

Validation and Verification Report for Foam Supplies, Inc.

American Carbon Registry

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1. Introduction

This report is provided to Foam Supplies, Inc. (FSI) as a deliverable of the American Carbon Registry (ACR) project validation and verification process. It covers the validation and verification of the Foam Blowing Agent Project 003F (the Project) for the period from January 1 to December 31, 2020.

The Project reports emission reductions for a single 10-year crediting period from January 1, 2020 to December 31, 2029.

During the validation/verification process, Global Chemical Consultants LLC (GCC) acted as the project advisor for the project developer, FSI. As such, First Environment communicated directly with GCC regarding most validation/verification activities.

First Environment, Inc. (First Environment) conducted validation and verification activities from the date of the kickoff meeting through April 24, 2021.

2. Objectives

The purpose of the validation and verification was, through review of appropriate evidence, to establish that:

- the objectives of the ACR Validation and Verification Standard Chapters 1.B and 8.B are met;
- the Project conforms to the requirements of the criteria discussed in Section 3 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

Validation activities also include an assessment of the likelihood that implementation of the projects will result in the emission reductions as stated by FSI in the GHG Project Plan.

3. Verification Scope & Criteria

Specific scope metrics for the verification are outlined in the table below:

Geographic Boundaries	Kingspan manufacturing facility in Winchester, VA
Greenhouse Gases Verified	Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO ₂ -e) resulting from blowing agent transition; Project emissions from use of eligible BA (methyl formate)
Reporting Periods	January 1 to December 31, 2020
Data Sources	Metered blowing agent consumption
Level of Assurance	Reasonable assurance
Definition of Materiality	Misstatements greater than five percent of the Project's emission reductions assertion were considered material. Qualitative non-conformities with and discrepancies in the GHG Project Plan and Monitoring Report between the validation and verification criteria were also considered material.

The following outlines the guidance and protocols used to conduct the validation and verification:

<p>Standards of Validation/Verification</p>	<ul style="list-style-type: none"> • ACR Standard, Version 7.0, December 2020 (ACR Standard) • Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from The Transition to Advanced Formulation Blowing Agents in Foam Manufacturing and Use, Version 2.0 (the Methodology) • GHG Project Plan (verification phase only)
<p>Validation/Verification Process</p>	<ul style="list-style-type: none"> • ACR Validation and Verification Standard, Version 1.1, May 2018 • ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006

The ACR Monitoring Report was also used to inform the verification process.

4. Project Description

The Project consists of the transition from a high GWP blowing agent (BA) to methyl formate in the production of XPS boardstock at Kingspan’s manufacturing facility in Winchester, Virginia. The replacement of a high-GWP blowing agent with methyl formate in the XPS boardstock production processes results in a net reduction of greenhouse gas emissions. The Project occurs on two XPS boardstock production lines (E-6 and E-7) at the Kingspan facility.

In the baseline scenario, the facility used a blend of HCFC142-b and ethyl chloride as the blowing agent blend for XPS boardstock production. In the project scenario, the facility utilizes a blend of methyl formate, HFC-134a, and cyclopentane as the blowing agents for XPS boardstock manufacture. The methyl formate fraction in the blend displaces HFC-134a, the default baseline blowing agent for the Project.

The Project is not a systems supply house (formulator) project, as defined by the Methodology.

The GHG Project Plan provides additional details about the Project.

5. Overview of the Validation and Verification Process

To review the Project’s GHG information, the following validation and verification process was used:

- conflict of interest review;
- selection of Audit Team;
- initial interaction and kick-off meeting with primary FSI contacts;
- development of the validation/verification plans and sampling plan;
- review and evaluation of GHG information systems and data;
- follow-up interaction with FSI contacts for corrective action or supplemental data as needed; and
- final statement and report development.

The process was used to gain an understanding of the Project's emission sources and reductions to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

5.1 Conflict of Interest Review

Prior to beginning any third-party assessment, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the Projects. No potential conflicts were found for these Projects. A project-specific conflict of interest form for the Project was filed with the ACR on March 9, 2021.

