up-to-date eGRID factor is more appropriate than the tool default due to regional specificity and widespread use of these data for emission accounting purposes. The value applied will be updated to remain in agreement with the most current source value. This deviation results in increased accuracy of emission reduction quantifications.

The project will use the most recent eGRID dataset available as they are released, in accordance with Verra's Standard.

4. Use of 2006 IPCC Guidelines defaults for CO₂ emissions from fossil fuels: An alternative approach to the determination of the fossil fuel emission coefficients is used here based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The emission factors in these guidelines are widely used and considered to be industry standards. The value applied will be updated to remain in agreement with the most current source value. This deviation results in increased accuracy of emission reduction quantifications.

In alignment with the Verra Standard requirements, the most recent version of the IPCC Guidelines will be used.

5. Use of standard temperature of 68 °F rather than 32 °F: Rather than use the standard temperature of 32 °F as prescribed by the methodology and the *Tool to determine the mass flow of a greenhouse gas in a gaseous stream*, the Project elects to use 68 °F. 68 °F is more common

for U.S.-based landfill Project types and thus aides in consistency with industry standards. This does not negatively impact the conservativeness of the quantification of emission reductions.

6. Use of invoices provided by the fuel supplier to quantify $FC_{i,j,y}$. Rather than measuring the volume of fuel consumed using a ruler or calibrated accessory per Tool 03, invoices provided by the fuel supplier listing the number and total volume of fuel tanks purchased will be used to determine $FC_{i,j,y}$. Fuel purchase receipts credibly prove transactions with third-party fuel vendors and are thus a robust resource for quantifying fuel usage. By applying the total volume of fuel purchased in a year, fuel consumption is conservatively overestimated.

3.2.2 Project Description Deviations

Current and previous (01-July-2021-31-December-2022) Project Description deviations:

- 1. Use of handheld methane sample readings for Flare 4:** According to the Clinton Project Description Document, methane readings at Flare 4 are measured by a continuous gas analyzer; however, handheld gas analyzers were utilized to measure methane concentrations at Flare 4 during this reporting period. For the Flare 4 emissions reductions calculations, we apply methane concentration readings taken by a handheld gas analyzer. These handheld samples at the flare were temporarily used during this reporting period because the continuous methane analyzer at the flare was sent to the manufacturer for servicing and repair. Due to the customization of the analyzer requiring specific repairs, paired with supply chain and sourcing delays on replacement parts, delays compounded and the analyzer was not returned back to the site until April 2023. As described in Section 3.2.1 above, we apply the handheld methane concentration from sample readings across consecutive days until the next methane sample reading for weeks in which two methane samples were taken.
- 2. Flare thermocouple readings:** The thermocouple at the new Flare 4 (replacement flare) is placed farther way from area of combustion compared to its predecessor and therefore the flare often reads temperatures below 500 °F. We altered the emission reductions calculations to consider all flow to be combusted during periods when the flares' operating temperatures are greater than 212 °F, rather than 500 °F. 212 °F represents the vaporization point of water and therefore indicates that the flare is actively burning landfill gas. The value chosen ensures that the landfill gas was combusted, and that flare is at a temperature far above the ambient temperature. This deviation is consistent with the manufacturer's specifications, which states that the flare is operational and running in automatic mode once it exceeds the low flare temperature setpoint, which is typically 200 °F. The flare is programmed to shut down and restart if it drops below the low flare temperature setpoint.
- 3. Gas analyzer field calibrations:** Throughout the reporting period, there were inconsistencies in the documentation of field calibration results prior to the use of handheld gas analyzers. As a result, the project deviates from the equipment calibration plan on page 60 of section 5.3 of the Project Description Document. Andrew Whelpley, the landfill manager, has testified that it is a standard operating procedure at the facility to field calibrate the handheld gas analyzers

before use each day. This SOP has been in place since 2004 and has been enforced by Andrew since then. It was formally published in 2005 and has most recently been updated in December 2022.⁹ Andrew Whelpley's testimony and the SOP serve as proof that field calibrations did occur, although records of the results are unavailable for many field calibrations across the reporting period. This deviation does not negatively impact accuracy or conservativeness of GHG emission reductions.

- 4. Quantification of $F_{CH_4,m}$ on a dry basis:** The project will deviate from the Project Description Document to use CDM Tool 08 Option A instead of Option C, as validated. Upon further review, it was found that Option A is more appropriate because the gaseous stream is considered dry through the criteria prescribed by Tool 08 Paragraph 23 (b): because the gaseous stream is less than 60 °C at the flow measurement point, the flow measurement adheres to the Tool's definition of dry basis. Inlet gas temperatures shown in the compiled raw data files for the flare and engines demonstrate that the gaseous stream does not exceed 60 °C (140 °F). See the Data/Parameter box for T_t in Section 4.2 for a list of the maximum flow temperatures at Flare 4 and the engine skid by month. We propose a deviation to use the equations under CDM Tool 08 Option A and thus define $F_{CH_4,m}$ on a dry basis.

This deviation causes no significant change to the calculations as Option A and Option C utilize the same equation format, with the only difference being the notation of variables as being on a wet or dry basis. It does not impact the applicability of the methodology; rather, it improves the accuracy of the calculations by correctly identifying $F_{CH_4,m}$ as being on a dry basis. It also clarifies the Project's conformity to CDM Tool 06's requirement for F_{CH_4} to be quantified on a dry basis. Finally, the deviation does not impact the additionality or the appropriateness of the baseline scenario.

Previous methodology deviations:

- 1- Gas analyzer calibration:** In December 2022, gas analyzer s/n 1003016 was utilized to measure methane concentration. In addition, gas analyzer s/n 1905215B was used to take methane samples for two months outside its window of annual factory calibrations, from October 2022 to December 2022. This deviation seeks to use the four methane samples taken by gas analyzer s/n 1003016 and 21 methane samples taken by analyzer s/n 1905215B although the analyzers did not receive a factory calibration annually as specified in the project description document. A 2% discount factor shall be applied to all readings taken by these analyzers outside of their factory calibration windows, as Elkins Earthworks guarantees accuracy within $\pm 2\%$ for methane readings between 30% and 100%. In other words, the 2% discount is applied to readings taken after the meter reaches the 12-month mark past its prior calibration record. This is because the meter was not a "non-calibrated instrument" until it surpassed the annual calibration date on which it was due for calibration. The 2% deduction accounts for the maximum amount of variability the meters would have at any given reading

⁹ The 2005 and 2022 SOPs have been provided as Attachments 5 and 15.

while remaining within an acceptable range of accuracy. This 2% discount factor shall be added to the 10% discount factor applied to all readings, resulting in a 12% discount applied to all readings taken from analyzers s/n 1003016 and s/n 1905215B outside of their windows of factory calibration. Analyzer s/n 1003016 was most recently factory calibrated on 18-January-2023 and is lacking an annual calibration in 2022. The analyzer had auto calibrations performed using known calibration gases prior to each use to ensure its credibility. Auto calibration records in December 2022 indicate that the analyzer was performing properly before taking each methane sample. These auto calibration records are available for each of the four methane samples taken by the analyzer in December 2022. Analyzer s/n 1905215B was most recently factory calibrated on 06-December-2022, fourteen months after its previous factory calibration. 19 of the 21 methane samples taken by the analyzer include auto calibration records, and auto calibrations were performed but not recorded for the other 2 samples according to testimony from the landfill manager. See Project Description Deviation 4 for more information about the landfill's standard operating procedure for methane sampling. In addition to the SOP at the landfill, the 02-October-2023 and 31-July-2023 as-found calibration records for analyzers s/n 1003016 and s/n 1905215B, respectively, prove that both analyzers were operating within acceptable ranges prior to their 2023 calibrations. This deviation does not negatively impact the accuracy or conservativeness of GHG emission reductions.

