St. Marys Cement Inc. (Canada)
Carbon Dioxide Emission Intensity Report

ALCF ECA Amendment Application for St. Marys Cement

2026-11-06

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Document Distribution

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Prepared for

St. Marys Cement Inc. (Canada)

410 Bowmanville Avenue

Bowmanville, ON, L1C 7B5

Submitted to

Ministry of the Environment, Conservation and Parks

Prepared by

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Abbreviations and Glossary

Abbreviations

Abbreviation	Description
ALCF	Alternative Low Carbon Fuels
ECA	Environmental Compliance Approval
EPA	Environmental Protection Act
ESDM	Emission Summary and Dispersion Modelling
GHG	Greenhouse Gases
Ministry	Ministry of the Environment, Conservation and Parks
O. Reg.	Ontario Regulation
WSP	WSP Canada Inc.

1. Introduction

WSP Canada Inc. (WSP) was retained by St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America (VCNA), to provide permitting and technical support for an amendment to the existing Alternative Low Carbon Fuel (ALCF) Environmental Compliance Approval (ECA) issued under Part II.1 of the Ontario Environmental Protection Act for the Bowmanville Cement Plant located at 410 Bowmanville Avenue in Bowmanville, Ontario (the Facility). The site location is illustrated in Figure 1.

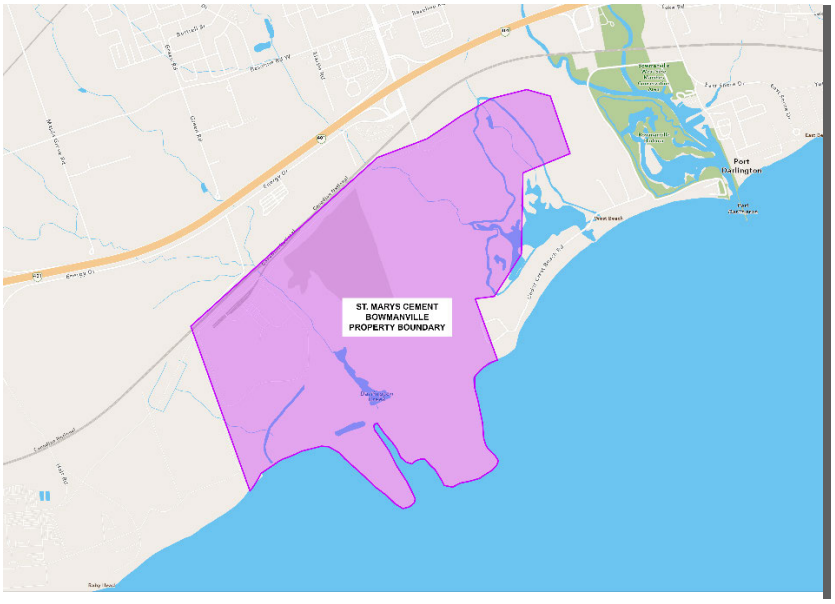


Figure 1: Site Location

The Facility currently operates under its existing ECA No. 0550-CEAHMA issued September 19, 2022 and permits the use of ALCFs in the cement manufacturing process. The proposed ALCF ECA Amendment Application will seek the approval to increase the maximum ALCF use from 400 tonnes per day to 800 tonnes per day and to incorporate planned modifications associated with ALCF ancillary equipment. These modifications include upgrades to the calciner to accommodate increased ALCF use and a process improvement to increase combustion residence time. The calciner modification will support the increased ALCF usage and further displacement of conventional fuels currently used at the Facility.

As part of this proposed ALCF ECA Amendment Application, this Carbon Dioxide Emission Intensity Report (the Study) was prepared to assess the carbon dioxide intensity of ALCFs and conventional fuels (i.e., petroleum coke and coal). ALCFs are used at the Facility to displace these conventional fuels.

Carbon dioxide emission intensity refers to the amount of carbon dioxide, a greenhouse gas, released per unit of a specific activity. This activity may refer to electricity generation, fuel combustion, or industrial production processes. It provides a standardized metric for assessing and comparing the carbon

footprint of different activities. With respect to fuel combustion, a fuel with a lower carbon dioxide emission intensity releases less carbon dioxide per unit of energy produced than a fuel with a higher emission intensity and is therefore considered a more carbon-efficient energy source.

