

# Climeworks

## Mammoth Facility Output Audit Report

For Puro.Earth

CO <sub>2</sub> Removal Supplier	ClimeWorks
Removal Method	Direct Air Capture & CO <sub>2</sub> Storage in Basalt Formations
Production Facility	Climeworks Mammoth
Production Facility Address	Capture Facility: Nordurvellir 4, 816 Ölfus, Iceland
Net Volume of CO <sub>2</sub> Removal	264.7 CORCs
Removal Period	March 1 <sup>st</sup> , 2025 – August 31 <sup>st</sup> , 2025
Auditors	350Solutions: Guy Hardwick Kelly Nesbitt Tim Hansen
Report Date	December 1, 2025
Version	V1.1

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## Acronyms

<b>CDR</b>	Carbon dioxide removal
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CORC</b>	CO <sub>2</sub> Removal Certificate
<b>DAC</b>	Direct air capture
<b>EF</b>	Emissions factor
<b>GHG</b>	Greenhouse gas
<b>MRV</b>	Measurement, Reporting, Verification
<b>RECs</b>	Renewable energy certificates

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## OUTPUT AUDIT REPORT

<b>Company:</b> Climeworks Mammoth	<b>Company Contact:</b> Pietro Rossi* Fintan Tuohy	<b>VVB:</b> 350 Solutions Guy Hardwick* Kelly Nesbitt Tim Hansen
<b>Removal Method:</b> Direct Air Capture & CO <sub>2</sub> Storage in Basalt Formations		
<b>Report Date:</b> December 1, 2025		
<b>Document No:</b> 350-PU2507.02-OA		
<b>Revision:</b> V1.1		

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### 1. Introduction

Puro.Earth contracted 350Solutions to perform an audit of carbon dioxide removal credit (CORC) claims for Climeworks Mammoth direct air capture (DAC) process. The Output Audit included observation of operations during a site visit, collection of files and evidence, review of data collection and handling procedures, and evaluation of adherence of the project to the relevant Puro.Earth Standard, and Methodology. The crediting period for the audit is June 1, 2024 – June 1, 2039.

This output audit involved a site visit to the Mammoth facility on September 16, 2025 and a desk review of documents provided by Climeworks, including the facility audit documentation completed by DNV. 350Solutions affirms that Mammoth has the appropriate equipment, procedures, and protocols in place to quantify GHG removal through DAC and CO<sub>2</sub> storage in Basalt Formations in accordance with the requirements of the relevant Puro.Earth General Rules and Geologically Stored Carbon methodology:

- Puro.Earth General Rules v4 [1]
- Geologically Stored Carbon v2 (2024) [2]

A summary of the project and Output Audit is provided below.

**Table 1: Output Audit Summary**

Audit Summary	
<b>CO<sub>2</sub> Removal Supplier</b>	Climeworks AG
<b>Removal Method</b>	Direct Air Capture & CO <sub>2</sub> Storage in Basalt Formations
<b>Verification Type</b>	Supplier Output Audit; Puro Standard General Rules (v4) and Geologically Stored Carbon Methodology (Edition 2024, v2)
<b>Production Facility Name and Registry</b>	Climeworks Mammoth, Facility ID: 417791
<b>Production Facility Locations</b>	Capture Facility: Nordurvellir 4, 816 Ölfus, Iceland
<b>Verified CORCs</b>	278.3 tonnes CO <sub>2</sub> -eq
<b>Audit Kickoff Date</b>	July 17, 2025
<b>Audit Report Date</b>	December 1, 2025

## 2. Technology Description

### 2.1. Process Overview

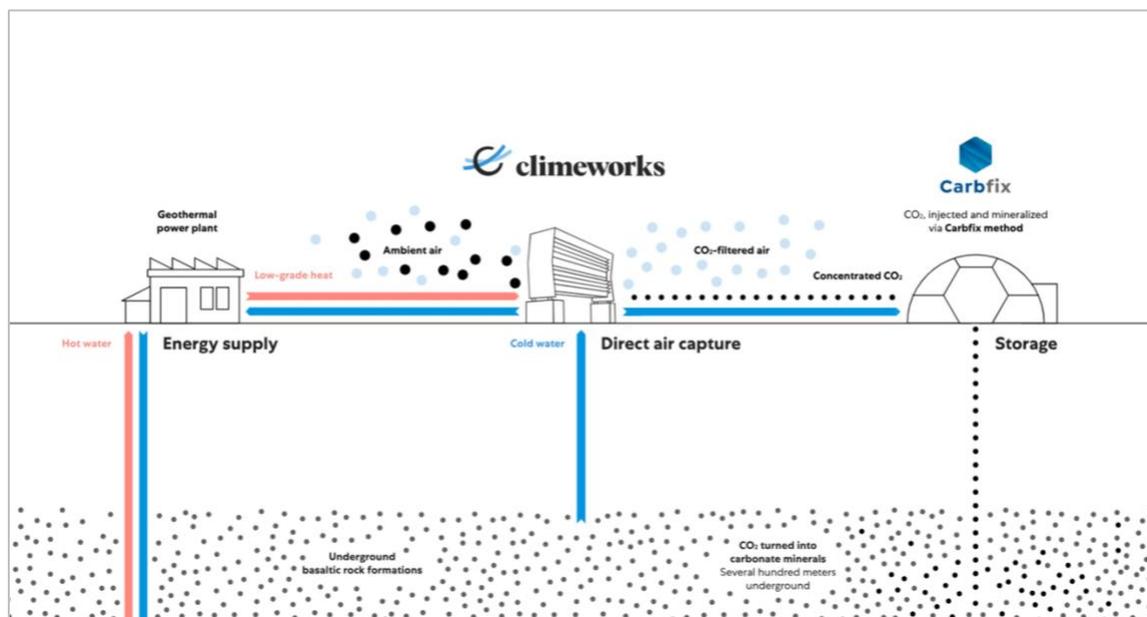


Figure 1: Mammoth process description (Source: Climeworks)

2.2. Climeworks Project Mammoth is the second DAC facility with permanent storage capabilities built by Climeworks, after Project Orca, based at the same address at the Hellisheiði geothermal power plant, 50 kms southeast of Reykjavik. Project Mammoth operates its DAC facility following the same basic three steps as Orca; capture, transport and storage, with a few minor differences, and at a larger scale (when all collector containers are operational). All operations are powered by low-grade waste heat provided by the Hellisheiði geothermal power plant, which is operated by the project partner ON Power, a subsidiary of Orkuveita Reykjavíkur (Reykjavik Energy). ON Power reports power and water usage monthly to Climeworks for use as part of

their DAC calculations.