3.3 Grouped Projects

This is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Regulatory requirements relating to landfill gas Projects
Data unit	--
Description	Regulatory requirements relating to landfill gas Projects
Source of data	Publicly available information of United States' and State of Illinois' regulatory requirements relating to landfill gas. In particular, the landfill is regulated under Title 35 Illinois

	Administrative Code (35 IAC), Subtitle G: Land Pollution (Regulations) and under the Title V Clean Air Act Permit Program. The WVPA energy plant is also regulated under Title 40 Code of Federal Regulations.
Value applied	--
Justification of choice of data or description of measurement methods and procedures applied	Landfill operates under permits as outlined in Section 1.14. As part of the validation process, necessary permits are identified so that they may be tracked during Project monitoring.
Purpose of Data	The information is used to assess the landfill's regulatory standing.
Comments	N/A

Data / Parameter	OX _{top_layer}
Data unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool " <i>Emissions from solid waste disposal sites</i> "
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	Specified in methodology.
Purpose of Data	Baseline and Project Emissions calculations
Comments	N/A

Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/tCH ₄
Description	Global warming potential of CH ₄
Source of data	IPCC's Fifth Assessment Report
Value applied	28

Justification of choice of data or description of measurement methods and procedures applied	This term is specified in version 4.5 of the VCS Standard and reflects the default value from IPCC Fifth Assessment Report (AR5).
Purpose of Data	Baseline and project emissions calculations
Comments	N/A

Data / Parameter	$F_{CH4,PJ,y}$ (ex-ante)
Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG which is flared and/or used in the Project activity in year y
Source of data	$F_{CH4,PJ,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} / GWP_{CH4}$
Value applied	See Attachment 17 of PDD
Justification of choice of data or description of measurement methods and procedures applied	Calculated in the First Order Decay (FOD) model provided as Attachment 17 of PDD
Purpose of Data	Calculation of Project Emissions (ex-ante)
Comments	N/A

Data / Parameter	η_{PJ}
Data unit	Percent
Description	Efficiency of the LFG capture system installed in the Project activity
Source of data	ACM0001 Methodology
Value applied	50%
Justification of choice of data or description of measurement methods and procedures applied	This is the default value given by the methodology.
Purpose of Data	Calculation of baseline emissions (ex-ante $F_{CH_4,PJ,y}$)
Comments	N/A

Data / Parameter	η_{flare}
Data unit	Percent
Description	Efficiency of the flare installed in the Project activity
Source of data	Climate Action Reserve's U.S. Landfill Protocol (v5).
Value applied	96%
Justification of choice of data or description of measurement methods and procedures applied	Using a Methodology Deviation, the efficiency of the flare is set at 96% based on the value prescribed by the Climate Action Reserve's U.S. Landfill Protocol (v5). This value is widely accepted for U.S. landfill open flares.
Purpose of Data	Calculation of Project emissions from flaring
Comments	This Methodology Deviation has been approved in previous reporting periods under the first crediting period.

Data / Parameter	$F_{CH_4,BL,x-1}$
Data unit	tCH ₄ /yr

Description	Historical amount of methane in the LFG which is captured and destroyed in the year prior to implementation of the Project activity
Source of data	Value taken from initial validation
Value applied	3,899
Justification of choice of data or description of measurement methods and procedures applied	This value was determined at the initial validation and is maintained here. The data set and the calculations performed to determine baseline methane capture appears in Attachments 14 and 16 of PDD.
Purpose of Data	Calculation of baseline methane destruction
Comments	N/A

Data / Parameter	$FCH_{4,x-1}$
Data unit	tCH ₄ /yr
Description	Amount of methane which is generated in the SWDS in the year prior to the Project activity
Source of data	Calculated in original PDD and shown in Attachments 16 and 17 of PDD (ex-ante model of landfill methane production)
Value applied	12,130
Justification of choice of data or description of measurement methods and procedures applied	This value is a result of the decay model that predicts the annual methane production of the landfill.
Purpose of Data	Calculation of baseline methane destruction
Comments	N/A

Data / Parameter	$BE_{CH_4,SWDS,y}$
Data unit	tCO _{2e} /yr
Description	Amount of methane generated in calendar year y by the landfill in absence of any collection system

Source of data	Calculated per the tool “Emissions from solid waste disposal sites” at the time of the initial validation and recalculated at the time of the second crediting period validation.
Value applied	See Attachment 17 of PDD
Justification of choice of data or description of measurement methods and procedures applied	The value was determined upon the second crediting period, updated from the initial validation to account for changed values and modeled for continued decay.
Purpose of Data	Modeled value of the methane produced by the SWDS in a given year
Comments	Used for ex-ante estimation of the amount of methane that would have been generated in a given year, as well as to establish baseline scenario reductions

Data / Parameter	$F_{CH_4,BL,y} \text{ (ex-ante)} = F_{CH_4,hist,y}$
Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG that would be flared in the baseline in year y for the case of an existing LFG capture system
Source of data	$0.321 \times F_{CH_4,PJ,y} \text{ (ex-ante)}$
Value applied	Calculated
Justification of choice of data or description of measurement methods and procedures applied	This value was determined upon validation of the first crediting period.
Purpose of Data	Calculation of baseline emissions
Comments	See Attachment 17 of PDD

Data / Parameter	$EF_{EL,j,y}$
Data unit	tCO ₂ /MWh
Description	Emission factor for electricity consumption from source j
Source of data	eGRID 2022 data (released 30-January-2024)
Value applied	0.621

Justification of choice of data or description of measurement methods and procedures applied	This is a widely used and accepted source for grid emission factors.
Purpose of Data	Calculating Project emissions from electricity use
Comments	Clinton is in SRMW region. This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation.

Data / Parameter	TDL _{j,y}
Data unit	%
Description	Transmission and distribution losses of providing electricity to source j in year y
Source of data	eGRID 2022 data (released 30-January-2024)
Value applied	5.1%
Justification of choice of data or description of measurement methods and procedures applied	This is a widely used and accepted source for U.S. electricity grid data
Purpose of Data	Calculating Project emissions from electricity use
Comments	This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation.

Data / Parameter	COEF _{i,y}
Data unit	tCO ₂ /gallon
Description	Emission factor for fossil fuel type i
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Propane - 0.006
Justification of choice of data or description of measurement methods and procedures applied	This is a widely used and accepted source for fossil fuel emission factors.

Purpose of Data	Calculating project emissions from fossil fuel use
Comments	This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation.