As defined in O. Reg. 79/15, and subject to the other applicable conditions of the regulation, an ALCF must have a carbon dioxide emission intensity that is lower than that of the conventional fuel it replaces. With respect to the Facility ECA, conventional fuels are solid fuels, including petroleum coke and coal, for regular firing and also include diesel, propane and natural gas for preheating during start-up. ALCFs are only fired during normal operating conditions, as such this Study only considers proposed ALCFs and petroleum coke and coal.

1.1 Purpose

The purpose of this Study is to demonstrate that the carbon dioxide emission intensities of the proposed ALCFs are less than those of the conventional fuels, consistent with the requirements set forth in Section 11 of O. Reg. 79/15.

2. Site Description

The Facility produces portland cement by combining materials bearing calcium carbonate, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is then ground with finishing materials such as gypsum and limestone to produce cement. St. Marys Cement has a maximum production rate of 2.4 million tonnes of clinker per year and operates 24 hours per day, 7 days a week, 12 months a year with the exception of scheduled kiln shut-downs.

The thermal requirements of the cement manufacturing process at the Facility have been historically met by combustion of petroleum coke, coal, and ALCFs. When operating at the maximum production rate of 2.4 million tonnes of clinker per year, the fuel fed to the kiln ranges from approximately 350 to 450 tonnes per day of petroleum coke and coal.

The primary North American Industrial Classification System (NAICS) codes that best apply to the Facility are 327310 – Cement Manufacturing and 327320 – Ready Mix Concrete Batching.

3. Alternative Low Carbon Fuels

An ALCF is a fuel that has a carbon dioxide emission intensity less than the carbon dioxide emission intensity of the petroleum coke or coal it is replacing and must meet one of the following criteria to satisfy the fuel requirements in subparagraph 1.(1).1 of Ontario Regulation 79/15.

1. The fuel:
   i. must not be derived from or composed of any material set out in Schedule 1 of O. Reg. 79/15;
   ii. is wholly derived from or composed of materials that are biomass or municipal waste or a combination of both; and
   iii. unless the fuel is wholly derived from or composed of materials that are solid biomass, has a high heat value of at least 10,000 megajoules per tonne.
2. The fuel is wholly derived from or composed of organic matter, not including peat or peat derivatives, derived from a plant or micro-organism and grown or harvested for the purpose of being used as a fuel.

As part of the proposed ALCF ECA Amendment Application, St. Marys Cement will request the approved list of ALCF baskets to include the following:

- Material that is biomass fuel derived from harvested plant and forest sources, end of life agricultural sources, Woodwaste or Agricultural Waste, and includes but is not limited to sawdust, wood chips, wood, miscanthus grass, millet, sorghum, hemp, switch grass, and maize;
- Material that is comprised of non-recyclable plastics, including but not limited to manufacturing rejects, material resource recovery facility rejects, nylon (including but not limited to tire fluff), plastics bags and packaging;
- Material that is comprised of construction, renovation & demolition waste, including but not limited to scrap wood, treated lumber, carpets, textiles, sawdust, nylon, floor laminates and asphalt shingles;
- Material that is comprised of non-recyclable paper fiber/wood/plastic composites, including but not limited to single-serve coffee pods, printed papers, paper towels, rejects and trimmings from paper recycling facilities such as ragger tails (residue including plastic trimmings, staples, paper fibre and metal wire), end rolls and cores; and
- Material that is comprised of rubber (non-tire derived), including but not limited to shredded conveyor belts.

These materials are summarized in Table 1.