5.2 Audit Team

First Environment's Audit Team consisted of the following individuals who were selected based on their validation and verification experience, as well as familiarity with industrial gas operations.

Lead Assessor – Michael Carim
Validation/Verification Team – Emily Saul
Internal Reviewer – James Wintergreen

5.3 Audit Kickoff

The audit process was initiated with a kickoff meeting on March 24, 2021 with the primary FSI contacts. The meeting focused on confirming the scope, schedule, and data required for validation.

5.4 Development of the Validation & Verification Plans

The Audit Team formally documented the validation/verification plan as well as determined the data sampling plan. The validation/verification plan was informed by the kick-off meeting where key elements of the validation and verification scopes were discussed including project team members, project level of assurance, materiality threshold, and standards of reporting and evaluation. It also provided an outline of the validation and verification processes and established project deliverables. FSI was afforded the opportunity to comment on the key elements of the plans for validation and verification. A separate data-sampling plan was designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

5.5 Site Visit

Mr. Michael Carim conducted a site visit on November 6, 2019 at the project facility as part of previous validation/verification activities for the Project. On-site verification activities were performed to assess GHG project boundaries, site operations, data collection processes, and information management systems, as well as to conduct interviews with key project personnel. Because the strategic review process did not identify any material changes to project data management systems since the site visit performed in November 2019, follow-up on-site inspection was not deemed necessary for the current validation/verification processes.

5.6 Emissions Reduction Data and Calculation Assessment

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities and identify if either contained material or immaterial misstatements.

5.7 Corrective Actions and Supplemental Information

The team made requests for corrective action during the validation and verification processes. FSI provided sufficient responses to all requests. These requests and FSI's responses are described in Appendix A of this report.

5.8 Validation & Verification Reporting

Validation and verification reporting, represented by this report, documents the validation and verification processes and identifies their findings and results. Validation and verification reporting consists of this report for FSI, along with a validation/verification statement. Both the report and statement are submitted to ACR as part of the validation/verification reporting process.

6. Validation Results

6.1 Project Boundary

The Project boundary is defined as emissions from Foam Manufacture (SSR 3) and Foam Usage (SSR 5). Fugitive emissions of BAs occur in the baseline and project scenarios during foam blowing and throughout the lifetime of manufactured XPS boardstock material. Emission reductions occur from the replacement of a high-GWP BA with a low-GWP BA.

The Audit Team assessed the source, sink, and reservoir (SSR) determination included in the GHG Project Plan through observations and interviews during the site inspection and found the justification accurate and in accordance with the applied methodology.

Overall, FSI provided an accurate description of the Project boundary and a comprehensive justification for the project SSRs.

6.2 Baseline Scenario

The baseline scenario is defined as the continued use of the baseline BA in the production of XPS boardstock at the Kingspan facility. Kingspan utilized a blend of ethyl chloride and HCFC-142b for the baseline BA. Because SNAP regulations required the discontinuation of HCFC-142b in XPS boardstock production in 2010, a default BA was employed for the purposes of emission reduction calculations.

It was demonstrated that HFC-134a would have been the BA most likely to replace HCFC-142b if Kingspan had not transitioned to methyl formate. Industry and trade association documentation was provided to confirm that HFC-134a was the most likely replacement for HCFC-142b after its regulatory phase-out in 2010. Therefore, the fraction of methyl formate in the project scenario BA blend is assumed to replace HFC-134a.

6.3 Emission reduction quantification methodologies and calculations

Emission reductions are quantified in accordance with the procedures described in the Methodology and the ACR Standard. The equations are correctly identified and the calculation of GHG emission reductions is presented in a transparent manner, incorporating all relevant GHG sources, sinks, and reservoirs.

Baseline emissions are quantified according to Equations 1 and 2 in the Methodology based on the quantity of eligible BA consumed and the Blowing Agent Ratio, the latter of which is used to

determine the equivalent quantity of baseline BA that is required to produce a foam with equivalent thermal performance.

Project emissions are quantified directly from the quantity of eligible BA consumed according to Equation 3 in the Methodology.