Data / Parameter	ρ_{CH_4}
Data unit	lbs. CH ₄ /ft ³ dry landfill gas
Description	Methane density
Source of data	US EPA conversion factor, "Basic Concepts in Environmental Science" http://www.epa.gov/apti/bces/reference/reference.htm
Value applied	Engine – Rosemount meter: 0.04240 Engine – ABB meter: 0.04176 Flare 4 – Sage meter: 0.04240 0.04162 lbs/ft ³
Justification of choice of data or description of measurement methods and procedures applied	Defined per Equation 6 of Tool08 under Option A: $\rho_{i,t} = (P_t * MM_i) / (R_u * T_t)$
Purpose of Data	Baseline and Project Emissions Calculations
Comments	Density as measured in US units per gas industry standard temperature and pressure: 1 atmosphere and 68° F, or 14.70 psia and 527.67 Rankine See PDD Deviation 4.

Data / Parameter	P_n
Data unit	psia
Description	Total pressure at normal conditions
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0
Value applied	14.70
Justification of choice of data or description of	This is a physical value for atmospheric pressure

measurement methods and procedures applied	
Purpose of Data	To determine methane density
Comments	N/A

Data / Parameter	T_n
Data unit	°R
Description	Temperature at normal conditions
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0
Value applied	527.67
Justification of choice of data or description of measurement methods and procedures applied	This is a physical value for normal temperature
Purpose of Data	To determine methane density
Comments	Note that the tool sets this value at 273.15 K. However, we find the value of 527.67 °R (68 °F) to be the more appropriate value for normal conditions. As such, calculations are based on this value.

Data / Parameter	MM_{CH_4}
Data unit	lb/lbmol
Description	Molecular mass of methane
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0
Value applied	16.043
Justification of choice of data or description of measurement methods and procedures applied	This is a physical value for molecular mass of methane.
Purpose of Data	To determine methane density

Comments	N/A
Data / Parameter	R_u
Data unit	psia • ft ³ /lbmol • °R
Description	Universal ideal gases constant
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0
Value applied	10.73
Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of Data	To determine methane density
Comments	See PDD Deviation 4

The following parameters were used in the initial crediting period as part of the tool *Emissions from solid waste disposal sites* and defaults have been updated in the second crediting period in accordance with v08.0 and ACM0001 v19.

Data / Parameter	ϕ default
Data unit	Unitless
Description	Model correction factor to account for model uncertainties
Source of data	Emissions from solid waste disposal sites v08.0
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	From Tool: Application A, default value
Purpose of Data	Corrects for model uncertainties in baseline calculations
Comments	N/A

Data / Parameter	f_y
Data unit	%
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Historic Project records and ongoing Project monitoring.
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	This value references historical conditions and requirements that were in place when the Project underwent initial validation.
Purpose of Data	Accounts for any methane that is handled outside of the Project activity.
Comments	According to ACM0001, this parameter “shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation (2) of this methodology.”

Data / Parameter	OX
Data unit	Fraction
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Based on an extensive review of published literature on this subject, including the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.1
Justification of choice of data or description of measurement methods	This term is given by the methodology.
Purpose of data	Discounts the total methane produced to account for oxidation from soil or other covering materials.
Comments	N/A

Data / Parameter	F
Data unit	Unitless
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods	This term is given by the methodology.
Purpose of data	Reflects the methane fraction in the gas produced by the landfill.
Comments	N/A

Data / Parameter	DOC _{f,y}
Data unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods	Taken from 2019 Refinement to the 2006 IPCC Guidelines
Purpose of data	Reflects the fraction of organic waste that can decompose
Comments	N/A

Data / Parameter	MCF _y
Data unit	Unitless
Description	Methane correction factor
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value applied	1
Justification of choice of data or description of measurement methods	Taken from 2019 Refinement to the 2006 IPCC Guidelines based on guidelines from <i>Emissions from solid waste disposal sites v08.0</i> based on Application A for an anaerobic managed solid waste disposal site.
Purpose of data	Corrects for the increased anaerobic activity in managed SWDS.
Comments	N/A

Data / Parameter	DOC _j														
Data unit	Fraction														
Description	Fraction of degradable organic carbon in the waste type j (weight fraction)														
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)														
Value applied	For MSW, the following values for the different waste types j should be applied: Default values for DOC_j <table border="1"> <thead> <tr> <th>Waste type j</th><th>DOC_j (% wet waste)</th></tr> </thead> <tbody> <tr> <td>Wood and wood products</td><td>43</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr> <tr> <td>Textiles</td><td>24</td></tr> <tr> <td>Garden, yard and park waste</td><td>20</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>0</td></tr> </tbody> </table>	Waste type j	DOC _j (% wet waste)	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Waste type j	DOC _j (% wet waste)														
Wood and wood products	43														
Pulp, paper and cardboard (other than sludge)	40														
Food, food waste, beverages and tobacco (other than sludge)	15														
Textiles	24														
Garden, yard and park waste	20														
Glass, plastic, metal, other inert waste	0														
Justification of choice of data or description of measurement methods	Default values from 2019 Refinement to the 2006 IPCC Guidelines														
Purpose of data	Used to determine the fraction of organic content that is degradable														

Comments	N/A
Data / Parameter	W_x
Data unit	t
Description	Total amount of waste disposed in a SWDS in year x
Source of data	Measurement by third-party reporting
Value applied	See Attachment 13 and Attachment 17 of PDD.
Justification of choice of data or description of measurement methods	Total waste disposal is tracked and recorded historically.
Purpose of data	Used to calculate the ex-ante baseline emissions.
Comments	N/A

Data / Parameter	k_j										
Data unit	1/yr										
Description	Decay rate per waste type j										
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)										
Value applied	<table> <tr> <th><u>Waste Type</u></th><th><u>k</u></th></tr> <tr> <td>Pulp, paper, cardboard (not sludge), textiles</td><td>0.06</td></tr> <tr> <td>Wood, wood products, and straw</td><td>0.03</td></tr> <tr> <td>Garden and park waste</td><td>0.1</td></tr> <tr> <td>Food, food waste, sludge, bev & tobacco</td><td>0.185</td></tr> </table>	<u>Waste Type</u>	<u>k</u>	Pulp, paper, cardboard (not sludge), textiles	0.06	Wood, wood products, and straw	0.03	Garden and park waste	0.1	Food, food waste, sludge, bev & tobacco	0.185
<u>Waste Type</u>	<u>k</u>										
Pulp, paper, cardboard (not sludge), textiles	0.06										
Wood, wood products, and straw	0.03										
Garden and park waste	0.1										
Food, food waste, sludge, bev & tobacco	0.185										
Justification of choice of data or description of measurement methods	Default decay values used to model decay of waste in the landfill.										
Purpose of data	Calculation of baseline emissions.										
Comments	At Clinton, the climatic conditions are as follows: Mean Avg. Temp = 11.5° C (NOAA 30-year normals) Mean Avg. Precip = 90.3 cm (NOAA 30-year normals)										

Potential Evapotranspiration = 63.6 cm (Thornthwaite method)
MAP/PET = 1.420
→ Boreal/Temperate, Wet

4.2 Data and Parameters Monitored

Data / Parameter	Management of SWDS
Data unit	--
Description	Management of SWDS
Source of data	Original design of the landfill and check-ins with Project staff on the continued operation of the facility.
Description of measurement methods and procedures to be applied	--
Frequency of monitoring/recording	Annually
Value applied	--
Monitoring equipment	--
QA/QC procedures to be applied	--
Purpose of data	Ensure that the operation of the Project does not reduce the amount of organic waste being diverted from the Clinton landfill in the absence of Project activity.
Calculation method	--
Comments	The landfill is operating in the same manner as described in the PDD. All solid waste practices remain the same.