### 2.3. Capture and Processing

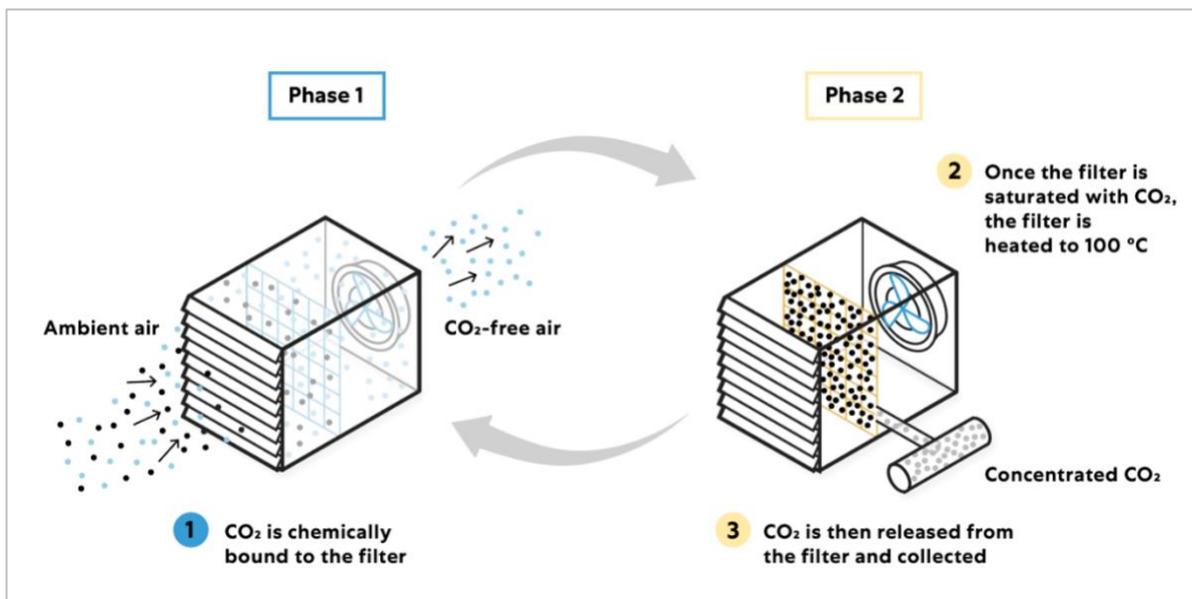
The first step of the system involves DAC which utilizes a series of fans and ‘collector containers’ containing solid sorbent material to chemically bind atmospheric carbon dioxide (CO<sub>2</sub>). Air with reduced CO<sub>2</sub> concentration is released back into the atmosphere. Mammoth will have a total of 72 ‘contactor containers’, with 3 in reserve on standby. The containers are stacked in 3’s, each consisting of 6 container sub-units which operate in tandem with one another. Once the sorbent in a sub-unit is saturated with CO<sub>2</sub>, it enters a desorption phase where the sub-unit is isolated and heated to around 100°C with a vacuum applied, to liberate the CO<sub>2</sub> from the sorbent. The process makes use of waste, low-grade heat from the geothermal facility. The sorbent material can complete several thousand cycles before needing replacement.

Figure 3: Depiction of the Climeworks vacuum-temperature swing adsorption process shows the front and back of each of the contactor containers, and how individual sub-units are isolated with a door that slides across each container.

Figure 3 is a simplified depiction of the vacuum- temperature swing adsorption process.



**Figure 2: Left. Rear of contactor containers showing array of fans for drawing CO<sub>2</sub> across sorbent material. Right. Isolation door of contactor container sub-units for application of heat and vacuum for CO<sub>2</sub> desorption.**



**Figure 3: Depiction of the Climeworks vacuum-temperature swing adsorption process**

The liberated CO<sub>2</sub> from each collector container feeds to two centralized, temporary, low pressure storage vessels. The CO<sub>2</sub> is then compressed and sent to the absorption tower where it is dissolved in water sourced from ONPower and two local wells. This ensures that water insoluble gases are removed prior to injection without the need for further processing. Figure 4 displays the temporary storage vessel, and the water absorption tower. Water that is used for CO<sub>2</sub> dissolution is treated with a series softeners and deionizers to prevent carbonate scaling buildup and potential corrosion

of equipment in the facility. The water quality is measured continuously to understand the carbonate content of the water prior to CO<sub>2</sub> dissolution to determine the baseline for Climeworks CORC calculation.

Figure 5 displays the pipes delivering the high temperature steam used in the DAC process and those used for return water. Also shown in

Figure 5 is the water treatment system used prior to the dissolution of the CO<sub>2</sub> in the absorption tower.



**Figure 4: Left. Temporary storage vessel for CO<sub>2</sub> liberated from the contactor sorbent. Right. Absorption tower where the captured CO<sub>2</sub> is dissolved into treated water.**



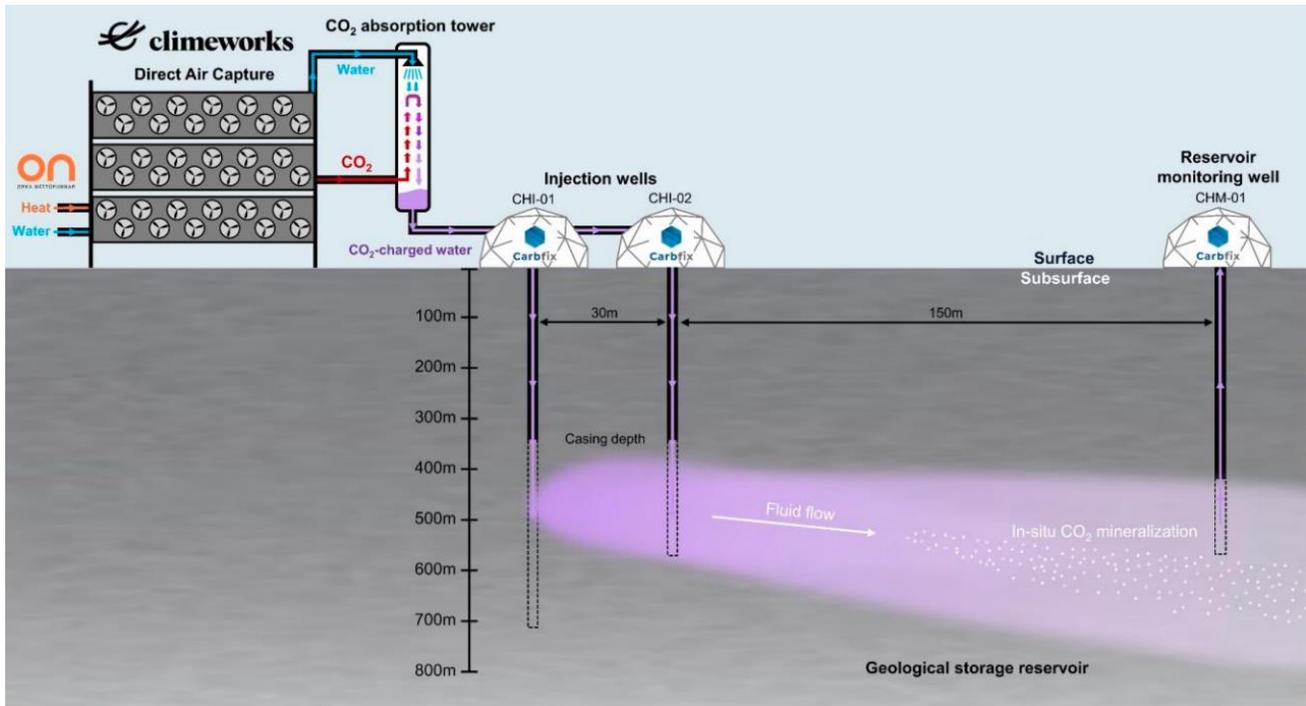
**Figure 5: Left. 170-degree steam pipes leading from ONPower generation plant to Mammoth facility as well as water return pipes. Right. Water treatment plant for softening and deionizing water used in CO<sub>2</sub> dissolution process. Monitoring equipment can also be seen.**

## 2.4. CO<sub>2</sub> Transportation

Project Mammoth and its injection facilities are located on the same site and are connected for CO<sub>2</sub> charged water by an underground pipeline of less than 300m. Booster pumps, controlled and powered by the DAC facility, feed the CO<sub>2</sub> charged water from the absorption tower to the injection wells. Upon arrival at the injection site, the CO<sub>2</sub> charged water is continuously monitored for CO<sub>2</sub> concentration, temperature, pressure and flow. These values are reported by Carbfix (the CO<sub>2</sub> storage partner) to Climeworks for use in their CORC calculations.

## 2.5. Injection and Storage

The CO<sub>2</sub>-charged water is injected via two injection wells (CHI-01 and CHI-02) into a basaltic geological reservoir at a depth of at least 350m to ensure that there is sufficient pressure to keep the CO<sub>2</sub> dissolved in the water. Upon injection, the higher density of the CO<sub>2</sub>-laden water relative to the reservoir water leads to it sinking, preventing upward migration of the CO<sub>2</sub> as would typically occur if it was injected as a free phase (i.e. not dissolved). Permanent storage of the CO<sub>2</sub> is provided through subsurface (in-situ) mineralization reactions in the basaltic rock. The CO<sub>2</sub>-charged water is acidic (with a pH of between 3 and 5) which leads to the dissolution and release of calcium, magnesium and iron from minerals contained within the storage reservoir rock, which bind with the dissolved CO<sub>2</sub> to form stable carbonate minerals such as calcite (CaCO<sub>3</sub>), magnesite (MgCO<sub>3</sub>) and siderite (FeCO<sub>3</sub>). It has been demonstrated that after two years, all the CO<sub>2</sub> will have mineralized, ensuring long term storage [3], with field trials showing that this process can occur within months of injection. The injection well and storage formation is managed by Carbfix, Climeworks' dedicated storage partner, and is in compliance with all local laws and regulations, and the EU CCS directive. During injection, pressure, temperature, and flow for both the gaseous CO<sub>2</sub> stream and the injected water are recorded continuously as part of Carbfix normal operations. The reservoir monitoring well (CHM-01) and groundwater monitoring wells located downstream of the injection well are used in combination with reservoir models to track the fate of CO<sub>2</sub> and verify that storage is occurring as described. Figure 6 depicts the injection, permanent storage process and Carbfix operations. Carbfix assumes full responsibility for injection, monitoring, and long-term liability of the injection and storage site.