Table 1: Proposed ALCF Materials and Example ALCFs

ALCF Material	Example of ALCFs
Biomass	Sawdust, wood chips, wood, miscanthus grass, millet, sorghum, hemp, switch grass, and maize
Non-recyclable Plastics	Manufacturing rejects, material resource recovery facility rejects, nylon (including but not limited to tire fluff), plastics bags and packaging
Construction, Renovation & Demolition Waste	Scrap wood, treated lumber, carpets, textiles, sawdust, nylon, floor laminates asphalt shingles
Non-recyclable Paper Fiber/Wood/Plastic Composites	Single-serve coffee pods, printed papers, paper towels, rejects and trimmings from paper recycling facilities
Non-Tire Derived Rubber	Shredded conveyor belts

It is anticipated that the ALCF materials will be blended and homogenized in the ALCF building prior to conveyance to and firing in the kiln. The proportion of individual ALCF materials will depend on availability of material which would result in different amount of required petroleum coke and coal to achieve the total required heat input for clinker production. The ALCF feed system is integrated with the plant control system to regulate the fuel substitution rates into the kiln to maintain the desired temperature profile and combustion conditions.

4. Carbon dioxide Emission Intensity Calculations

In accordance with O. Reg. 79/15, the carbon dioxide emission intensity calculations must be based on chemical analysis data for the conventional fuel and proposed ALCFs. The following sections summarize the sampling requirements, chemical analysis results, and carbon dioxide emission intensity calculations.

The chemical analysis results are based on data obtained for the proposed ALCF ECA Amendment Application under O. Reg. 79/15.

4.1 Conventional Fuel Sampling

Samples of coal and petroleum coke were submitted for chemical analysis to estimate the total carbon content and high heat value. A copy of the conventional fuel chemical analysis methods and sampling results are provided in Appendix B – Conventional Fuels Laboratory Analysis Results.

Samples are required to meet the following criteria listed in Section 9.(3) of O. Reg. 79/15:

a) only include samples taken and analysed during the most recent six-month period during which the facility was operating before the determination is made;

b) include at least one sample taken and analysed during each month of the six-month period mentioned in clause (a);

c) not include any samples taken more than 36 months before the determination is made; and

d) be representative of the coal or petroleum coke in the place of which alternative low-carbon fuel is proposed to be combusted.

At the time of finalization of this Study, the available data for conventional fuels are from samples collected between March 2026 and August 2026. In total, there is at least one sample of coal and petroleum coke for each month between March and August based on the “Sample Received” date indicated in Table A1 in Appendix A – Carbon Dioxide Emission Intensity Calculations.

In accordance with O. Reg. 79/15, only prescribed chemical analysis methods were used to estimate the total carbon content and high heat value of each fuel. The carbon dioxide emission intensity calculations are summarized in Table A1 in Appendix A – Carbon Dioxide Emission Intensity Calculations. A copy of the chemical analysis data for conventional fuels is provided in Appendix B – Conventional Fuel Data.

4.2 ALCF Sampling

Samples of the ALCF materials were obtained from existing and potential suppliers of ALCFs currently available for the Facility. The materials were submitted for chemical analysis to estimate the biological carbon content, total carbon content and high heat value of each ALCF material. A copy of the ALCF chemical analysis methods and sampling results are provided in Appendix C – ALCF Laboratory Analysis Results.

These samples met the following criteria listed in Section 10.(2) of O. Reg. 79/15:

1. Only samples taken within 36 months before the determination is made shall be used.
2. One of the following methods shall be applied:
    a) Analysis in accordance with a prescribed chemical analysis method of at least one sample of the fuel.
    b) Analysis in accordance with a prescribed chemical analysis method of at least one sample of each of the individual materials that the fuel is composed of or derived from, using a weighted average of the carbon content and high heat value of the individual materials.
3. The samples analyzed must provide results that are sufficiently representative of the fuel or individual materials and must allow for adequate characterization of the fuel or individual materials.

At the time of finalization of this Study, the available data for ALCFs are from samples collected between January 2025 and September 2026. The carbon dioxide emission intensity calculations are summarized in Table A2 in Appendix A – Carbon Dioxide Emission Intensity Calculations.

Biological carbon content data for the ALCF samples were obtained from analytical testing using the ASTM D6866-24 *Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis* biobased carbon testing methodology. Although Subsection 10.(3) of O. Reg. 79/15 references ASTM D6866-12 as the test method, the regulation specifies the standard “as amended from time to time”. Therefore, the updated version of ASTM D6866-24 test method is acceptable under O. Reg. 79/15.