Data / Parameter	BE _{CH₄,y}
Data unit	tCO ₂ e
Description	Baseline emissions from the SWDS in year y

Source of data	$((1 - OX_{top_layer}) * F_{CH4,PJ} - F_{CH4,BL}) * GWP_{CH4}$
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 108,795 2024 (3 months): 33,937
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	The emissions in year y if the baseline scenario were chosen instead of the Project scenario by the Project owners.
Calculation method	$((1 - OX_{top_layer}) * F_{CH4,PJ} - F_{CH4,BL}) * GWP_{CH4}$
Comments	N/A

Data / Parameter	$F_{CH4,PJ,y}$ (ex-post)
Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG which is flared and/or used in the Project activity in year y
Source of data	Calculated value based on other parameters
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 6,706 2024 (3 months): 2,092
Monitoring equipment	N/A

QA/QC procedures to be applied	N/A
Purpose of data	The amount of methane that was used in the Project activity in year y
Calculation method	$F_{CH_4,EL,y} + F_{CH_4,flare,y}$
Comments	N/A

Data / Parameter	$F_{CH_4,EL,y}$ (ex-post)
Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG which is used for electricity generation in year y
Source of data	Determined using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 2,914 2024 (3 months): 840
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Determine methane destroyed by gensets
Calculation method	Calculated using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Option A)
Comments	Equal to $F_{CH_4,t}$

Data / Parameter	$F_{CH_4,flare,y}$ (ex-post)
------------------	------------------------------

Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG which is flared in year y
Source of data	Calculated value
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 3,792 2024 (3 months): 1,252
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Determine methane destroyed by flares
Calculation method	Calculated using Equation 4 in the methodology
Comments	Per CDM Tool 06, "Project emissions from flaring" this parameter is also identified as F _{CH₄,RG,m}

Data / Parameter	F _{CH₄,sent flare,y} (ex-post)
Data unit	tCH ₄ /yr
Description	Amount of methane in the LFG which is sent to the flares in year y
Source of data	Determined using "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 3,950.5

	2024 (3 months): 1,303.8
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Determine methane destroyed by flare
Calculation method	Calculated using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Option A)
Comments	Equal to $F_{CH_4,t}$ and $F_{CH_4,RG}$

Data / Parameter	$PE_{flare,y}$
Data unit	tCH ₄ /yr
Description	Project emissions from flaring in year y
Source of data	Determined using tool “Project emissions from flaring”
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 158.0 2024 (3 months): 52.2
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Determine methane destroyed by flare
Calculation method	Calculated using “Project emissions from flaring”
Comments	N/A

Data / Parameter	$F_{CH_4,BL,y}$ (ex-post)
------------------	---------------------------

Data unit	tCH ₄ /yr
Description	Amount of methane attributable to baseline destruction equipment
Source of data	$0.321 \times F_{CH_4,PJ,y}$ (ex-post)
Description of measurement methods and procedures to be applied	Calculated value based on other parameters
Frequency of monitoring/recording	Calculated value
Value applied	2023 (12 months): 2,150 2024 (3 months): 671
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Determine methane destroyed by flare in baseline scenario
Calculation method	$0.321 \times F_{CH_4,PJ,y}$ (ex-post)
Comments	N/A

Data / Parameter	Op _{j,h}
Data unit	Hours
Description	Operating hours of the energy plant
Source of data	Engine operating clock totalizer
Description of measurement methods and procedures to be applied	Operating clock hours are kept showing monthly totalizer readings, which are used to demonstrate consistent operation by comparing against monthly gas flow and monthly power generation.
Frequency of monitoring/recording	Daily
Value applied	Monthly operating hours (monthly breakdown provided in project data files):

	2023 (12 months): Engine 1: 7,860 hours Engine 2: 8,159 hours 2024 (3 months): Engine 1: 1,495 hours Engine 2: 1,566 hours
Monitoring equipment	Records of engine uptime
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of the baseline and project emissions
Calculation method	N/A
Comments	The gensets are equipped with shutoff valves that prevent gas from passing through and entering the atmosphere while the gensets are non-operational. For any period where one or more of the destruction devices are not operational, it will be demonstrated that the remaining devices have the capacity to destroy the gas flow recorded during the period, and if relevant, it will be shown that the output corresponds to the gas flow. Redundant controls implemented on-site automatically control how hard the blower pulls gas to the flare. Should either of the gensets shut down, the variable frequency drive would automatically ramp up the blower to the flare to maintain high levels of gas collection and destruction.

Data / Parameter	$Op_{flare,h}$
Data unit	Hours
Description	Operation of the flares
Source of data	Flare thermocouple readings
Description of measurement methods and procedures to be applied	Parameter (a) temperature is monitored to ensure operation of the flares. Any flow measured during periods when the flares' operating temperatures are less than 212°F is considered uncombusted and excluded from the calculation of emissions reductions per

	the measurement procedures in Data / Parameter table 19 of CDM Tool 08. Such periods with temperatures less than 212 °F are defined as non-operating hours.
Frequency of monitoring/recording	Continuously
Value applied	Operating hours (monthly breakdown provided in project data files) at Flare 4: 2023 (12 months): 8,613 2024 (3 months): 1,823
Monitoring equipment	Thermocouple
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of the baseline and project emissions
Calculation method	N/A
Comments	For any period where the engines are not operational, the flare has the capacity to destroy the gas flow recorded during the period. Redundant controls implemented on-site automatically control how hard the blower pulls gas to the flare. Should either of the gensets shut down, the variable frequency drive would automatically ramp up the blower to the flare to maintain high levels of gas collection and destruction.

Data / Parameter	$EC_{PJ,j,y}$
Data unit	kWh
Description	Quantity of electricity consumed by the Project source j in year y
Source of data	Utility invoices
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Monitored continuously, bills provided monthly
Value applied	2023 (12 months): 162.8 MWh 2024 (3 months): 61.6 MWh
Monitoring equipment	Revenue meter owned by utility
QA/QC procedures to be applied	Per power company's procedures. The utility has a vested interest in maintaining conservative calibration of the meters, with legal and financial ramifications that ensure meter accuracy. As such, the meter is assumed to be accurate based on the utility's operation and dependence on the readings.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$FC_{i,j,y}$
Data unit	gallons
Description	Fossil fuel of type i consumed in process j consumed by the Project Activity in year y. In this case, fuel is propane.
Source of data	Purchase invoices
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Data is recorded in the form of receipts for purchases.
Value applied	2023 (12 months): 75 2024 (3 months): 81
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	See Methodology Deviation 6.