**Figure 6: Diagram depicting CO<sub>2</sub> Mammoth DAC process and Carbfix injection and monitoring process. Permanent storage mineral trapping mechanism is also displayed.**

## 2.6. Inputs and Outputs

A summary of process inputs and outputs associated with Mammoth’s operations are included in Table 3.

**Table 2: Verified DAC Production Inputs & Outputs**

Input / Output	Item	Verified Amount Over Monitoring Period <sup>1</sup>	Notes (Specifications, source, etc.)
<b>INPUTS</b>			
<b>Electrical Energy</b>	DAC, compression, water treatment, CO <sub>2</sub> dissolution, misc. site usage	4,822 MWh	100% provided by ONPower Geothermal power facility. Market leakage determined to be 0.
<b>Thermal Energy</b>	DAC, misc. site usage	12,713 MWh	100% provided by ONPower Geothermal power facility. Market leakage determined to be 0.
<b>Water</b>	Dissolution process, freshwater usage during ONPower energy generation	695,776 m <sup>3</sup>	Water is fully provided by ON Power, and CO <sub>2</sub> is dissolved in water before the CO <sub>2</sub> -rich water is delivered to Carbfix. In the case of Mammoth, Carbfix doesn't use any additional water.

<b>DAC Units &amp; Infrastructure</b>	DAC containers, liquefaction, filtration, compression, storage, misc. site usage	-	Mammoth facility lifetime is expected to be until at least 2039. Embodied emissions amortization starting 2029
<b>DAC Sorbent</b>	Sorbent consumed during monitoring period	6.13 tonnes	Spent or spilt sorbent
<b>Maintenance and Repairs</b>	Consumables used during associated maintenance for DAC units and Mammoth infrastructure	-	Internally tracked and compared to designated number of emissions within the total grey emissions to be amortized.
<b>Natural Carbon of water</b>	Natural carbon content of water used for Dissolution of CO <sub>2</sub>	10.04 tonnes	Calculated based on DIC test results conducted by external lab.
<b>OUTPUTS</b>			
<b>Captured CO<sub>2</sub></b>	Gross CO <sub>2</sub> captured during DAC process	442.10 tonnes*	Total CO <sub>2</sub> captured during DAC measured by Climeworks
<b>Stored CO<sub>2</sub></b>	Gross CO <sub>2</sub> injected into geological storage	452.14	Total CO <sub>2</sub> injected, measured by Carbfix and reported to Climeworks
<b>CO<sub>2</sub> released/ reversal</b>	Total amount of CO <sub>2</sub> released during injection and storage	0.638 tonnes	Total CO <sub>2</sub> released during intentional pumping of water from monitoring well and unintentional released.
<b>Operational Emissions</b>	Emissions released during Climeworks and Carbfix operations	163.1 tonnes	Total operational emissions related to heat, electricity, sorbent and water usage.
* Calculated based on Total CO <sub>2</sub> injected (452 tonnes) minus natural Carbon contents of water used during dissolution of captured CO <sub>2</sub> (10.04 tonnes).			

## 2.7. Changes since last Output Audit

Since the previous output audit, Climeworks has updated the project grey-emissions treatment for the Mammoth facility. The full amortization schedule for construction, maintenance, and decommissioning-related emissions has now been formalized, with allocations spread across years 6 to 15 of the plant’s operating life. The schedule specifies annual percentage deductions from late 2029 through April 2039, ensuring a more transparent and consistent application of grey emissions in line with the facility’s lifecycle profile. In addition, a contingency provision for future repairs and major component replacements has been incorporated, enabling more accurate forecasting of potential adjustments to the total amortized emissions in subsequent reporting periods.

Furthermore, Climeworks have reduced the emissions factors associated with the thermal energy supply, electrical energy supply, water supply and sorbents supply during this reporting period.

- The reduction in emissions from thermal and electrical energy and water supplies were a direct result of operational changes made by ONPower from the implementation of project Silverstone. Project Silverstone reduces CO<sub>2</sub> emissions by dissolving waste gases from the geothermal electricity production process into water and injecting into basaltic formations for permanent storage.
- The emissions reductions for sorbent production & use are due to Climeworks purchasing renewable energy credits for sorbent supply chain emissions. Puro Advisory Board

approved an update to Rule 5.2.19 allowing ongoing fractional use of RECs to adjust LCA emission factors for long-lived consumables such as sorbents. Previously, only up-front in-full REC procurement was permitted. The updated rule now includes clarified conditions for REC eligibility (spatial matching, temporal matching, energy-source specification, and commissioning disclosure). This ensures Climeworks can legally and consistently apply REC-based emission adjustments for their future sorbent use.

### 3. Audit Summary

#### 3.1. Audit Approach

A planned series of audit activities were conducted by 350Solutions to independently validate and verify production and output data, and CORC claims for the reporting period. The audit was conducted following the specifications of Puro General Rules (Version 4) and Geologically Stored Carbon Methodology (Edition 2024, v2). Specific audit activities conducted are summarized in Table 3. Auditor qualifications are attached as Appendix 3.

**Table 3: Audit Activities**

Date(s)	Verification Activity	Verification Tasks	Documents Reviewed
July 17, 2025	Introductory Document Review and information exchange	<ul style="list-style-type: none"> <li>- Opening meeting and review of operational and procedural changes</li> <li>- Review of LCA and supporting documentation</li> <li>- Requested previous audit reports and supporting documentation</li> <li>- Review of Puro CORC calculations</li> <li>- Review of product properties</li> <li>- Review of product end use</li> <li>- Discussed operational changes</li> <li>- Discussed audit process and site visit dates</li> <li>- Discussed scope as “expanded output audit”</li> </ul>	<ul style="list-style-type: none"> <li>- Mammoth Project Grey Emissions amortization schedule.docx</li> <li>- Mammoth LCA Model 2025-10-15 with RECs.xlsm</li> <li>- Mammoth LCA Model 2025-10-15 without RECs.xlsm</li> <li>- Mammoth RECs, Green heat certs and biodiesel certs.xlsm</li> <li>- Puro CORC Report Mammoth_V1.1 - 2025-08-31_Puro modification with RECs.xlsx</li> <li>- Puro CORC Report Mammoth_V1.1 - 2025-08-31_Puro modification without RECs.xlsx</li> <li>- 2024-07-03 Calibration certificate Flow RMU.pdf</li> <li>- 2025-01-17 Heartbeat verification Flow RMU.pdf</li> <li>- 2025-02-18 FIR Carbo 6100.pdf</li> <li>- Community_Engagement_Iceland_Sep2025_Update.docx</li> <li>- LCA Report DC110_2025_06_30.pdf</li> <li>- Leakage Determination.xlsx</li> <li>- Mammoth risk register.xlsx</li> <li>- Uncertainty calculation - 31-08-2025.xlsx</li> <li>- 2025-03 Mammoth Monthly Monitoring Report.pdf</li> <li>- 2025-05 Non-conformance report.pdf</li> <li>- 2025-05 Mammoth Monthly Monitoring Report.pdf</li> <li>- 2025-07 Mammoth Monthly Monitoring Report.pdf</li> <li>- Non-conformance report 25_01.pdf</li> <li>- Climeworks_Mammoth_2025_02-03.pdf</li> <li>- Climeworks_Mammoth_2025_04.pdf</li> <li>- Climeworks_Mammoth_2025_05.pdf</li> <li>- Climeworks_Mammoth_2025_06.pdf</li> <li>- Climeworks_Mammoth_2025_07.pdf</li> <li>- Climeworks_Mammoth_2025_08.xlsx</li> <li>- 2025_07_Electricity.pdf</li> <li>- 2025_03 Mammoth ON invoices.pdf</li> <li>- 2025_07_Absorption Water.pdf</li> <li>- 2025_07_Cold Water.pdf</li> <li>- CDR Report Mammoth.pdf</li> </ul>
September 16, 2025	Site Visit	<ul style="list-style-type: none"> <li>- Conducted onsite walkthroughs of Orca, Mammoth, and Carbfix facilities</li> <li>- Reviewed CO<sub>2</sub> capture, transfer, and injection operations</li> <li>- Verified measurement instruments and calibration records</li> <li>- Assessed CO<sub>2</sub> capture, injection, energy, and monitoring datasets</li> </ul>	<ul style="list-style-type: none"> <li>- 2025-07 Mammoth Monthly Monitoring Report.pdf</li> <li>- Non-conformance report 25_01.pdf</li> <li>- Climeworks_Mammoth_2025_02-03.pdf</li> <li>- Climeworks_Mammoth_2025_04.pdf</li> <li>- Climeworks_Mammoth_2025_05.pdf</li> <li>- Climeworks_Mammoth_2025_06.pdf</li> <li>- Climeworks_Mammoth_2025_07.pdf</li> <li>- Climeworks_Mammoth_2025_08.xlsx</li> <li>- 2025_07_Electricity.pdf</li> <li>- 2025_03 Mammoth ON invoices.pdf</li> <li>- 2025_07_Absorption Water.pdf</li> <li>- 2025_07_Cold Water.pdf</li> <li>- CDR Report Mammoth.pdf</li> </ul>