The Project Activity does not result in the equipment used in the baseline being transferred to another location or activity in which a BA with a GWP greater than 30 is used; therefore, activity-shifting leakage emissions are not considered. First Environment conducted interviews with facility personnel knowledgeable about the BA transition process at Kingspan and reviewed historical engineering diagrams for the E-6 and E-7 extrusion lines during the site visit to confirm that no activity-shifting leakage emissions occurred as a result of Project implementation.

Total net emission reductions are determined according to Equation 5 in the Methodology by subtracting project emissions from baseline emissions.

After reviewing the quantification procedure and supporting evidence, the Audit team concluded that the methodologies and the applicable tools have been applied correctly to calculate baseline emissions, project emissions, leakage, and net GHG emission reductions and removals.

6.4 Data Monitoring and Management System

The monitoring plan described within the GHG Project Plan includes all relevant data and parameters required to obtain a reliable result of generated emission reductions and meets the requirements of the Methodology. The primary variables monitored in order to determine and account for emission reductions are presented in Table 1 below.

TABLE 1: Monitoring Parameters

Monitoring Parameter	Method of Estimation	Frequency of Measurement	Unit of Measurement	Frequency of Recording
Blowing Agent Ratio (BAR)	Calculated	Once at validation	Dimensionless	N/A
Quantity of eligible BA used in the project (Q _{EBA})	Metered BA consumption	Continuous	Pounds	Recorded at the end of each process order; aggregated annually

The GHG Project Plan includes a complete description of the frequency, responsibility, and procedures for recording, storing, monitoring, and measuring all project data. All requirements in Sections 5.1 and 5.2.1 of the Methodology are addressed by the monitoring plan contained within the GHG Project Plan. The adequacy of the data management systems described in the monitoring plan was assessed during the site visit through tracing data back to its origin and reviewing system controls.

The requirements in Section 5.2.2 and 5.2.3 of the Methodology relevant to a formulator or systems supply house are not applicable to the project activities.

6.5 QA/QC Procedures

The GHG Project Plan includes QA/QC procedures for data that meet the requirements of the methodology. Procedures implemented at Kingspan include data triangulations for the quantity of BA consumed, such as comparisons of metered usage to changes in BA storage tank levels and/or raw material purchases. Because project monitoring is limited to a single, directly estimated parameter, minimal data uncertainty is foreseen.

6.6 Project-specific conformance to ACR eligibility criteria, including additionality

The Project meets the eligibility requirements set forth in the ACR Standard as described below.

TABLE 2: ACR Eligibility Criteria

Eligibility Requirement	Conformance Details	Validation Conclusion
Start Date	January 1, 2020	Consistent with requirement.
Minimum Project Term	N/A – project type does not contain risk of emission reduction reversal.	N/A
Crediting Period	January 1, 2020 through December 31, 2029.	Consistent with requirement.
Real	Blowing agent transition is performed in accordance with an approved ACR methodology to produce verifiable evidence of emissions mitigation.	Consistent with requirement. ACR has issued an exemption to its forward crediting policy for the approved methodology applied by the Project. ¹
Emission or Removal Origin	The project proponent reduces non-energy direct emissions at an XPS boardstock manufacturing facility that utilizes foam blowing agents.	Consistent with requirement. FSI has ownership of emission reductions via contractual agreement with Kingspan.
Offset Title	FSI holds rights to GHG emission reductions associated with the BA transition through the terms and conditions agreed upon with Kingspan.	Consistent with requirement. FSI has ownership of emission reductions via contractual agreement with Kingspan.

¹ ACR guidance on the methodology states: “In order to quantify avoided emissions associated with the transition to an advanced formulation blowing agent, it is necessary to utilize modeled emission rates over a 10-year crediting period. These avoided emissions are quantified during the project’s reporting period and Emission Reduction Tonnes (ERTs) are granted for the full 10 years of avoided emissions.”