The following parameters were monitored for use in the *Tool to determine the mass flow of a greenhouse gas in a gaseous stream*.

Data / Parameter	$V_{t,db}$
Data unit	ft ³ dry gas/m
Description	Volumetric flow of the LFG in flare or engine
Source of data	Flow meters
Description of measurement methods and procedures to be applied	Data is captured by the datalogger. The Rosemount Pressure Transmitters and the ABB XMV Flow Transmitter measure differential pressure, static pressure, and process temperature continuously and converts these parameters into a compensated mass flow value at the following reference conditions:

	Engine 3051 s/n 514151: 60°F and 14.73 psia. Engine ABB XMV: 68°F and 14.73 psia. Sage Paramount: 60°F and 14.73 psia.
Frequency of monitoring/recording	Continuously monitored, recorded on a 1-minute basis
Value applied	Engines (SCF): 2023 (12 months): 373,680,423 2024 (3 months): 86,347,825 Flare 4 (SCF): 2023 (12 months): 534,350,179 2024 (3 months): 162,555,678
Monitoring equipment	Engines: ABB XMV Flow Transmitter s/n T223276318, Rosemount 3051 Pressure Transmitter s/n 514151* *WVPA installed the ABB meter on 13-October-2023, although the Rosemount meter logged flow data through 31-October-2023. The ABB meter formally replaced the Rosemount meter on 01-November-2023, when it began logging data. Flare 4: Sage Mass Flow Meter s/n 104765 (spare) and s/n 139064
QA/QC procedures to be applied	The flow meters are maintained and calibrated according to manufacturer specification.
Purpose of data	Calculation of the baseline and project emissions.
Calculation method	Integrated logic of Yokogawa data loggers. Note that the meters are calibrated to give readings for the reference conditions listed above. Thus, meter readings are corrected to standard cubic feet for 68°F using Equation 11 of the Tool to determine the mass flow of a greenhouse gas in a gaseous stream: $V_{t,db,n} = V_{t,db} \times \left[\left(\frac{T_n}{T_t} \right) \times \left(\frac{P_t}{P_n} \right) \right]$
Comments	N/A

Data / Parameter	$v_{CH_4,t,db}$
Data unit	ft ³ CH ₄ /ft ³ dry gas

Description	Volumetric fraction of methane in a time interval t on a dry basis
Source of data	GFL Environmental
Description of measurement methods and procedures to be applied	Captured by landfill staff via handheld measurements (please see noted deviation)
Frequency of monitoring/recording	Methane fraction is monitored non-continuously at the engines and the flare via handheld readings. The frequency of measurements ranged from less than weekly to twice weekly.
Value applied	Averages at engines: 2023 (12 months): 44% 2024 (3 months): 51% Averages at Flare 4: 2023 (12 months): 43% 2024 (3 months): 51%
Monitoring equipment	Elkins Envision handheld analyzers (S/N 1905215B, 2202205B, 2007201B, 1403200B, 1003016, 2204200B, 2106201B, 1003017, 2010230B) at the engine skid and Flare 4. Please see Section 3.2 Deviations.
QA/QC procedures to be applied	The handheld analyzers are calibrated to reference gases before use, as documented in the LFG Monitoring Field Reports. These meters are factory calibrated annually.
Purpose of data	Calculation of the baseline and project emissions
Calculation method	Average of handheld methane measurements applied to weeks in which two or more readings were taken across the reporting period.
Comments	Field calibrations are now documented in methane reading Excel files.

Data / Parameter	T_t
Data unit	°F (or °R)
Description	Temperature of the gaseous stream to the power plant or flare in time interval t

Source of data	GFL Environmental		
Description of measurement methods and procedures to be applied	Landfill gas temperature is monitored continuously, and automatically converted by the respective flow meter/transmitter into compensated total flow value at reference condition 60 °F. Readings are corrected to 68 °F (527.67 °R) for further calculations.		
Frequency of monitoring/recording	Continuously		
Value applied	Maximum Temperature per Month (° Fahrenheit)		
	Month	Engines	Flare 4
	January-2023	107	81
	February-2023	109	81
	March-2023	118	86
	April-2023	118	97
	May-2023	119	112
	June-2023	122	114
	July-2023	126	119
	August-2023	127	119
	September-2023	136	113
	October-2023	135	113
	November-2023	119	96
	December-2023	130	83
	January-2024	95	84
	February-2024	95	87
	March-2024	95	89
Monitoring equipment	Flow meters		
QA/QC procedures to be applied	The flow meters are maintained and calibrated according to manufacturer specification, which is every 5 years.		
Purpose of data	Calculation of the baseline and project emissions		
Calculation method	N/A		
Comments	All temperature values measured during the monitoring period fall below the maximum threshold of 60 °C / 140 °F.		

Data / Parameter	P_t
Data unit	Atmospheres (or psia)
Description	Pressure of the gaseous stream to the power plant or flare in time interval t
Source of data	Flow meters give readings for standard pressure of 1 atm (14.70 psia)
Description of measurement methods and procedures to be applied	Flow meter readings
Frequency of monitoring/recording	Continuously
Value applied	N/A
Monitoring equipment	Flow meters
QA/QC procedures to be applied	The flow meters are maintained and calibrated according to manufacturer specification, which is every 5 years.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	Continuous pressure recordings are monitored but are not required by Tool 08 to demonstrate dry basis qualification.

4.3 Monitoring Plan

The purpose of monitoring is to ensure the Project accomplishes its greenhouse gas reductions as expected by WVPA, and to ensure its emission reductions are creditable pursuant to this PD and the Verified Carbon Standard.

The data to be reported are:

- Total landfill gas captured
- Landfill gas flow to the generators and flares
- Landfill gas constituent concentration
- Operating hours of the generators
- Quantity of electricity generated
- Quantity of grid electricity used by Project equipment
- Quantity of waste disposed at the landfill

The origin, measurement techniques, monitoring time periods, responsibilities, and data quality management systems are described in below.

Parameter	Data source	Frequency	Party	Notes
Normalized flow to generators	Continuous flow meter (Rosemount 3051 Transmitter, ABB XMV Transmitter)	Captured continuously	Wabash operations technician	Continuous flow data is submitted periodically to 3Degrees
Normalized flow to flares	Continuous flow meter (Sage Thermal Mass Flow Meter)	Captured continuously	GFL Environmental technician	Continuous flow data is submitted periodically to 3Degrees
Landfill gas temperature and pressure	Continuous flow meter	Captured continuously	Wabash operations technician/ GFL technician	Flow readings are normalized to standard temperature and pressure by flow meter, thus temperature and pressure are not tracked separately
Total electricity generated	kWh meters	Hourly	Ameren	Total generated electricity is reported in Wabash monthly electricity bills, used to verify methane destruction
Engine Operating Hours	Operating hours meters	Hourly	Wabash operations technician	Cumulative engine operating hours are recorded daily
Flare Operating Hours	Flare Thermocouples	Continuously	GFL personnel	At temperatures above 212 °F, flare is assumed to be operational
Methane fraction at flares	Siemens Ultramat 23 continuous gas analyzers	Continuously	GFL personnel	Continuous methane data is submitted periodically to 3Degrees
Methane fraction at power plant	Handheld meter (Elkins Earthworks Envision and Landtec GEM units)	At least twice weekly	GFL personnel	Methane data is aggregated in a spreadsheet manually and sent to 3Degrees periodically. Field calibration records also kept on meter

Parameter	Data source	Frequency	Party	Notes
Waste Disposed	Scale readings as submitted to Illinois EPA	Annually	GFL personnel	3Degrees will collect this data annually from IEPA reports as they become available
Grid electricity used by Project	Electricity bills for WPVA/ GFL	Monthly	GFL personnel	
Propane used by the Project	Propane receipts for GFL	Periodically	GFL personnel	
Operating permits	Wabash Valley Power personnel, GFL, Illinois EPA	Annually	3Degrees	3Degrees will ensure operating permits are valid and complete

The following chart provides a summary of equipment calibration. Actual QA/QC procedures will depend on the specific pieces of equipment used. The equipment manufacturer's recommendations and guidance are provided in Attachment 1.