		<ul style="list-style-type: none"> <li>- Reviewed CORC quantification and LCA supporting documents</li> <li>- Evaluated site permits, environmental safeguards, and monitoring plans</li> <li>- Reviewed additionality evidence and community engagement practices</li> </ul>	<ul style="list-style-type: none"> <li>- File: Renewable energy procurement for supply chain</li> <li>- Climeworks update on SDG goals progress - Sep 2025.pptx</li> <li>- Trade Registry Certificate - Carbfix (Icelandic).pdf</li> <li>- Trade Registry Certificate - Orca náttúrunnar (Icelandic).pdf</li> <li>- Statement of Ownership Climeworks.pdf</li> <li>- ISOR_Certificate of Registration (English).pdf</li> <li>- Puro Additionality_Mammoth_final.pdf</li> <li>- StoragePermitApplication-RiskAssessment-CONFIDENTIAL.pdf</li> <li>- Puro Stakeholder Engagement Report_final.pdf</li> <li>- Environmental and Social Safeguard Questionnaire - v1.0_final.pdf</li> <li>- EIA for Hellisheiði - Report Submitted by Carbfix - Jan 2023 (Icelandic).pdf</li> <li>- File: evidence of safe working environment</li> <li>- Building permit approval (IS).pdf</li> <li>- Capture site description.xlsx</li> <li>- Environmental impact assessment waiver (IS).pdf</li> <li>- Monitoring Plan.xlsx</li> <li>- Mammoth PDD Direct Air Capture and Geological Storage V1.0.pdf</li> <li>- Puro Public Project Description V1.0.pdf</li> </ul>
<b>November 20 – 28, 2025</b>	Data Review	<ul style="list-style-type: none"> <li>- Review of LCA and supporting documentation</li> <li>- Review of Puro CORC calculations</li> <li>- Review of raw material sources and sustainability</li> <li>- Review of system inputs and outputs</li> <li>- Review evidence of product output</li> <li>- Review of product properties</li> <li>- Review of product end use</li> <li>- Review of equipment and calibrations</li> <li>- Reviewed previous Output Audit Reports</li> <li>- Reviewed original production facility audit documentation</li> </ul>	
<b>November 26 – December 1, 2025</b>	Report Writing	<ul style="list-style-type: none"> <li>- Compose Audit Report</li> <li>- Internal quality control</li> </ul>	Puro CORC Report Mammoth_V1.1 - 2025-08-31_Puro modification with up front RECs.xlsx CDR Report Mammoth.pdf

### 3.2. Verified Output & CORCs

Table 4 includes the specific CORCs claimed by Climeworks for its Mammoth facility during the reporting period, as well as the level verified by 350Solutions during the data review.

**Table 4: Verified CORCs for the Mammoth Facility**

Performance Metric Name / Description	Claimed Value	Verified Value <sup>1</sup>	Data Source	Reporting Period
<b>CO<sub>2</sub> Stored</b>	442.10 tonnes	442.10 tonnes	- Puro CORC Mammoth_V1.1-2025-08-31_Puro modification with up front RECs (1)	March 1 <sup>st</sup> 2025
<b>CO<sub>2</sub> Emissions</b>	163.1 tonnes	163.1 tonnes		-
<b>CO<sub>2</sub> Releases/ Reversals</b>	0.638 tonnes	0.638 tonnes		August 31 <sup>st</sup> 2025

<b>Total CORCs</b>	278.3	278.3		
<sup>1</sup> Verified values are based on verification of final production records for the reporting period.				

## 4. Audit Findings

### 4.1. Summary of Audit Findings

350Solutions has reviewed and audited the documentation of the technology, the instrumentation, the procedures, performance and collected data and has found that the data presented in the Puro Audit Package and during the site visit and follow up:

**Meets the requirements of the Puro General Rules V4 and Geologically Stored Carbon Methodology (Edition 2024, v2)**

**Meets the requirements of the Puro General Rules V4 and Geologically Stored Carbon Methodology (Edition 2024, v2) with minor modifications**

**Does Not Meet the requirements of the Puro General Rules V4 and Geologically Stored Carbon Methodology (Edition 2024, v2)**

350Solutions utilized a reasonable level of assurance in performance of the output audit. A summary of findings associated with primary requirements of the *Puro General Rules* and *Geologically Stored Carbon Methodology* and any identified issues with the audit are summarized below.

**Table 5: Audit Findings**

Puro GSC Method. Section Ref.	Audit Verification Topic	Final Findings
3.2	Eligibility of the CO <sub>2</sub> Stream	Acceptable. The project demonstrated that captured CO <sub>2</sub> is fully eligible under Puro v4 requirements. DAC-derived CO <sub>2</sub> was verified as atmospheric through operational capture records, with no evidence of fossil-origin inputs.
2.2 & 3	Production Facility Definition & Eligibility	Acceptable. System components for capture, transport, and storage were clearly defined and aligned with the activity boundary criteria. All included infrastructure exists solely for CO <sub>2</sub> removal purposes as required.
3.4	Baseline Scenario Demonstration	Acceptable. The project provided a defensible baseline consistent with Puro v4 guidance. No alternative activity would result in greater geological carbon stock, and no fossil sources are involved.
3.5	Additionality Requirements	Acceptable. Documentation shows the CO <sub>2</sub> removal activity is not legally required and depends on carbon finance to operate at scale. No evidence of regulatory mandates or double-benefit conditions was observed.
3.6	Prevention of Double Counting	Acceptable. Contractual attestations confirm sole ownership of the carbon removal attribute and prohibit claims by any party in the capture, logistics, or storage

