



Landfill Project Verification Protocol

Capturing and Destroying Methane from Landfills

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1 Introduction

The California Climate Action Registry's (California Registry) Landfill Project Verification Protocol provides guidance to California Air Resources Board (CARB) and California Registry-approved verifiers for verifying greenhouse gas (GHG) emission reductions associated with installing a landfill gas control system, in accordance with the California Registry's Landfill Project Reporting Protocol. Project verification occurs on an annual basis. This verification protocol supplements the California Registry's General Verification Protocol (GVP). It describes the core verification activities in the context of a landfill operation and provides information on project monitoring parameters.

The purpose of verification is to provide an independent review of data and information used to produce a GHG project report. It aims to ensure that a participant's reported emission reductions are real, permanent, surplus, and verifiable. The intended audience of the project verification protocol is approved verifiers. However, landfill emission reduction project developers will also find it useful to review this document to develop a better understanding of the verification activities associated with reporting GHG reductions to the California Registry. Landfill sector verifiers must read and be familiar with the following California Registry reporting tools:

- General Reporting Protocol
- Landfill Project Reporting Protocol
- General Verification Protocol
- Landfill Project Verification Protocol
- The Climate Action Reserve (Reserve)

The California Registry's general and industry-specific verification protocols are designed to be compatible with each other and are available on the California Registry's website at <http://www.climateregistry.org>.

Only CARB- and California Registry-approved landfill sector verifiers are eligible to verify landfill project reports. Approved verifiers under the California Registry's GVP are not automatically permitted to verify the landfill project reports. To become an approved landfill sector verifier, a general verifier must successfully complete a landfill sector-specific application process. Information on the application process can be found at <http://www.climateregistry.org>.

2 Standard of Verification

The California Registry's standard of verification for landfill GHG projects is the Landfill Project Reporting Protocol. To verify a landfill project developer's project report, verifiers apply the verification guidance in the GVP and this document to the standards described in the project reporting protocol. It provides eligibility rules, methods to calculate reductions, performance-monitoring instructions, and procedures for reporting project information to the California Registry. The Landfill Project Reporting Protocol:

- defines the GHG reduction project
- defines project eligibility rules
- delineates the project boundary
- provides GHG reduction calculation methods
- identifies procedures for project monitoring
- describes project reporting parameters

Specifically, this verification protocol supports the verification of GHG reduction projects associated with the installation of a landfill gas control system that captures and destroys methane gas from landfill operations and that commences operation on or after January 1, 2001. The landfill gas control system destroys methane associated with the biodegradation of landfill waste that would have otherwise been emitted to the atmosphere. Captured landfill gas could be destroyed on-site, transported for off-site use (e.g. through gas distribution or transmission pipeline), or used to power vehicles. Regardless of how project developers take advantage of the captured landfill gas, the ultimate fate of the methane must be destruction.

Project verification occurs annually. GHG reductions associated with the landfill gas control system are accounted for on an ex-post basis, and project developers annually report reductions that occurred the preceding year. Although projects must be verified annually at a minimum, the California Registry will accept verified emission reduction reports on a sub-annual basis, should the project developer choose to have a sub-annual verification schedule (i.e. monthly, quarterly, etc.).

Table 1 in the Landfill Project Reporting Protocol delineates which emission sources should be reported within the project boundary.

3 Core Verification Activities – Landfill Operations

Although the California Registry's Landfill Project Reporting Protocol provides explicit guidance to determine the GHG impact associated with installing a landfill gas control system, the focus of this verification protocol is on the process to undertake a review and verify a landfill project developer's GHG reduction report.

The California Registry's core verification activities are a risk assessment and data sampling effort developed to ensure that the risk of a reporting error is assessed and addressed through appropriate sampling and review. An illustration of the core verification process is provided in Figure 1, and a description of the three-step procedure is provided below, which is adapted from the California Registry's GVP.