Equipment	Calibration procedure	Frequency	Responsible party
Continuous flow meter	Factory calibration, as recommended by manufacturer	Per manufacturer's recommendation	Factory-authorized representative
Continuous methane analyzers	Field calibrate against reference gases, record results	Annually	GFL personnel technician
Generator kilowatt-hour meter	As recommended by manufacturer	Not responsibility of Project operators	Ameren
Handheld gas constituent analyzer	Field calibrate against reference gas cylinder, record results	Daily prior to use	GFL personnel operations technician
Handheld gas constituent analyzer	Factory calibration	At least annually	Factory-authorized representative

Reporting Period Calibration Calendars:

Siemens Ultramat (Flare 4)	Sage Flow Meter s/n 139064 (Flare 4)	Sage Flow Meter s/n 104765 (Flare 4)	Rosemount Model 3051s (Engines)	ABB TotalFlow Gas Chromatograph (Engines)	ABB XMV Flow Transmitter s/n T223276318 (Engines)
	12-July-2022	10-March-2021	23-February-2021; within compliance tolerances	11-October-2023	11-October-2023
	24-January-2024	25-August-2022			

Handheld Methane Analyzer Calibrations			
Device	2022 Calibration	2023 Calibration	In Use?
Elkins Envision s/n 1003017	N/A	16-August-2023	Yes
Elkins Envision s/n 1003016	N/A	18-January-2023 04-August-2023	Yes
Elkins Envision s/n 2010230B	N/A	24-July-2023	Yes
Elkins Envision s/n 2007201B	14-March-2022	15-March-2023	No
Elkins Envision s/n 1905215B	6-December-2022	04-August-2023	Yes
Elkins Envision s/n 1403200B	05-January-2022	17-January-2023	No
Elkins Envision s/n 2106201B	29-March-2022	03-February-2023	Yes (until 12-Dec-2023)
Elkins Envision s/n 2202205B	08-March-2022	02-March-2023	No
Elkins Envision s/n 2204204B	08-August-2022	16-May-2023	Yes

Non-conformances with this monitoring plan are recorded and implemented as Project Description deviations in the relevant reporting period monitoring reports and corrective action is taken as appropriate/possible to return to conformance with the monitoring plan.

Project Personnel and Responsibilities

GFL Environmental will be responsible for data collection and quality assurance for flare related data. Relevant staff includes Andrew Whelpley, Program Manager, and Kyle Martin, Compliance Specialist. Dedicated Yokogawa data recorders will continuously record gas flow, methane, and flare operating temperature for each flare. GFL is responsible for factory calibration of the meters related to the flares.

Wabash Valley Power has overall responsibility for operation and maintenance of the power plant. The primary data that they will retain relevant to effort is the engine hour logs. GFL will be responsible for data collection and quality assurance of the engine flow meter and collection of methane readings at the power plant and field calibration of the handheld methane analyzer.

3Degrees will be responsible for collating data, performing additional quality assurance checks, preparing Project emissions reductions calculations in accordance with the PD and ACM0001, and preparing monitoring reports and VCS documentation.

Data Generation and Storage

Project data is generated on site by Project meters, or through utility bills/propane receipts. For the engines, data from Project meters will be backed up through manual records, i.e. totaled flow, weekly methane readings, and engine operating hours will be entered into Excel spreadsheets for long-term storage. Utility bills will be stored on site, and also scanned for transfer to 3Degrees for analysis and storage.

Continuous flow, methane, and flare temperature data for the Project flares will be recorded to flash memory cards on the data recorders and also backed up wirelessly to an online SCADA system. Field calibration records for the flare flow meters, continuous methane analyzers, and the Landtec GEMs will be stored at GFL offices in Peoria, IL. Field calibration events for the Landtec GEM will be recorded manually in a weekly monitoring log. Utility bills and propane receipts will be stored on site in the Landfill offices and scanned for transfer to 3Degrees.

Project data will be submitted to 3Degrees in electronic format on an approximately quarterly basis. 3Degrees will receive flow, methane, and engine operating hours in Excel format with the exception of raw flow data in proprietary Yokogawa format (3Degrees has a viewer for this type of file and converts to an excel format for data processing). Utility bills and factory calibration certificates will be transmitted to 3Degrees in PDF form. These data submittals will form the basis of the 3Degrees' calculation of credits generated during each monitoring period. 3Degrees will also collect current copies of permits and ensure that all necessary permits are valid.

All Project data, documents, permits, and calculations will be stored on 3Degrees' cloud-based server. 3Degrees will ensure that all the documents and records are maintained for at least two years after the end of the Project crediting period.

Internal Auditing Procedures

Quality Assurance will be provided by 3Degrees' independent review of all Project data and calibration records on a quarterly basis. 3Degrees' handling of Project data will include the following steps:

- Integration of new data submittals into past performance data;
- Review of data for anomalies, inconsistencies, and outlying data points;
- Completeness checks of data for gas quality, gas quantity, and evidence of destruction;
- Review of electricity generation and engine operating hours in relationship to Project performance.

3Degrees will work with GFL to resolve any issues identified during the quality assurance review.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are determined according to the following equations that are based on version 19 of ACM0001. Baseline emissions from electricity, heat generation, and natural gas usage do not apply to this Project, therefore the methodology equation reduces to:

$$BE_y = BE_{CH_4,y}$$

Where $BE_{CH_4,y}$ is given by:

$$BE_{CH_4,y} = \left((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y} \right) \times GWP_{CH_4}$$

Where:

OX_{top_layer} = Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless), equal to 0.1

$F_{CH_4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the Project activity in year y (t CO₂e/yr)

$F_{CH_4,BL,y}$ = Amount of methane in the LFG that would be flared in the baseline in year y (t CO₂e/yr)

GWP_{CH_4} = Global warming potential of CH₄ (t CO₂e/tCH₄), equal to 28

As required by the methodology, we set OX_{top_layer} to 0.1 to account for the effect of oxidation. Similarly, we set the GWP of methane to the default value of 28 from the IPCC Fifth Assessment Report. The value of $F_{CH_4,PJ,y}$ is quantified ex-post from data produced during this reporting period.