		chain. No marketing or corporate GHG accounting conflicts were identified.
<b>3.3</b>	Requirements for the CO <sub>2</sub> Removal Supplier	Acceptable. The Supplier demonstrated legal registration, metering capability, end-to-end contractual control of CO <sub>2</sub> , and provided all required agreements with capture, logistics, and storage operators ensuring audit access.
<b>3.2.8–3.2.12</b>	Legal Framework, Permits & Regulatory Compliance	Acceptable. The storage site operates under a regulatory framework equivalent to Class VI/CCS Directive requirements. All relevant permits for capture, transport, and injection were reviewed and found to be valid and compliant.
<b>3.2.6–3.2.7</b>	Storage Reservoir Eligibility & Site Characterization	Acceptable. Geological characterization confirms the reservoir meets Puro’s criteria for permanent storage, including caprock integrity and confinement. No evidence of incompatibility or sub-surface risks was identified.
<b>3.2.6 &amp; 7.5</b>	Injection Operations & Conditions for Geological Storage	Acceptable. Injection parameters, well integrity records, and operational data confirm the site operates within required pressure and temperature limits. CO <sub>2</sub> is injected under conditions suitable for long-term containment.
<b>7</b>	Monitoring Requirements	Acceptable. A comprehensive monitoring plan is in place covering capture, transport, and storage phases. Instrument calibration records and plume monitoring procedures satisfy Puro v4 monitoring expectations.
<b>6</b>	Leakage Assessment, Mitigation & Quantification	Acceptable. The project evaluated all potential leakage pathways and provided mitigation measures. No ecological, market-based, or activity-shifting leakage risks were identified that would materially affect net-negativity.
<b>7.6 &amp; 8.2</b>	Reversals, Release & Corrective Actions	Acceptable. The project maintains appropriate contingency and corrective action procedures for well failure, unexpected releases, or operational reversals. No conditions suggesting elevated reversal risk were observed.
<b>3.8 &amp; 3.9</b>	Environmental and Social Safeguards	Acceptable. The project demonstrated that its activities cause no net harm and comply with relevant environmental and social safeguards, and community-level protections.
<b>4</b>	Quantification of CO <sub>2</sub> Removal (CORC Output)	Acceptable. Quantification follows Puro v4 methodology using complete datasets The calculations reviewed were internally consistent, traceable, and conservatively applied.
<b>5</b>	Life Cycle Assessment Requirements	Acceptable. The project submitted an LCA prepared according to ISO/WRI/PAS2050 principles. All emissions within the activity boundary were included and independently verified prior to audit review. RECs were also correctly used/applied according to the revised rule 5.2.19
<b>4.8</b>	Uncertainty Assessment	Acceptable. Measurement uncertainties were identified and managed using lower-bound conservative values as required. Calibration documentation for flow meters and measurement systems was complete and current.

<b>8</b>	Risk and Uncertainty Management	Acceptable. Operational, geological, and logistical risks were appropriately assessed. The project has reasonable controls to ensure permanence, and no unmitigated high-risk factors were identified.
<b>3.3.6 &amp; 7</b>	Data Availability, Documentation & Auditability	Acceptable. All required documentation—including operational records, data logs, calibration certificates, and contracts—was provided in full. Data trails were coherent, auditable, and sufficient for verification.

Additional details regarding audit activities, documents reviewed, and observations during the audit process are summarized in Appendix 1.

## 4.2. Critical Findings and Exceptions

Assessment of the output audit package and associated CORC report identified several initial findings (Appendix 1). All findings, primarily associated with missing supporting evidence, have been addressed and closed. Findings of note include the following:

**Table 6: Critical Findings**

ID No	Type	Finding / Issue	Conclusion / Resolution
3	Omission	<p>A review of the project’s risk registers to assess whether it adequately identifies, evaluates, and mitigates risks associated with CO<sub>2</sub> transport, geological storage, and potential reversals was undertaken.</p> <p>The current version of the register did not explicitly address CO<sub>2</sub> transport risks and Geological storage.</p> <p>In the absence of clearly documented risk categories and mitigation measures for these areas, the register did not fully meet expectations for comprehensive risk identification and tracking.</p>	<p>Climeworks revised the risk register accordingly. The additions now provide improved coverage of CO<sub>2</sub> transport, geological storage, and reversal-related risk categories.</p>

## 4.3. Forward Action Requests and Recommendations

A full list of Output Audit findings is provided in Appendix 2. Section 4.3 outlines the forward action requests (FARs) and recommendations for this reporting period, supporting improvements in future operations and CORC calculations while enabling monitoring of any emerging issues in subsequent Output Audits. A summary of open FARs and opportunities for improvement is presented below for reference in future verifications.

**Table 7: FARs and Recommendations**

ID No	Type	Finding / Issue	Conclusion / Resolution
15	FAR	Modelling results for GHG assessment in reservoir	An assessment of the storage reservoir is being conducted by Carbfix in 2026. The results for this are to be made available during the next Output Audit to confirm the storage reservoir is behaving as predicted.

32	FAR	Permit update March 2026 (Carbfix)	The results from the permit update are also to be made available once they have been completed in March 2026 to ensure that Carbfix are still eligible for injection of CO <sub>2</sub> into the storage reservoir.
1	FAR	<p>During the assessment of stakeholder engagement practices, the Verifier sought clarification on how interested or affected stakeholders—beyond existing business clients—can contact Climeworks to raise concerns, submit queries, or communicate with the company.</p> <p>While Climeworks demonstrated well-structured communication pathways for contracted business customers (dedicated account owners, regular business reviews, and priority escalation), a clear and accessible mechanism for new stakeholders or impacted community members was not evident.</p> <p>Under Puro General Rules 6.4.5, CO<sub>2</sub> Removal Suppliers must:</p> <ul style="list-style-type: none"> <li>• maintain “accessible and transparent communication channels for all interested and affected stakeholders,”</li> <li>• provide “clear instructions for submitting concerns or complaints,” and</li> <li>• ensure “stakeholder contact points are visible, publicly available, and easy to identify.”</li> </ul> <p>Climeworks currently relies on (a) Icelandic authorities’ formal complaint mechanisms and (b) a general website contact form. However, neither is sufficiently visible nor clearly framed as the designated channel for submitting concerns regarding Climeworks’ CO<sub>2</sub> removal activities. Additionally, the information is not displayed at facility entrances or publicly signposted in a way that satisfies Puro’s expectation for accessible communication pathways.</p>	<p>Climeworks is required to establish a dedicated communication channel through which any interested or affected stakeholder can contact the company directly, including:</p> <ul style="list-style-type: none"> <li>• clear instructions for submitting questions, concerns, or complaints;</li> <li>• publicly accessible and visible information (e.g., on company website and/or signage at facility entrances);</li> <li>• a designated point of contact or monitored address;</li> <li>• documentation of procedures for receiving, recording, and responding to stakeholder input.</li> </ul> <p>Evidence of implementation should be submitted for review as part of the next verification cycle.</p>
33	Recommendation	Maintenance and repairs tracker which documents all consumables and materials that have been used during normal maintenance and repair operations	Currently, Climeworks track these items internally and compare the calculated emissions to a designated amount of the grey emissions to be amortized in the future.

## 5. Revision History

Version	Date Issued	Noted Changes
<b>Draft v1.0</b>	November 28, 2025	Initial Draft
<b>Draft v1.1</b>	December 1, 2025	Post internal quality assurance review, minor edits
<b>Final v1.2</b>		Edits following review by Puro

## 6. Auditor Signatures

Auditor Information		
VVB	Auditor	350Solutions Project ID No.
350Solutions, Inc.	Guy Hardwick (Lead Verifier)	PU2507.02
350Solutions, Inc.	Kelly Nesbitt (Supporting Verifier)	
350Solutions, Inc.	Tim Hansen (Quality Assurance)	

**Signed:** Guy Hardwick (Lead Verifier)

Kelly Nesbitt (Supporting Verifier)

**Signed:** Tim Hansen (Quality Assurance)



### 6.1. Validation and Verification Body Details

350Solutions Inc. declares that we are an impartial verifying body, free from any conflicts of interest, capable, and qualified to complete this verification for the current operational period according to the Puro Standard and applicable methodologies.

350Solutions is an accredited inspection & verification body by ANAB under ISO 17020:2012 for completion of ISO 14034:2016 Technology Verifications and was the first accredited entity in North America for ISO 14034:2016. 350Solutions is based out of Raleigh, North Carolina, USA.

350Solutions Technical Lead for the Climeworks project Output Audit is Guy Hardwick, supported by Kelly Nesbitt. Quality assurance was provided by Tim Hansen. Complete qualifications are attached as Appendix 3.

Our opinion is provided with a reasonable level of assurance for Climeworks' activities at the Mammoth project.