Eligibility Requirement	Conformance Details	Validation Conclusion
Additional	Project satisfies additionality test in approved methodology and Regulatory Surplus Test in ACR Standard.	Project conforms to ACR additionality criteria. See Section 6.7 below for conformance details.
Regulatory Compliance	The Kingspan facility was in compliance with regulatory requirements relative to foam blowing during the reporting period.	Attestation was provided to First Environment by Kingspan to confirm regulatory compliance relative to the foam manufacturing process throughout the reporting period.
Permanent	N/A – project type does not contain risk of emission reduction reversal.	N/A
Net of Leakage	Potential for leakage emissions is accounted for under project monitoring plan and emission reduction quantification equations.	First Environment confirmed that the Project has implemented sufficient procedures to track any potential leakage emissions.
Independently Validated or Verified	The Project Proponent contracted First Environment, Inc. to provide independent, trustworthy, and objective third-party validation and verification services for the Project.	First Environment is an ANAB-accredited and ACR-approved validation/verification body. Audit activities were performed independently and in accordance with all ACR requirements.
Environmental & Community Assessments	No negative community or environmental impacts are identified. Net positive impact due to improvements in air quality.	Consistent with requirement. Project occurs in foam blowing manufacturing processes at a private industrial facility. No negative external environmental or community impacts are created from the blowing agent transition.

The Project activity complies with the applicability requirements of the Methodology. The table below lists the relevant applicability requirements and identifies how the Project meets them.

TABLE 3: Methodology Criteria

Eligibility Requirement	Conformance Details	Validation Conclusion
Location	Winchester, VA	Consistent with requirement.
Foam Application	XPS Boardstock	Consistent with requirement.
Start Dates	<i>See Table 2 above</i>	
Minimum two years of usage of a BA with GWP > 30 prior to the project activity	N/A – applies default BA	N/A – applies default BA

The Project does not participate in any other GHG emission trading or compliance programme and has not previously been rejected by another GHG programme.

6.7 Additionality

The Project satisfies the requirements for the demonstration of additionality specified by the ACR Standard by passing an approved practice-based performance standard and a regulatory surplus test.

The Project consists of use of an eligible BA in the XPS boardstock application, which is an Eligible Foam Application listed in the Methodology; therefore, the project satisfies the performance standard specified by the Methodology.

No existing laws mandate the use of a low-GWP blowing agent in XPS boardstock manufacture during 2020. GCC provided an analysis of existing laws and regulations as well as signed management attestations from Kingspan to confirm the Project's voluntary implementation.

6.8 Approved Deviations

No deviation requests were filed with the ACR for the Project's reporting period.

7. Verification Results

During the verification process, First Environment reviewed the Project's Monitoring Report, GHG emission reduction assertion, and supporting documentation for the current verification period to ensure consistency with the GHG Project Plan and the Methodology. Discrepancies between Project documentation and the verification criteria were considered material and identified for corrective action. Additionally, First Environment assessed the GHG emission reduction assertions and underlying monitoring data to determine if either contained material or immaterial misstatements. The results of these reviews are discussed in greater detail below.

7.1 GHG Information Verified

Emission reduction calculations were reviewed to ensure accuracy in the formulas used and the raw data used as inputs. Formulae were tested to ensure they were consistent with the calculation methodology described in the Methodology and GHG Project Plan. Total baseline emissions were quantified in accordance with Equations 1 and 2 from the Methodology.

The amount of BA replaced was calculated from metered data for the quantity of methyl formate consumed in Kingspan's production process. For each extrusion line, the PLC displays totalized the quantity of methyl formate consumed in each process order. The totalized value is recorded by line personnel from the PLC in Kingspan's ERP at the end of each process order. Data for each process order is summed over each reporting period to obtain the total quantity of eligible BA consumed. ERP outputs summarize total BA consumption by process order over the entire reporting period.

First Environment confirmed that the manufacturers of the flow meters on the E6 and E7 lines do not issue any requirements for ongoing, periodic calibration of the instruments.

A blowing agent ratio (BAR) was calculated based on the ratio of the molecular weights of the baseline and project BA materials.

Project emissions associated with foam manufacturing and the remaining years of foam use were quantified using Equation 3 from the Methodology. Project emissions are calculated based on the measured quantity of Eligible BA that is used in the project scenario.