The biological carbon content data is required to estimate the non-biological carbon content of the ALCF materials, which is the carbon content of the portion of the ALCF that is not composed of or derived from biomass or organic matter (excluding peat or peat derivatives).

4.3 Sample Calculations

Sample calculations of conventional fuels and ALCFs were completed following the formulas outlined in Section 9. and 10. of O. Reg. 79/15, respectively. Sample calculations for carbon dioxide emission intensities for conventional fuels and ALCFs are included in Appendix A – Carbon Dioxide Emission Intensity Calculations.

4.4 Summary of Assessment

The carbon dioxide emission intensity values were calculated for each conventional fuel and ALCF material sample. The average carbon dioxide emission intensities for each conventional fuel were estimated over the applicable sampling period.

A summary of the high heat values and carbon dioxide emission intensities is included in Table 2. The detailed sample calculations and results are presented in Appendix A – Carbon Dioxide Emission Intensity Calculations.

Table 2: Carbon dioxide Emission Intensity for Conventional Fuels and ALCFs

Fuel Type	Supplier	Fuel	High Heat Value [MJ/kg]	Carbon dioxide Emission Intensity [kg carbon dioxide/MJ]
Conventional Fuels	-	Petroleum Coke	31.47	0.0920
	-	Coal	29.00	0.0888
ALCFs	Supplier A1	Biomass	16.41	0.0009
	Supplier A2	Biomass	17.05	0.0018
	Supplier A3	Biomass	16.28	0
	Supplier A4	Biomass	10.12	0
	Supplier A5	Biomass	16.28	0
	Supplier B1	Plastic	33.05	0.0707
	Supplier B2	Plastic	12.72	0.0473
	Supplier C	Nylon	31.82	0.0597
	Supplier D	Non-tire Derived Rubber	37.45	0.0751

The results demonstrate that the ALCFs have lower carbon dioxide emission intensities when compared to petroleum coke and coal. The ALCFs also have high heat values of at least 10,000 megajoules per tonne (10 MJ/kg), meeting the requirements of O. Reg. 79/15.

5. Conclusions

St. Marys Cement is undertaking efforts to increase the maximum ALCF use from 400 tonnes per day to 800 tonnes per day and to incorporate planned modifications associated with ALCF ancillary equipment, at the Facility in accordance with O. Reg. 79/15. This Study was prepared in accordance with the requirements outlined in Section 11 of O. Reg. 79/15 and assessed the carbon dioxide emission intensity of ALCFs and the conventional fuels they are intended to displace. The results of this Study support the proposed ALCF ECA Amendment Application and show that the proposed ALCFs have a lower carbon dioxide emission intensity than conventional fuels.

The results presented in this Study are solely based on the chemical analysis data that was provided by St. Marys Cement for the purposes of the proposed ALCF ECA Amendment Application under O. Reg. 79/15.

6. Basis and Use of this Report

This Carbon dioxide Emission Intensity Report was prepared for the exclusive use of St. Marys Cement and once finalized, is intended to fulfill the Ministry of the Environment, Conservation and Parks requirements for an ALCF ECA Amendment Application for a Non-Demonstration (Permanent) Project under Ontario Regulation 79/15. The Study is based on conventional fuel samples collected and analysed between March 2026 and August 2026 and samples of ALCF materials collected and analysed between January 2025 and September 2026. The calculations made to estimate the carbon dioxide emission intensities of the fuels followed the formulas and procedures outlined in O. Reg. 79/15.

6.1 Limitations

WSP Canada Inc. prepared this Study solely for the use of the intended recipient St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this Study. The content and opinions contained in the present Study are based on the observations and/or information available to WSP Canada Inc. at the time of preparation. The information, recommendations and opinions expressed in this Study are for the sole benefit of St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America, subject to the limitations and purposes described herein.

The Study, all plans, data, drawings and other documents as well as all electronic media prepared by WSP Canada Inc. are considered its professional work product and shall remain the copyright property of WSP Canada Inc. Use of or reliance on this Study by others is prohibited and is without responsibility to WSP Canada Inc. If St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America gives, lend, sell, or otherwise make available the Study or any portion thereof to any other party, it does so at its own risk and liability. If a third party makes use of, relies on, or makes decisions in accordance with this Study, said third party is solely responsible for such use, reliance or decisions. WSP Canada Inc. does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this Study. This limitations statement is considered an integral part of this Study.