*Notice: 350Solutions, Inc. declares that we are an impartial auditor, free from any conflicts of interest, capable, and qualified to complete this audit according to the Puro Standard and related Validation and Verification Body Requirements. Verifications and audits conducted by 350Solutions are based on an evaluation of technology performance and CO<sub>2</sub> removal claims via site visit observations and review of data submitted by the audited company. Audits are completed in accordance with rules and methodologies specified by Puro and utilizing the appropriate quality assurance procedures established under the 350Solutions accredited ISO 17020/14034 Quality Management Program, noting that this verification is not a fully compliant ISO 14034:2016 verification. 350Solutions makes no*

*expressed or implied warranties as to the performance of the technology and does not certify that a technology will always operate at the levels verified, nor that it meets all state, local, or federal legal requirements.*

## 7. References

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- [1] Puro.Earth, Puro.Earth General Rules version 4.0, 2024, Website: <https://puro.earth/document-library?tab=methodologies>
- [2] Puro.Earth, Puro.Earth Geologically Stored Carbon version 2, 2024, Website: <https://puro.earth/document-library?tab=methodologies>
- [3] Matter et al., Rapid carbon mineralization for permanent disposal of anthropogenic carbon dioxide emissions, 2016, Website: <https://www.science.org/doi/10.1126/science.aad8132>

## Appendix 1: Log of Findings

All material clarifications, misstatements, and omissions have been resolved.

Type	Finding/Issue	Required Action	Supplier Response	350 Response	2nd Supplier Response	Conclusion/Resolution
Clarify	How can stakeholders contact you / authorities / convey their concerns?		Stakeholders: Climeworks has circa <b>160 business customers</b> . Each business customer has a Climeworks account owner. The business can reach out to the respective account owner with concerns and any concern from a business is treated as a priority. If the account owner moves on from Climeworks, the account ownership is transferred to a colleague. Account owners actively arrange regular business reviews with their business customers.	How do new interested and /or affected parties contact you? (Community Engagement Iceland - Update 2025) Point 5. you provide information where people can submit complaints or queries, but how do people find this information? Is it displayed on a sign board at your premises entrance and on your company website?	Community Engagement Iceland - Update 2025 Point 5: this is a communication channel specific for official complaints through the Icelandic authorities, not a communication channel established by Climeworks. Here it is assumed that stakeholders know our business since their complaint would be specific to us. As we are a registered business in Iceland the municipality or other relevant agencies have our business contact and would contact us to handle any such complaint.  More in general, our website provides a contact form where any interested stakeholder can get in contact with us. Those emails are routinely checked by our Communications team. ( <a href="https://climeworks.com/contact">https://climeworks.com/contact</a> )	Climeworks have conducted and continue to conduct extensive community engagement. See line 6 for recommendations regarding grievance mechanisms.
Clarify			Stakeholders: Individual consumers or <b>Pioneers</b> can contact Climeworks via the Climeworks Pioneers email address. Climeworks has a dedicated Pioneers and Sustainability Lead responsible for dealing with any concerns from Pioneers.			See line 6
Clarify			Stakeholders: A number of <b>carbon rating agencies</b> have contacted Climeworks with concerns and questions regarding our operations. Climeworks has a Senior Science and Technology Manager responsible for dealing with concerns from carbon rating agencies.			See line 6
Clarify			Stakeholders: Climeworks employs a Project Director Country Director for Iceland who to only handles concerns which are raised by the <b>local community</b> but proactively reaches out to community members in Iceland.			See line 6
Clarify	Is there a grievance register in place?	Provide document	Stakeholders: <b>The Government</b>	No, but we have a robust communication process that connects external stakeholders with		See line 6 Recommendation that Climeworks put together a robust grievance

			the relevant Climeworks employee and the plant manager.		mechanism which is easily accessible via their website and communicated to the wider community. Grievance log is recommended to monitor grievances, when they were raised and how/ if they were resolved.
Omission	The current risk register does not address CO <sub>2</sub> transport risks, geological storage risks, or include a reversal-risk assessment.	Update the risk register to include: - CO <sub>2</sub> transport risks - pipeline (operational interruptions, handling, accidental release, regulatory compliance). - Geological storage risks (well integrity, mineralization performance, monitoring failure, leakage pathways). - A clear reversal-risk assessment outlining potential reversal mechanisms and mitigation measures.	Lines 41 to 51 address CO <sub>2</sub> transport risks (line 47) and geological risks (43-46, 48, 50) as well as other CO <sub>2</sub> injection risks. Reversal risks are covered by answer in line 5 of this RFI. A line in the Risk Register for reversal risk has been added as well		Thank you for pointing out these items and updating the risk register
Omission	A documented reversal-risk assessment	Please provide documentation in which you discuss/evaluate project specific factors that could increase the overall reversal			See above
Clarify	Please confirm the location of the CO <sub>2</sub> purity tests for the CO <sub>2</sub> captured at both facilities	CO <sub>2</sub> stream tests	Purity tests are conducted for Orca on a monthly basis. Results are in "2025-08-25 LE121590-0001 test report.pdf"  In Mammoth, dissolved CO <sub>2</sub> is injected (not pure CO <sub>2</sub> ), therefore the requirement of purity test doesn't apply. The CO <sub>2</sub> stream is continuously monitored at the point of injection		Thank you for clarifying this item
Omission	Documentation for roles and responsibilities for Mammoth facility with Carbfix is missing. Please confirm whether the Monitoring plan for Orca, which calls out responsibilities	Confirm Monitoring Plan for Mammoth is the same as Orca or provide Mammoth monitoring plan	The monitoring plan details who between Carbfix and Climeworks is responsible for which instrument (column Q). The ownership of each instrument is complete (data quality, maintenance, inspections...)		Updated monitoring plan received. Thank you

	of each party is appropriate.				
Clarify	Please confirm that Climeworks operations do not fall under the NDC's for Iceland	Confirm information	Climeworks' CDR activities at the Orca and Mammoth in Iceland are certified under the Puro Geologically Stored Carbon Methodology and verified by external auditors. Certification ensures that each ton of CO <sub>2</sub> removed is issued as a Carbon Removal Certificate (CORC) in the Puro.Earth registry, which is designed for voluntary carbon markets—not Iceland's own NDC.		Thank you for providing the statement.
Omission	Documentation associated to the permitting for water use is not present in the Carbfix permits, or any other documentation	Please provide water use permits for Carbfix and Climeworks	No documentation, Climeworks is not the licensee for water extraction. ON Energy provides water for Climeworks in Iceland. ON Energy has a license to extract 2,000 liters / second from the Engidalur well 5 km north of Hellisheidi. Currently, ON avails of approximately 900 liters / second.	Is the water that is also used by Carbfix for Orca operations also provided by ONPower? Specifically, I am thinking about the water sourced from the two local wells. Is this the case for the well those feeds into Mammoth also?	Water for Mammoth is provided by ON Power. In case of Orca, Carbfix extracts the water where CO <sub>2</sub> is dissolved and reinjects that underground. The water permit from Carbfix has been added (Water Permit Carbfix Orca - Leyfi-OS-2015-L026-02, relevant part in articles 4 and 6). Make-up water for Climeworks process is provided by ON Power. Orca cooling water is provided and circulated back to ON Power.  Water for Mammoth is fully provided by ON Power, and CO <sub>2</sub> is dissolved in water before the CO <sub>2</sub> -rich water is delivered to Carbfix. In the case of Mammoth, Carbfix doesn't use any additional water.
Clarify	Confirm that the flow meter for the CO <sub>2</sub> injected has a measurement frequency of 15 minutes or less	Please clarify	The flow sensors for the injection water flow have a measurement frequency of 10 sec. Average minute values are used for the calculation of CO <sub>2</sub> injected.		Confirmed - thank you
Omission	Please provide a copy of the LCA report which justifies the modelling choices made for the CORCs model	Please provide LCA explainer document	Documentation provided for all relevant LCA's		Confirmed in Facility audit package provided
Clarify	Please clarify that emissions associated to ongoing monitoring are less than 1% of the emissions of the storage stage.	Please clarify	The only material monitoring emissions are related to water samples extracted from the monitoring well, few kg per sample. The monitoring plan post-closure calls for no more than 5 samples per year which renders these emissions negligible (against a total construction emission of the storage stage of ~500 tCO <sub>2</sub> ).		Explanation covers this requirement. Thank you

