# ່ເບຼ Windfall Bio

### Windfall Bio Feedback on Draft Argentina Landfill Protocol - Inclusion of Biofilters

Dear Climate Action Reserve,

We commend the development of the draft Argentina Landfill Protocol. To enhance its comprehensiveness, we recommend the explicit inclusion and consistent treatment of fully enclosed biofilters as an eligible landfill gas (LFG) destruction technology.

### Detailed Recommendations:

### 1. Definition & Eligibility (Page 4, Para 2):

- a. Issue: Lack of explicit eligibility for fully enclosed biofilters as destruction devices: Current examples of destruction devices omit biofilters. These systems - used to biologically oxidize methane via methanotrophs - have been recognized by regulators, including the United States EPA<sup>1</sup>, the State of Colorado<sup>2</sup>, and the Quebec Compliance Carbon Market<sup>3</sup> as a commercially available technology to mitigate methane emissions.
- b. **Recommendation:** Explicitly include "fully enclosed biofilters" alongside flares, turbines, engines, boilers, etc., as eligible LFG destruction technologies.

### 2. Terminology (Page 54, Glossary):

- a. Issue: "Fully Enclosed Biofilter" is undefined.
- b. Recommendation:
  - *i.* Add a definition for "Fully Enclosed Biofilter." Suggest adapting Colorado's proposed rule definition: *"A container with material layer(s) that have or promote the growth of methanotrophs or methane-utilizing bacteria that oxidize methane in landfill gas. A biofilter is connected to a gas collection system or gas venting system at an MSW landfill."*
  - *ii.* Update all relevant diagrams (e.g., System Boundary Diagram, Monitoring Configuration) to depict biofilters alongside other destruction technologies

### 3. Determining the destruction efficiency for fully enclosed biofilters (Page 67, Table C.3):

a. Issue: Biological approaches to destroying methane, such as fully enclosed biofilters, are supported by peer-reviewed studies<sup>4</sup> and have been recognized as eligible destruction devices by the State of Colorado and in the Québec Compliance Landfill Protocol. However, because biofilters rely on microbial populations whose activity can vary based on environmental conditions, there is inherent variability in destruction efficiency.

<sup>&</sup>lt;sup>1</sup> US EPA

<sup>&</sup>lt;sup>2</sup> Colorado Proposed Landfill Methane Mitigation Rule

<sup>&</sup>lt;sup>3</sup> Quebec Compliance Carbon Market

<sup>&</sup>lt;sup>4</sup> <u>Methane oxidation and removal efficiency of landfill biocovers and biofilters: A systematic review of field</u> and lab data.

# ່ເບຼ Windfall Bio

**Recommendation:** It is recommended to require or encourage a secondary destruction device (such as an open or enclosed flare) to operate as a backup to the fully enclosed biofilter. In this configuration, the destruction efficiency applied to the entire system should be equivalent to that of the secondary destruction device. This renders any potential variability in the biofilter's primary methane destruction rate operationally irrelevant. This approach also aligns with Athian's Cap-and-Flare protocol<sup>5</sup>.

## 4. Recognizing the role and regulation of biomass from biofilters

- a. **Issue**: Fully enclosed biofilters generate microbial biomass as a byproduct of methane oxidation. This biomass may be suitable for use as landfill biocover material or as a valuable input for fertilizer or soil amendments. The draft protocol does not explicitly address allowable use cases of biomass produced as a byproduct of methane destruction nor does it explicitly state that project developers shall follow all relevant rules and regulations pertaining to its use.
- b. **Recommendation:** Clarify that the use of harvested biomass from fully enclosed biofilters for fertilizer or soil amendment is allowable under the protocol. However, the use of this biomass must comply with all applicable regulatory requirements and obtain relevant licenses or certifications. While outside the greenhouse gas assessment boundary and not creditable, biomass use as a co-benefit should not interfere with project eligibility.

## 5. System Boundary (Page 13, Diagram 1):

- a. Issue: Diagram omits biofilters as a destruction pathway.
- b. **Recommendation:** Add "Biofilter" to the diagram. Confirm biomass use derived from the biofilter is outside the GHG assessment boundary.

## 6. Emissions Sources (Page 14, Table 4.1):

- a. **Issue:** Table lacks emission sources specific to biofilters used to process biomass into valuable end uses like fertilizer.
- b. **Recommendation:** Add a row for "Emissions from destruction of LFG via biofilter." Note applicability to baseline/project emissions, exclusion of biogenic CO2 /N2O, and calculation of CH4 based on destruction efficiency.

## 7. Oxidation Factor (Page 20, Eq. 5.3):

- a. **Issue:** Default OX factor (0.1) may risk over-crediting.
- b. **Recommendation**: Implement a tiered approach for the OX factor, prioritizing Argentinian national/subnational defaults or established factors reflecting site conditions (e.g., cover depth/flux per US EPA Subpart HH).

b.

<sup>&</sup>lt;sup>₅</sup> <u>Athian.ai</u>



#### 8. Baseline Calculation Clarity (Page 22, Para 1):

- a. Issue: Potential typo and ambiguity regarding required equations.
- b. **Recommendation:** Correct typo. Clarify whether Equation 5.5 *and* Equation 5.8 must be used for calculating baseline methane destruction.
- 9. Monitoring Configuration (Page 30, Figure 6.1):
  - a. Issue: Diagram of monitoring equipment omits biofilters.
  - b. **Recommendation:** Include "Fully Enclosed Biofilter" as an example destruction device. Depict the flowmeter *before* the biofilter inlet.

Incorporating these suggestions will improve the protocol's clarity, consistency, and practical application. We thank you for considering this feedback. Windfall Bio is a team of over 40, including PhD biologists and engineers with deep experience designing, building, and operating industrial-scale biofilters, and we would be glad to offer technical support or provide additional documentation should the Reserve find it helpful during its protocol refinement process.

Warmest regards,

McKenzie Wilson

Director of Carbon Accounting, Windfall Bio

mckenzie@windfall.bio

Kyle Kornack,

Director of Carbon Business Development, Windfall Bio

kyle@windfall.bio