St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America, acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility; and therefore, St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America, cannot rely upon the electronic media versions of WSP Canada Inc. Study or other work products. As the digital file transmitted to the intended recipient is no longer under the control of WSP Canada Inc. the original file will be retained by WSP Canada Inc. for a period of not less than 10 years. WSP Canada Inc. does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

7. Licensed Engineering Practitioner Statement

Ontario Regulation 79/15 requires that this Carbon dioxide Emission Intensity Report be certified by the licensed engineering practitioner who prepared the report.

As the licensed engineering practitioner who prepared this Carbon dioxide Emission Intensity Report, I can confirm that, in accordance with Section 11.(1) of Ontario Regulation 79/15,

i. the carbon dioxide emission intensities of the coal or coke and of the alternative low-carbon fuel have been determined in accordance with this Regulation, and

ii. the carbon dioxide emission intensity of the alternative low-carbon fuel proposed to be combusted is predicted to be less than the carbon dioxide emission intensity of the coal or coke in the place of which the alternative low-carbon fuel is proposed to be combusted.



Jamie McEvoy, P.Eng., License Number 100150333

8. Proponent Statement

Ontario Regulation 79/15 requires that this Carbon dioxide Emission Intensity Report be certified by the proponent or a person who is authorized by the proponent.

By signing below, Ruben Plaza, Director Environment Cement VCNA of St. Marys Cement Inc. (Canada), a subsidiary of Votorantim Cimentos North America, certifies that the information given to the licensed engineering practitioner to prepare the Carbon dioxide Emission Intensity Report is complete and accurate.



Ruben Plaza, Director Environment Cement VCNA

Appendix A

Carbon Dioxide Emission Intensity Calculations

Table A1: Carbon Dioxide Emission Intensity Calculation for Conventional Fuels

Description

St. Marys Cement currently operates under its existing ECA No. 0550-CEAHMA issued September 19, 2022 and permits the use of ALCFs in the cement manufacturing process. The ALCF ECA Amendment Application seeks the approval to increase the maximum ALCF use from 400 tonnes per day to 800 tonnes per day and to incorporate planned modifications associated with ALCF ancillary equipment.

Methodology

As per O. Reg. 79/15 Section 9.(1), the carbon dioxide emission intensity of conventional fuels is calculated using the following formula:

CO_2 Emission Intensity = Total Carbon Content x 3.67 / HHV

Where:
Total Carbon Content = Total Carbon Content of Conventional Fuel [kg C / tonne fuel]
HHV = High Heat Value of Coal [MJ / kg fuel]

Sample Calculation

CO_2 Emission Intensity = Total Carbon Content x 3.67 / HHV

CO_2 Emission Intensity (Sample ID March Petcoke) =

$$\frac{76\%\ \text{kg C}}{100\%\ \text{kg fuel}} \times \frac{1000\ \text{kg fuel}}{1\ \text{tonne fuel}} \times 3.67\ \frac{\text{kg } CO_2}{\text{kg C}} \times \frac{1}{31.03\ \text{MJ}} \times \frac{1\ \text{kg fuel}}{1000\ \text{kg fuel}}$$

CO_2 Emission Intensity (Sample ID March Petcoke) = $0.0895\ \frac{\text{kg } CO_2}{\text{MJ}}$