			Monitoring emissions before closure are duly accounted for as intentional reversals (see CORC report)	
Clarify	Confirm when Carbfix last conducted monitoring of well pressure decay and ensured location of charged water was what was expected by the well model	Please confirm date and report if any.	The wellhead pressure is monitored continuously (see document with hourly averaged values). The results of the updated model will be submitted for the storage permit report in April 26.	Confirmed. Thank you for clarifying. FAR for review of updated well model
Omission	No Stakeholder engagement report provided.	Provide document	This document is part of the facility audits documentation. Puro.Earth should have given access to the facility audit documentation to 350 Solutions. In addition, the file (Puro Stakeholder Engagement Report_final) has been added to the RFI folder. A short update on the activities relevant for the year 2025 has also been provided (Community Engagement Iceland - Update 2025.docx)	Document provided for review
Omission	Missing a copy of the explicit anti-discrimination policy	Provide document		Document provided for review
Omission	Missing a copy of the document referencing human rights principles	Provide document		Document provided for review
Omission	Missing documentation on Labor rights and working conditions	Provide document		
Omission	Missing documentation on Gender and non-discrimination	Provide document		Document provided for review
Omission	Climeworks does not address pollution prevention to air, water and soil as well as noise and vibration	Provide document, EIA?		sufficient data/clarification provided

Omission	Avoiding or minimizing adverse impacts to community health and safety	Provide EIA for review	<p>There is one EIA covering the entire Hellisheiði site, comprising of both Climeworks and Carbfix facilities for both Orca and Mammoth projects. This was prepared by Carbfix in 2023 and is provided both in original language, Icelandic, and in English translation.</p> <p>This document is part of the facility audits documentation. Puro.Earth should have given access to the facility audit documentation to 350 Solutions.</p> <p>In addition, the file (EIA for Hellisheiði - Report Submitted by Carbfix - Jan 2023) have been added to the RFI folder.</p>	Document provided for review
Omission	Missing documentation covering assumption, model, parameter representativeness and default-value justification, System-level and storage-related uncertainty factors, Full uncertainty propagation to final CO <sub>2</sub> removal values	Provide documents	Sources added to the uncertainty calculation. Error propagation formula valid as is. Details for injected water and DIC values for the monitored period have been added and the final uncertainty updated	sufficient data/clarification provided
Clarify	Climeworks outlines their monitoring system including QA/QC procedures and a secure data management system, quantitative monitoring information is collected and managed appropriately. Omission in documentation: Documentation does not explicitly outline	Is this occurring? Revise applicable documentation to include this process	<p>The Monitoring Plan outlines how often sensors, which are relevant to the CDR calculation chain, are validated or calibrated. The document "QA/QC procedures for measurement device" still applies as in the facility audit. The chapter 3.5 of the Project Description still applies as in the facility audit.</p> <p>SOPs for internally validated instruments are added (O4131-GEN--ALL-SOP-10005 and O4131-GEN--ALL-SOP-10006). Externally calibrated instruments are calibrated as per manufacturers procedures. Reports for Master instruments are submitted during output audits whenever due, as per the Monitoring Plan</p>	sufficient data/clarification provided

	that time stamp data is occurring (this is assumed)			
Omission	Monitoring Plan required, reference is made to this document in the PPD.	Provide a copy of mammoths monitoring plan for review	It looks like the Monitoring Plan is not there anymore, despite having discuss a few changes about that during the Eligibility Check with Puro.Earth. It has now been uploaded again in "02 Updated facility documents"	Document provided for review
Omission	documentation showing continuously monitoring of temp and pressure at the well	Please provide copies for review	The temperature and pressure sensors for the injection have a measurement frequency of 10 sec. Average hourly data is provided in the additional documents.	Monitored by storage partner and parameters reported monthly.
Clarify	Where do you take your chemical sampling from?	Please clarify	Chemical samples of the CO2 stream are taken at the interface between Climeworks and Carbfix facilities in Orca and at the injection well in Mammoth	sufficient data/clarification provided
Clarify	How does Climeworks track maintenance and repairs for Mammoth that are to be compared to the allotted figure of amortized emissions to ensure it is covered.	Confirm how consumables for repairs and maintenance are tracked and included within the LCA	Currently, Climeworks track these items internally and compare the calculated emissions to a designated amount of the grey emissions to be amortized in the future.	Noted that this is kept internally. It is recommended that Climeworks make available a maintenance tracker that documents materials used for repairs and maintenance for future verification.

## Appendix 2: Site Pictures

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**Figure A: Cooling towers for process water/ steam used at Mammoth facility**



**Figure B: CO<sub>2</sub> and H<sub>2</sub>S sensors used by Climeworks staff as part of their HSE equipment**



**Figure C: CO<sub>2</sub> compressors used prior to CO<sub>2</sub> dissolution in absorption tower.**



**Figure D: Carbfix CO<sub>2</sub> charged water Injection well housing, one of two.**



**Figure E: Inside the Carbfix well housing**



**Figure F: Left. CO<sub>2</sub> concentration meter. Right. Bubble point meter for well monitoring**



**Figure G: Left. CO<sub>2</sub> environment sensor for HSE and monitoring leakage. Right. Pressure sensor for incoming CO<sub>2</sub> charged water**

## Appendix 3: Verifier Qualifications

Supporting documentation, including verifier resumes, and verifier or corporate accreditations are also included in this appendix.

Verifier Qualifications	Criteria Met?	Evidence / Notes <i>(note how the criteria was met, specific documents - resume/CV, publications, certifications, etc.)</i>
<b>Verifier has relevant technical knowledge of the type of technology being evaluated and carbon removal processes in general</b>		
<b>A) Does Verifier have:</b>		
1. An in-depth technical knowledge of the technology type under verification;	<input checked="" type="checkbox"/>	350Solutions is accredited to ISO/IEC 17020:2012 and ISO 14034 Environmental Technology Verification (ETV) as a Type A (third party) Inspection Body (ANAB Certificate Number: AI-2618). The technical scope of 350's accreditation includes verification of performance and environmental impact as it relates to design, materials, equipment, installation and operations of technologies in the categories of Energy, Clean Production and Process, and Air Pollution Monitoring and Abatement. As documented in 350Solutions' ETV Standard Operating Procedure (ETV QPM 350-223-03), and Quality Systems Procedures for verifier qualifications (QSP-350-005-02), 350Solutions conforms to the requirements of ISO 17020 Annex A with respect to verifier qualifications and procedures. These procedures and quality management programs are generally relevant to verification under the Isometric Standard. Note that verifications completed for Isometric are not equivalent to ISO 14034 verifications.
2. Knowledge of specific risk areas associated with performance of such technologies (i.e. common failure points, performance issues, barriers to scaleup);	<input checked="" type="checkbox"/>	
3. Knowledge of the environmental implications related to the use of the technology from a life cycle perspective, such as impact of the technology on lifecycle CO2 emissions and carbon removal;	<input checked="" type="checkbox"/>	
4. Knowledge of relevant applicable test methods and standards for evaluating performance or impact of the technology;	<input checked="" type="checkbox"/>	
5. Knowledge of relevant calculation, modeling, and statistical methods in order to assess test results and calculations of performance metrics and uncertainty, as applicable;	<input checked="" type="checkbox"/>	
6. Knowledge of data quality and data validation approaches, including QA/QC procedures, for example.	<input checked="" type="checkbox"/>	
<b>Verifier is a credible independent 3<sup>rd</sup> party</b>		
<b>B) Is Verifier:</b>		
1. third-party body independent of the team registered for the Isometric Registry	<input checked="" type="checkbox"/>	350Solutions is accredited to ISO/IEC 17020:2012 and ISO 14034 ETV as a Type A (third party) Inspection Body. As documented in 350Solutions ETV Policy Manual (ETV QPM 350-200-03), 350Solutions conforms to the requirements of ISO 17020 Annex A with respect to impartiality for Type A inspections, pursuant to ISO 14034 activities.
2. Not directly involved in the design, manufacture or construction, marketing, installation, use or maintenance of the specific technologies submitted to Isometric for verification, or represent the parties engaged in those activities.	<input checked="" type="checkbox"/>	
3. Not part of a legal entity that is engaged in design, manufacture, supply, installation, purchase, ownership, use or maintenance of the items inspected.	<input checked="" type="checkbox"/>	