No foam blowing equipment used in the baseline scenario was transferred to different foam blowing applications and/or facilities using a high-GWP blowing agent; therefore, there is no activity-shifting leakage associated with the Project and these emissions are assigned a value of zero in Equation 4 from the Methodology. Market-shifting leakage is not applicable to the Methodology.

Total emission reductions were computed using Equation 5 from the Methodology. All emission sources within the project boundary are properly accounted for in calculations.

7.2 Verification Assessment Techniques and Processes Employed

Copies of the raw data used in the calculations, including facility ERP data documenting the quantity of BA consumed, were compared with the data used in the final calculations and tested for transcription or mathematical errors. First Environment sampled all areas identified as being of high risk of inaccuracy, uncertainty, or misstatement and reviewed evidence such as flow meter QA/QC records and performed other data checks in order to assess whether the project sufficiently mitigated data uncertainty. The assessments performed on this data, as described above, confirmed the reliability of the evidence provided and verified the accuracy of the information flow. Additionally, First Environment performed recalculations of emission reductions for the entire reporting period to assess whether they were free of material misstatement. First Environment found the emission reduction calculations to be free of material misstatement.

Evidence provided during the verification process was consistent with the requirements of the Methodology and the validated GHG Project Plan and meets generally accepted evidentiary standards for best practices in GHG accounting.

8. Audit Findings

FSI and Kingspan provided good documentation for the emissions estimates as well as the procedures surrounding the data collection process. To complete the validation and verification processes, First Environment issued corrective action requests. Through communications with the Audit Team, FSI resolved all requests made by First Environment during the validation and verification processes.

The findings issued, as well as FSI’s responses, are summarized in Appendix A.

9. Validation & Verification Conclusion

First Environment was retained to provide validation and verification services to Foam Supplies, Inc. for the Project’s GHG emission reductions assertion based on the following fundamentals:

- *Level of assurance:* Reasonable assurance.
- *Objectives of verification:* To assure project conformance with the validation/verification criteria and that the requirements of the ACR Validation and Verification Standard, Chapters 1.B and 8.B are met. Validation objectives also include an assessment of the likelihood that implementation of the project will result in the emission reductions stated in the GHG Project Plan.
- *Validation/Verification criteria:* American Carbon Registry Standard, Version 7.0, December 2020; Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from The Transition to Advanced Formulation Blowing Agents in Foam Manufacturing and Use, Version 2.0.
- *Definition of materiality:* Misstatements of greater than five percent of the GHG reduction assertion and qualitative non-conformities with validation and/or verification criteria are considered material.
- *Scope, including:*
 - *Boundaries of the assertion:* Kingspan manufacturing facility and use phase of the manufactured foam product.
 - *The physical infrastructure, facilities, and activities within the assertion:* Foam blowing equipment used in XPS boardstock manufacture.
 - *GHG sources, sinks, and reservoirs included within the assertion:* Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO₂-e) resulting from blowing agent replacement in foam manufacturing and remaining years of foam use; Project emissions from use of eligible BA (methyl formate).
 - *The time period for the assertion:* January 1 to December 31, 2020.

Based on the assessments performed and the historical evidence reviewed, First Environment concludes that the GHG Project Plan is in conformance with the specified validation criteria and the Project GHG emissions reductions, due to the transition to a low-GWP BA at Kingspan for the 2020 reporting period, can be considered with a reasonable level of assurance:

- consistent with the GHG Project Plan,
- consistent with the ACR Standard and the Methodology, and
- without material discrepancy.

Verified results show:

Reporting Period: January 1, 2020 through December 31, 2020	Total
Baseline Emissions (m.t.CO ₂ e)	615,415
Project Emissions (m.t.CO ₂ e)	1,267
Emissions Reductions (m.t.CO ₂ e)*	614,148