Substituting the appropriate values gives:

$$BE_{CH4,2023} = ((1 - 0.1) \times 6,706 - 2,150) \times 28 = 108,795$$

$$BE_{CH4,2024} = ((1 - 0.1) \times 2,092 - 671) \times 28 = 33,937$$

For the **ex-post** calculations, we use the following equation:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the Project activity in year y (tCH₄/yr)

$F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year y (tCH₄/yr).

$F_{CH4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year y (tCH₄/yr)

The terms $F_{CH4,flared,y}$ and $F_{CH4,EL,y}$ both rely on the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” to determine the methane destroyed in the baseline.

The term $F_{CH4,EL,y}$ is determined directly using the tool and monitoring the working hours of the power plant so that no emission reductions are claimed during non-working hours. This is taken into account by monitoring the kW production of the equipment utilizing the LFG to only claim engine destruction when an engine is operating in year y ($Op_{j,m,y}$). Substituting the appropriate values gives:

$$F_{CH4,PJ,2023} = F_{CH4,flared,2023} + F_{CH4,EL,2023} = 3,792 + 2,914 = 6,706$$

$$F_{CH4,PJ,2024} = F_{CH4,flared,2024} + F_{CH4,EL,2024} = 1,252 + 840 = 2,092$$

The term $F_{CH4,flared,y}$ is determined using Equation 4 in the methodology, as below:

$$F_{CH4,flared,y} = F_{CH4,sent_flare} - \frac{PE_{flare,y}}{GWP_{CH4}}$$

Where:

$F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year y (tCH₄/yr)

$F_{CH4,sent_flare}$ = Amount of methane in the LFG which is sent to the flare in year y (tCH₄/yr), determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”

$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y (tCO_{2e}/yr), determined using the tool “Project emission from flaring”

To determine both $F_{CH_4,EL,y}$ (the mass flow of methane to the engines) and $F_{CH_4,sent\ flare,y}$ (the mass flow of methane to the flare), we measure the flow of the LFG on a volumetric dry basis using measurement Option A and the following equations from CDM Tool 08:

$$F_{CH_4,t} = F_{CH_4,EL,y} = F_{CH_4,sent\ flare,y} = V_{t,db,n} \times v_{CH_4,t,db} \times \rho_{CH_4,n}$$

With the density of methane converted to the conditions of each flow meter's internally corrected output per Equation 6 of Tool 08:

$$\rho_{CH_4,n} = \frac{P_n \times MM_{CH_4}}{R_u \times T_n}$$

Where:

$F_{CH_4,t}$ = Mass flow of methane in the LFG in time interval t (lb CH₄/h).

$V_{t,db,n}$ = Volumetric flow of the LFG in time interval t on a dry basis at normal conditions (ft³ dry gas/h)

$v_{CH_4,t,db}$ = Volumetric fraction of methane in the LFG in time interval t on a dry basis (ft³ CH₄/ft³ dry gas)

$\rho_{CH_4,n}$ = Density of methane in the landfill gas at normal conditions (lb CH₄/ft³ dry landfill gas)

P_n = Absolute pressure at normal conditions (1 atm or 14.70 psia)

T_n = Temperature at normal conditions (68 °F, or 527.67 °R)

MM_{CH_4} = Molecular mass of methane (lb/lbmol)

R_u = Universal ideal gas constant (psia • ft³/lbmol • R)

$PE_{flare,y}$ is determined using the tool “Project emissions from flaring” and the equation below:

$$PE_{flare,y} = GWP_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

$F_{CH_4,RG}$ = Mass flow of methane in the flare gas in minute m (kg)

η_{flare} = The efficiency of the flare in minute m

Note that the flare operability is monitored via thermocouple readings.

Note that $F_{CH_4,RG,m}$ is calculated as $F_{CH_4,flared,y}$ due to Equation 4 in the methodology directing calculations to use CDM Tool 06 “Project emissions from flaring” for calculation of $PE_{flare,y}$. CDM Tool 06 points towards the use of CDM Tool 08 to determine $F_{CH_4,m}$, defined as the mass flow of methane in the residual gas stream, which is thus equivalent to $F_{CH_4,RG,m}$. CDM Tool 08 additionally refers to $F_{CH_4,m}$ as $F_{i,t}$.

For the **ex-post** determination of the amount of methane that would have been captured and destroyed in the baseline term $F_{CH_4,BL,y}$, we use Case 4 as described in ACM0001 (a requirement to destroy methane exists and a LFG capture system exists).

For Case 4, ACM0001 states that $F_{CH_4,BL,y}$ shall be determined based on information in contract or regulation requirements and data related to the existing LFG capture system, as follows:

$$F_{CH_4,BL,y} = \max\{F_{CH_4,BL,R,y}; F_{CH_4,BL,sys,y}\}$$

Where:

$F_{CH_4,BL,R,y}$ = Amount of methane in the LFG which is flared in the baseline due to a requirement in year y (t CH₄/yr) – as determined by the procedures outlined in Case 2

$F_{CH_4,BL,sys,y}$ = Amount of methane in the LFG that would be flared in the baseline in year y for the case of an existing LFG capture system (t CH₄/yr) - as determined by the procedures outlined in Case 3

For the Clinton Landfill, the amount of methane destroyed in the baseline scenario is not numerically defined by a regulation or a contract, therefore we follow the Case 3 steps to determine $F_{CH_4,BL,y}$:

$$F_{CH_4,BL,y} = F_{CH_4,BL,sys,y} = F_{CH_4,hist,y} = \frac{F_{CH_4,BL,x-1}}{F_{CH_4,x-1}} \times F_{CH_4,PJ,y}$$

Where:

$F_{CH_4,BL,x-1}$ = the amount of methane in the LFG which is captured and destroyed in the year prior to the Project implementation (tCH₄/yr)

$F_{CH_4,x-1}$ = the amount of methane in the LFG generated in the SWDS in the year prior to the Project, and is calculated according to the methodological tool “Emissions from solid waste disposal sites” (tCH₄/yr)

$F_{CH_4,PJ,y}$ is calculated as above.

$F_{CH_4,BL,x-1}$ is determined using the data from one historic year (2006) prior to the start date of the Project. This data and calculation are included as Attachments 14 and 16 and were developed as part of the Project’s validation of the first crediting period. As the analysis shows, in the year prior to the Project the baseline flare destroyed 3,889 tCH₄.

$F_{CH_4,x-1}$ is calculated for the same time period, 2006, based on a first-order decay model described in the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site.” In the baseline year, 2006, the site generated 12,130 tCH₄.

Combining these terms, we arrive at:

$$F_{CH_4,BL,y} = \frac{F_{CH_4,BL,x-1}}{F_{CH_4,x-1}} \times F_{CH_4,PJ,y} = \frac{3,889}{12,130} \times F_{CH_4,PJ,y} = 0.321 \times F_{CH_4,PJ,y}$$

Substituting the appropriate values gives:

$$F_{CH_4,BL,2023} = 0.321 \times 6,706 = 2,150$$

$$F_{CH4,BL,2024} = 0.321 \times 2,092 = 671$$

5.2 Project Emissions

See Project Data Files A and B for detailed calculations and results. Results are also provided in section 4.2.