**Guy Ingram-Hardwick**  
**Carbon Removal Verification Engineer, 350Solutions**

**EDUCATION:**

MEng Materials Science and Engineering, Loughborough University, UK - 2022

**EXPERIENCE SUMMARY:**

Guy Ingram-Hardwick is a Carbon Removal Verification Engineer, with experience in materials engineering, process engineering, MRV protocol development, experimental design and life cycle analysis (LCA). At 350 Solutions, Guy's efforts center on validation and verification of varied carbon removal pathways, including biochar, biomass storage, and DAC+S. Guy has led the verification of a biochar CDR supplier registered with Puro.Earth and supported verifications of bio-oil and biomass geologic storage pathways as well as DAC technology assessments. Guy began his experience in carbon removal working to develop an LCA model for Brilliant Planet, a marine based carbon removal company growing, processing and burying microalgae for carbon sequestration. Once completing the LCA model, Guy managed the third-party verification and co-authored the MRV methodology for Brilliant Planet before managing its adoption with carbon market registries and developing relevant documentation required for carbon removal verification and crediting.

Guy also studied degradation mechanisms for biodegradable polymers which was the focus of his Master's thesis. His work during the Master's thesis and at Brilliant Planet provided experience in experimental design and execution, including conducting field trials for developing novel technologies. This included leading design and execution of demonstration and testing of processing and storage of the microalgae, displaying the long-term permanence of the carbon removal system. Prior to his experience at Brilliant Planet, Guy worked as a process engineer at Pirelli's rubber compound manufacturing plant in Burton-on-Trent with a focus on data analytics for driving continuous improvement, as well as developing familiarity with industrial manufacturing operations and data, quality assurance, and international standards.

**RESEARCH AND PROFESSIONAL EXPERIENCE:**

January 2025 – Present: Carbon Removal Verification Engineer, 350Solutions  
Verify carbon dioxide removal technologies on behalf of registries and private companies ensuring high quality and meaningful climate impact.

Jul 2022 – Dec 2025: LCA and MRV Associate, Brilliant Planet  
Quantified the carbon removal efficiency of the Brilliant Planet system across a variety of engineering designs using LCA. Developed the proprietary MRV methodology and PDD as well as setting up a novel experimental design to display the permanence of the stored carbon.

July 2019 – September 2020: Process engineer, Pirelli  
Completed data analytics to drive continuous improvement for increasing efficiency, safety and rubber compound quality.

## Kelly Inder-Nesbitt

### Senior Carbon Removal Verification Engineer, 350Solutions Inc

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#### Education:

- Master of Science in Geography, Archaeology, and Environmental Studies, University of the Witwatersrand, 2014
- Bachelor of Science with Honors in Geography, University of the Witwatersrand, 2011
- Bachelor of Arts in Geography and Archaeology, University of the Witwatersrand, 2010

#### Experience Summary:

At 350Solutions, Kelly specializes in verifying carbon removal projects to ensure compliance with ISO 14034 standards and carbon registry requirements. With over a decade of experience in environmental compliance and carbon management, she brings extensive expertise in operational compliance and MRV framework implementation, enhancing accuracy, transparency and integrity in the voluntary carbon market.

Kelly's career spans multiple sectors, including aquaculture, mining, and carbon removal technology, where she has developed and audited environmental management systems that promote sustainable practices and attract investor finance. At 350Solutions, she leads the validation of diverse carbon removal pathways, including biochar, BECCS, DAC and direct ocean capture and biomass burial. Her responsibilities encompass site audits and rigorous evaluation of MRV systems to ensure scientifically validated project claims.

Previously Kelly led the development of Brilliant Planet's carbon dioxide removal methodology protocol for algal biomass burial and contributed as an author. She was also responsible for developing and implementing an ISO 14001 compliant EHSS Management System for the FirstWave Group, who are aquaculture industry leaders in Southern and Eastern Africa. This system is also aligned with IFC World Bank Best Practices and leveraged software tools to streamline compliance monitoring and enhance ESG reporting for investor and regulatory alignment.

Throughout her career, Kelly has consistently collaborated with project developers, communities, regulators, and clients to enhance the credibility of environmental initiatives through rigorous documentation and alignment with international standards. Her approach emphasizes precise data management and actionable reporting, elevating compliance practices into a strategic, value-adding process that drives sustainable business growth.

Kelly's strong communication skills and commitment to fostering collaboration enable her to manage complex compliance initiatives effectively. Her ability to bridge the gap between technical requirements and stakeholder expectations continues to advance science-driven, impactful solutions in the carbon removal industry.

**Tim Hansen, P.E.**  
**Founder and CEO, 350Solutions**

**EDUCATION:**

B.S., Chemical Engineering, University of Virginia, 1993

M.S., Engineering Science, Thayer School of Engineering, Dartmouth College, 1995

**EXPERIENCE SUMMARY:**

Mr. Hansen has 28 years of experience in management of energy and environmental technology development and demonstration projects and programs, as well as multimedia environmental engineering efforts. The majority of his recent work has focused on the evaluation of carbon removal (CDR) technologies, including validation of projects and verification of credits for multiple CDR pathways. Mr. Hansen's primary technical focus has been the management and technical performance of large technology evaluation programs in the advanced energy, transportation, and climate change areas, with a specific focus on verification of innovative low-carbon and carbon removal technologies.

**RESEARCH AND PROFESSIONAL EXPERIENCE:**

2019-Present Founder – CEO, 350Solutions, Inc.

Owns and operates a small cleantech engineering consulting business focused on the independent evaluation of new cleantech and low-carbon innovations and their impacts, with a current focus on carbon removal technologies. Provides independent technology verification, carbon removal credit verification, engineering consulting, testing and evaluation, techno-economic assessment, and other support to companies developing, using, or investing in new low-carbon technology innovations.

2012-2019: Director - Energy and Environment, Southern Research

Managed scientific and technical staff performing research, development, and evaluation of innovative clean energy technologies. Projects range from \$25,000 to \$6 million in size. Technical focus areas included biofuels and biochemicals, carbon capture and utilization, and renewable energy.

**PROJECT EXPERIENCE:**

Mr. Hansen has executed several independent technology performance verifications of emerging climatetech and carbontech innovations, as CEO of 350Solutions, Director of Energy & Environment at Southern Research, and Director of the U.S. EPA's Greenhouse Gas Technology Center. Mr. Hansen has recently focused on carbon removal technologies, completing verifications of carbon removal credit projects (biochar, carbonated materials, biomass injection) for registries, due diligence audits of enhanced weathering, DAC, direct ocean capture, and CO<sub>2</sub> to polymer technologies for credit offtake buyers, and leading development of independent methodologies for bio-oil sequestration for a novel CDR registry. Mr. Hansen has completed clean technology evaluations for various commercial and government clients, involving evaluation of commercial feasibility, economic and environmental impacts, and technology performance. Mr. Hansen has evaluated and verified technologies for the XPRIZE Carbon Removal in 2022 and 2024 and served as the contracted Measurement and Verification Program Lead for the NRG COSIA Carbon XPrize. Mr. Hansen served as U.S. Technical Expert for the development and implementation of ISO 14034 – Environmental Technology Verification.

**RECENT PUBLICATIONS:**

- Hansen, et al. Pilot Scale Demonstration & Independent Verification of Carbon Utilization Technologies for the NRG COSIA Carbon XPRIZE. TechConnect Briefs 2019. June 17, 2019.
- Tim Hansen, Kevin McCabe, Bill Chatterton, Michael Leitch, Integrating the ISO 14034 standard as a platform for carbon capture and utilization technology performance evaluation, *Clean Energy*, Volume 5, Issue 4, December 2021, Pages 600–610, <https://doi.org/10.1093/ce/zkab033>