*As measured and calculated in accordance with the Project Methodology

10. Lead Verifier Signature



Michael M. Carim
Senior Associate

11. Independent Internal Reviewer Signature



James Wintergreen
Senior Associate

12. Appendix A – Validation/Verification Findings

ID	Corrective Action Request	Summary of Participant Response	Validation/Verification Conclusion
1	Section A3 of the Project Plan includes “Unique” which is no longer applicable under the ACR Standard 7.0.	The Project Plan was revised to resolve the identified issue in Section A3.	Response is acceptable.
2	Section A8 of the Project Plan does not include Foam Supplies as a relevant party and the Monitoring Plan (Section D of Project Plan and Section V.2 of Monitoring Report) does not provide personnel names or responsibilities for Foam Supplies.	The Project Plan and Monitoring Report were revised to resolve the identified issues.	Response is acceptable.
3	Section B3 of the Project Plan does not state the temporal boundary for the Project.	The Project Plan was revised to resolve the identified issue in Section B3.	Response is acceptable.
4	Section E3 of the Project Plan references incorrect Equation numbers for leakage emissions.	The Project Plan was revised to resolve the identified issue in Section E3.	Response is acceptable.
5	Section H2 of the Project Plan addresses project term incorrectly and states the incorrect reporting period.	The Project Plan was revised to resolve the identified issues in Section H2.	Response is acceptable.
6	The following sections of the Monitoring Report do not address the ACR template requirements correctly: <ul style="list-style-type: none"> Section III.2 is not applicable to the project activity. The “Methodology Section” row of each parameter box in Section V.1 does not identify the relevant methodology section(s) for the monitored parameters. The “Measurement” row of each parameter box in Section V.1 is neither labeled nor addressed correctly. 	The Monitoring Report was revised to resolve the identified issues.	Response is acceptable.
7	Emission reduction totals are not rounded down to the nearest whole number (see calculation sheet “Kingspan Calcs 2020 3-24-2021.xlsx”).	The Project Plan and Monitoring Report were revised to state the correct emission reduction totals.	Response is acceptable.

ID	Clarification Request	Summary of Participant Response	Validation/Verification Conclusion
<i>No requests for clarification were issued during the validation/verification process</i>			

13. Appendix B: Addendum to Original Validation and Verification Report

First Environment, Inc. (First Environment) provides this addendum to its validation/verification report dated May 2021 for the Foam Blowing Agent Project 003F (the “Project”). This addendum summarizes the results of First Environment’s assessment of the Project’s end-of-life (EOL) emissions quantified under “*Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from The Transition to Advanced Formulation Blowing Agents in Foam Manufacturing and Use, Version 3.0*” (the Methodology v3.0).

The revised emission reduction calculations were reviewed to ensure consistency with the equations and quantification methods described in the Methodology. First Environment confirmed that the values applied for all monitored parameters in emission reduction calculations were consistent with the previously verified activity data for the Project. Calculations were updated to employ a leakage lifetime emission rate of 100 percent and all formulae for the quantification of baseline, project, and leakage emissions were updated to be consistent with the Methodology v3.0. First Environment also confirmed that the description of the project boundary and included GHG SSRs in the Project Plan were updated to include EOL emissions.

All aspects of the updated Project Plan and Monitoring Report relative to the validation and verification criteria remain the same as the previously assessed project documents, with the exception of the delineation of the project boundary and quantification of emission reductions, both of which were performed in accordance with the Methodology v3.0. Validation and verification conclusions with respect to all project eligibility and other requirements of the “*Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from The Transition to Advanced Formulation Blowing Agents in Foam Manufacturing and Use, Version 2.0*” remain unchanged from the original assessment.

Verified results using leakage lifetime emission rates under v3.0 of the Methodology show:

January 1 to December 31, 2020	Total
Baseline Emissions (tCO ₂ e)	1,938,316
Project Emissions (tCO ₂ e)	3,989
Emissions Reductions (tCO ₂ e)	1,934,327

The verified outstanding Emission Reductions Tonnes (ERTs) to be issued are as follows:

January 1 to December 31, 2020	Total
New ERTs Total	1,934,327
Original ERTs Total	614,148
Total Outstanding ERTs	1,320,179

Lead Verifier Signature



Michael M. Carim

Senior Associate

Independent Internal Reviewer Signature

A handwritten signature in black ink, appearing to read "Jay Wintergreen". The signature is fluid and cursive, with a large initial "J" and a long horizontal flourish extending to the right.

James Wintergreen
Senior Associate