ACM0001 requires identification of changes in fossil fuel use and non-renewable electricity consumption that occur as a result of the Project implementation. Project emissions are quantified through Equation 22 of the methodology:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} + PE_{SP,y}$$

Where:

PE_y = Project emissions in year y (t CO₂/yr)

$PE_{EC,y}$ = Emissions from consumption of electricity due to the Project activity in year y (t CO₂/yr)

$PE_{FC,y}$ = Emissions from consumption of fossil fuels due to the Project activity, for purposes other than electricity generation, in year y (t CO₂/yr)

$PE_{DT,y}$ = Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (t CO₂/yr)

$PE_{SP,y}$ = Emissions from the supply of LFG to consumers through a dedicated pipeline, in year y (t CO₂/yr)

$PE_{DT,y}$ and $PE_{SP,y}$ are not applicable to this Project and are both zero.

$PE_{EC,y}$ is determined according to the Methodological tool 05: *Baseline, Project, and/or leakage emissions from electricity consumption and monitoring of electricity generation* and applying the appropriate methodology deviation, as below:

$$PE_{EC,y} = \sum_j (EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}))$$

Where:

$EC_{PJ,j,y}$ = quantity of electricity consumed by the Project in year y (MWh/yr)

$EF_{EL,j,y}$ = emission factor for electricity generation for source j in year y (tCO₂/MWh), from eGRID

$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source j in year y (from most recent eGRID dataset)

Substituting the appropriate eGRID values into the equation gives the following:

$$PE_{EC,2023} = 162.8 \times 0.621 \times (1 + 0.0051) = 106.3 \text{ tCO}_2e$$

$$PE_{EC,2024} = 61.6 \times 0.621 \times (1 + 0.0051) = 40.2 \text{ tCO}_2e$$

$PE_{FC,y}$ is determined according to the *Tool to calculate Project or leakage CO₂ emissions from fossil fuel combustion* and the appropriate methodology deviation, as below:

$$PE_{FC,y} = \sum_i (FC_{i,j,y} \times COEF_{i,y})$$

Where:

$FC_{i,j,y}$ = Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)

$COEF_{i,y}$ = The CO₂ emission coefficient of fuel type i in year y (tCO₂/mass or volume unit)

The project used 156 gallons of propane during this reporting period, thus:

$$PE_{FC,2023} = 75 \times 0.006 = 0.42$$

$$PE_{FC,2024} = 81 \times 0.006 = 0.45$$

Substituting the appropriate values into Equation 22 gives the total project emissions by year:

$$PE_{2023} = 106.3 + 0.42 = 106.7 \text{ tCO}_2e$$

$$PE_{2024} = 40.2 + 0.45 = 40.7 \text{ tCO}_2e$$

5.3 Leakage Emissions

ACM0001 states that leakage effects are not accounted for under the methodology.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emission in year y (t CO₂e/yr)

PE_y = Project emission in year y (t CO₂e/yr)

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
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01-Jan-2023 to 31-Dec-2023	108,795	107	0	108,688		108,688
01-Jan-2024 to 31-Mar-2024	33,937	41	0	33,896		33,896
Total	142,732	148	0	142,584		142,584

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Jan-2023 to 31-Dec-2023	103,069	108,795	5.56%	The volume of gas destroyed increased during the reporting period due to the installation of Flare 4 in April 2021. Flare 4 has a significantly more powerful 75-horsepower blower than Flares 1 and 2, thereby collecting gas more efficiently and destroying more gas altogether. In addition, more gas was sent to the gas skid than in past RPs, increasing the total volume of gas destroyed.
01-Jan-2024 to 31-Mar-2024	26,561	33,896	27.62%	The volume of gas destroyed increased during the reporting period due to the installation of Flare 4 in April 2021. Flare 4 has a significantly more powerful 75-horsepower blower than Flares 1 and 2, thereby collecting gas more efficiently and destroying more gas altogether. In addition, more gas was sent to the gas skid than in past RPs, increasing the total volume of gas destroyed.
Total	129,630	142,584	10.0%	See above explanations.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

No information in the monitoring report is considered commercially sensitive, therefore the table below is not applicable.

Section	Information	Justification
N/A	N/A	N/A

APPENDIX 2: EVIDENCE OF SDG CONTRIBUTIONS

SDG 3 – Good health and well-being

3.9.1 Mortality rate attributed to household and ambient air pollution

The Project's landfill gas destruction reduces exposure of hazardous air pollutants (HAPs) to local residents. In addition to methane and carbon dioxide, landfill gas contains many other volatile organic compounds (VOCs), many of which are listed as hazardous air pollutants (HAPs) that pose threats to human health. Combustion of LFG serves to decrease its public health impact by destroying the majority of HAPs. Findings by the Natural Resources Defense Council¹⁰ demonstrate that raw landfill gas is approximately 24 times more carcinogenic to human health than landfill gas combustion exhaust. Improved air quality and local health benefits result from the Project activity. The emissions reduction calculator and raw flow files have been provided to the verifier as evidence of landfill gas destruction. Below is a summary of landfill gas destruction by reporting period.

Reporting Period	SCF LFG destroyed
2010	578,860,722
2011	685,650,064
2012	620,510,614
2013	594,753,100
Jan-Oct 2014	454,334,400
Nov 2014-Apr 2016	790,591,300
May 2016-Dec 2016	420,733,600
2017	666,903,138
2018	655,613,300
Jan 2019-Jun 2019	332,496,800
Jul 2019-Jun 2021	1,471,049,975
Jul 2021-Dec 2022	1,425,882,110
Jan 2023-Mar 2024	1,156,934,105
TOTAL	9,854,313,228

SDG 7- Affordable and clean energy

7.2.1 Renewable energy share in the total final energy consumption

¹⁰ Natural Resources Defense Council. March 2003. Is Landfill Gas Green Energy? Table 5. Available online: <https://www.nrdc.org/sites/default/files/lfg.pdf>

During this reporting period, the project generated 22,893 MWh of renewable energy. Below is a monthly generation summary. Monthly invoices from Wabash Power to the buyer have been provided to the verifier as supporting evidence of power generation.

Month-Year	MWh generated and sold
Jan-23	1,672
Feb-23	1,210
Mar-23	2,085
Apr-23	1,833
May-23	2,037
Jun-23	1,591
Jul-23	1,495
Aug-23	1,535
Sep-23	1,297
Oct-23	1,452
Nov-23	1,673
Dec-23	1,263
Jan-24	1,668
Feb-24	1,640
Mar-24	441
TOTAL	22,893

During previous reporting periods, the project generated 204,287 MWh of renewable energy. Over the project lifetime, 261,496 MWh of renewable energy has been generated. Below is a generation summary by reporting period.

Reporting Period	MWh generated and sold
2010	23,070
2011	13,576
2012	10,277
2013	13,698
Jan-Oct 2014	13,838
Nov 2014-Apr 2016	26,857
May-Dec 2016	14,262
2017	20,746
2018	20,290
Jan-Jun 2019	10,499
Jul 2019-Jun 2021	37,174
Jul 2021-Dec 2022	34,316
Jan 2023-Mar 2024	22,893
TOTAL	261,496