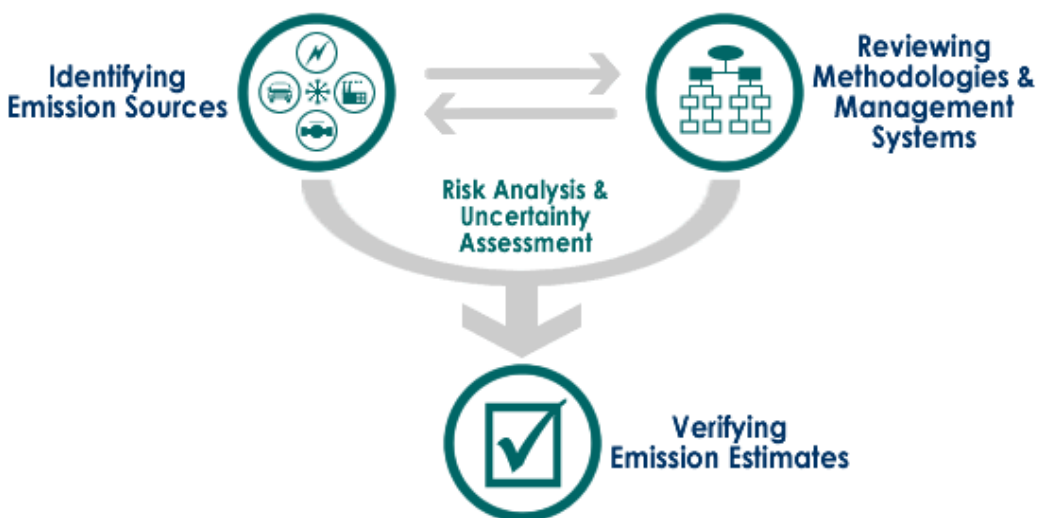


Figure 1. Core Verification Process.

The GHG reduction project's impacts are determined within a GHG assessment boundary. The project reporting protocol delineates the GHG sources and gases assessed by project developers to determine the net change in emissions associated with installing a landfill gas collection and destruction system. The boundary captures sources from landfill gas collection to destruction.

Within the defined GHG assessment boundary, project developers at landfill operations quantify the impact of methane and carbon dioxide by directly accounting for project emission reductions. Traditional baseline emission calculations are not required for this protocol for the quantification of methane reductions. The baseline scenario assumes that all uncontrolled methane emissions are released to the atmosphere except for the portion of methane that would be oxidized by bacteria in the soil of uncovered landfills, absent the project.

The verification process includes the identification of the emission sources, data management systems review, and verification of emission reduction estimates to verify the project's GHG impacts.

California Registry verifiers apply verification procedures consistently for all project developers. However, based on the size and complexity of a landfill project, verification activities may vary.

3.1 Step 1: Determining Project Eligibility

This step entails reviewing all project eligibility criteria as outlined in the project reporting protocol. Verification activities for the first year that a project is submitted to the California Registry include the review of project eligibility per the performance standard and regulatory tests included in the project reporting protocol. Verification activities for subsequent years will focus on verification of the regulatory additionality test.

Project eligibility questions to answer are:

1. Does the project meet the definition of the project as provided in the project reporting protocol?
2. Does the project pass the performance standard test (first reporting year only)?
3. Does the project pass the regulatory additionality test (each verification cycle)?
4. Did the project developer sufficiently review compliance with local, state and federal regulations or permitting requirements, as well as local agency ordinances/rulings, and provide a signed Attestation of Regulatory Compliance form (each verification cycle)?
5. Is the landfill a bioreactor, as defined in the project protocol?

3.2 Step 2: Identifying Emission Sources

Under this step, verifiers review the project developer's emissions and emission reductions source categories (components of the landfill gas collection and destruction system including fossil fuel consumption, indirect CO₂ emissions and methane destruction) to ensure that all sources are identified.

Every year a project report is submitted, project verifiers review the GHG emission report and document whether the report reflects the characterization and scope of the operation.

Questions to answer are:

1. Does the project report correctly depict the landfill system under the baseline scenario and project case?
2. Does the project report include all necessary methane and carbon dioxide sources within the project boundary?¹
3. Are GHG sources within the project boundary correctly organized by source category?
4. Are the GHG sources differentiated by gas?

3.3 Step 3: Reviewing GHG Management Systems and Estimation Methodologies

After confirming the scope and comprehensiveness of the project developer's emission sources, verifiers review the methodologies and management systems that the landfill project developer used to calculate project emission reductions. The objective is to assess the appropriateness of the data management systems that provide emissions information to the California Registry.

¹ Table 1 in the Landfill Project Reporting Protocol delineates which emission sources should be reported within the project boundary.

This is principally a risk assessment exercise, in which the verifier weighs the relative complexity of the scope of the project, the methodologies and management systems used to prepare the GHG project report, and the risk of calculation error as a result of reporting uncertainty or misstatement. A verifier's review of a project developer's GHG data collection and organization system should consider the following questions:

1. Did the project developer create and maintain a comprehensive Monitoring Plan that establishes all monitoring and reporting activities associated with the project?
2. Did the project developer correctly monitor, quantify and aggregate the amount of uncontrolled methane collected from the landfill and destroyed by the project landfill gas control system?
3. Did the project developer apply the correct methane destruction efficiencies?
4. Did the project developer correctly monitor, quantify and aggregate fossil fuel use?
5. Did the project developer correctly monitor, quantify and aggregate electricity use?
6. Did the project developer apply the correct carbon dioxide emission factors?
7. Is the landfill gas control system operated in a manner consistent with the design specifications?
8. Is the landfill gas control system monitored in a manner consistent with the Landfill Project Reporting Protocol monitoring requirements?
9. Are the landfill gas destruction devices operated and maintained in a manner consistent with manufacturer specifications?
10. Did the project developer provide source testing data for any of the destruction devices, or did the developer use the default destruction efficiencies provided in the Landfill Project Reporting Protocol? If qualifying source test data is available, the project developer must use the source test data in place of the default destruction efficiencies.
11. Is the landfill gas monitoring equipment calibrated at least quarterly?
12. Is an individual responsible for managing and reporting GHG emissions? Is this individual qualified to perform this function?
13. Is appropriate training provided to personnel assigned to GHG emission reporting duties?
14. If the project developer relies on external staff to perform required activities, are the contractors qualified to undertake such work? Is there internal oversight to assure quality of the contractors' work?
15. Are appropriate documents created to support and/or substantiate activities related to GHG emission reporting activities, and is such documentation retained appropriately? For example, is such documentation maintained through reporting plans or procedures, fuel purchase records, etc.?
16. For direct use agreements, between the project developer and the end user of the landfill gas (i.e. an industrial client purchasing the landfill gas from the project developer), is a legally binding mechanism built into the agreement language to assure that the GHG offset credits will not be double counted?
17. Are the mechanisms used to measure and review the effectiveness of GHG emission reporting programs appropriate for this purpose? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?

Using answers to the above questions as a guide, the verifier assesses the overall risk of misstatement associated with the GHG management systems. To do this, verifiers evaluate the general quality and performance of the management systems and identify areas that could cause concern with data quality.

Verifiers then identify the areas with the greatest potential for material misstatements (either based on volume of emissions, lack of management systems, or both) to determine the best risk-based strategy to identify a representative sample of emissions to recalculate in Step 4 below.

3.4 Step 4: Verifying Emission Estimates

Based on findings in the steps above, the verifier develops and implements a strategy to further investigate areas that have the greatest potential for material misstatements. By the end of this step, the verifier will either confirm or reject that material misstatement has occurred. This involves: (1) site visits to the landfill operation headquarters (or other locations where appropriate) where in-depth review of aspects of the data management systems are conducted, and (2) recalculation of a representative sample of the emission estimates for comparison with estimates reported by the project developer.

At least one site visit is required to be conducted during each year of verification activities. While verifiers may determine what type of sampling and site visits are appropriate to confirm a project developer's emissions, usually such activities include:

- Assessing data control systems at the facility level
- Reviewing documents such as fuel use records and emission monitoring results
- Recalculating emission estimates based on underlying activity data
- Generally attempting to detect material discrepancies by gathering different types of evidence

The final step in completing the core verification activities is to verify the emission estimates. To do so, verifiers recalculate a subset of the landfill operation's emission calculations and compare the subset recalculated results with the project developer's calculated results from the same sources to determine if the GHG emissions inventory is free of material misstatements.

Verifiers must compare the emissions data and recalculations to the project developer's emissions data and calculations for the same sources, and complete the following tasks:

1. Assess the areas of greatest impact and uncertainty in the emissions profile.
2. Select a representative sample of data to recalculate and sources to visit.
3. Develop and implement a strategy to recalculate the GHG emissions and visit the sources in the sample.
4. Assess the project developer's data collection.
5. Compare estimates of GHG emission reductions to those of the project developer to determine if any material misstatements exist.

Verifiers should concentrate their activities in the areas that have the greatest impact to the net change in emissions due to installing a landfill gas control system. The verification of emission estimates should document answers to the following questions:

1. Has the verifier documented their process for determining the appropriate sampling plan?
2. Has the verifier performed data triangulations where reasonable? Where more than one set of data is available for calculating emissions, a comparison can be performed as a check of the reported emissions.

3. Are the current year's reported emission reductions significantly different from the prior year's emission reductions? If so, does the verifier understand the reasons for the changes, and to the best of their knowledge, do they explain the differences in emissions?
4. Are any discrepancies between the verifier's emission estimates and the project developer's emission calculations significant?

It is possible that during the verification process differences will arise between the emission reductions estimated by the project developer and those estimated by the verifier. Differences of this nature may be classified as either material (significant) or immaterial (insignificant). If verifiers discover reporting errors, they must determine if these errors, when extrapolated throughout the entire operation, will result in a material misstatement. This is typically achieved by performing a sensitivity analysis on the error with respect to the total reported emission reductions. A discrepancy is considered to be material if the overall reported emission reductions differ from the overall emission reductions estimated by the verifier by 5% or more. A difference is immaterial if this difference is less than 5%.

4 Completing the Verification Process

The California Registry's GVP provides general instructions for verifiers to finalize the verification process. It describes completing a Verification Report, preparing a Verification Opinion, conducting an exit meeting with the California Registry participant, and notifying the California Registry of the participant's verified status. Verifiers are responsible for applying the guidance in a manner that meets the goals of project verification.