Summary of Carbon Dioxide Emission Intensity

Fuel Type	Sample ID	Sample Received	Test	HHV, Calorific Value, As Received	HHV, Calorific Value, As Received	Total Carbon Content, As Received	CO_2 Emission Intensity
			ASTM Method	ASTM D5865	ASTM D5865	ASTM D5373	—
			Unit	BTU/lb	MJ/kg	% wt.	kg CO_2/MJ
Petroleum Coke	March Petcoke	March 31, 2026	742-2	-	31.03	75.68%	0.0895
	April Petcoke	April 30, 2026	933-2	-	30.38	75.96%	0.0918
	June Petcoke[1]	May 21, 2026	Eurofins	-	31.20	80.73%	0.0949
	Fluid Coke, June Alternative Fuels - Fluid Coke	Received July 7, 2026	Andrew S. McCreath & Son, Inc.	14,149	32.91	86.72%	0.0967
	Petcoke, June Conventional Fuels-Petcoke	Received July 7, 2026	Andrew S. McCreath & Son, Inc.	13,543	31.50	77.74%	0.0906
	July Conventional Fuels-Petcoke	Received July 27, 2026	Andrew S. McCreath & Son, Inc.	13,857	32.23	79.60%	0.0906
	August Conventional Fuels-Petcoke	Received August 21, 2026	Andrew S. McCreath & Son, Inc.	13,342	31.03	75.96%	0.0898
			Average	**-**	**31.47**	**78.91%**	**0.0920**
Coal	March Coal	March 31, 2026	742-1	-	28.42	67.77%	0.0875
	April Coal	April 30, 2026	933-1	-	28.86	72.53%	0.0922
	June Coal[1]	May 21, 2026	Eurofins	-	30.27	77.57%	0.0941
	Coal-June Conventional Fuels-Coal	Received July 7, 2026	Andrew S. McCreath & Son, Inc.	12,723	29.59	70.47%	0.0874
	July Conventional Fuels-Coal	Received July 27, 2026	Andrew S. McCreath & Son, Inc.	12,413	28.87	67.61%	0.0859
	August Conventional Fuels-Coal	Received August 21, 2026	Andrew S. McCreath & Son, Inc.	12,021	27.96	65.20%	0.0856
			Average	**-**	**29.00**	**70.19%**	**0.0888**

Notes:
[1]Sample was collected in May 2026 and therefore considered representative of for the month of May.

Table A2: Carbon Dioxide Emission Intensity Calculation for ALCFs

Description

St. Marys Cement currently operates under its existing ECA No. 0550-CEAHMA issued September 19, 2022 and permits the use of ALCFs in the cement manufacturing process. The ALCF ECA Amendment Application seeks the approval to increase the maximum ALCF use from 400 tonnes per day to 800 tonnes per day and to incorporate planned modifications associated with ALCF ancillary equipment. St. Marys Cement requests the approved list of ALCF baskets and material on the ECA to be:

- Material that is biomass fuel derived from harvested plant and forest sources, end of life agricultural sources, Woodwaste or Agricultural Waste, and includes but is not limited to sawdust, wood chips, wood, miscanthus grass, millet, sorghum, hemp, switch grass, and maize;
- Material that is comprised of non-recyclable plastics, including but not limited to manufacturing rejects, material resource recovery facility rejects, nylon (including but not limited to tire fluff), plastics bags and packaging;
- Material that is comprised of construction, renovation & demolition waste, including but not limited to scrap wood, treated lumber, carpets, textiles, sawdust, nylon, floor laminates and asphalt shingles;
- Material that is comprised of non-recyclable paper fiber/wood/plastic composites, including but not limited to single-serve coffee pods, printed papers, paper towels, rejects and trimmings from paper recycling facilities such as ragger tails (residue including plastic trimmings, staples, paper fibre and metal wire), end rolls and cores; and
- Material that is comprised of rubber (non-tire derived), including but not limited to shredded conveyor belts.

Methodology

As per O. Reg. 79/15 Section 10.(1), the carbon dioxide emission intensity of an alternative low carbon fuel is calculated using the following formula:

CO_2 Emission Intensity = Non-Biological Carbon Content x 3.67 / HHV

Where:
Non-Biological Carbon Content = Non-Biological Carbon Content of Fuel [kg C / tonne fuel]
HHV = High Heat Value of Fuel [MJ / kg fuel]

A non-biological carbon value was calculated for each of the samples of fuel material by subtracting the biological carbon portion from total carbon. The non-biological carbon content value was used to calculate a carbon dioxide emission intensity for each sample.

Sample Calculation

Non-Biological Carbon Content = Total Carbon Content [%wt] x (1 - Biological Carbon Content [% wt])

Non-Biological Carbon Content = 41.54% x (100% - 99%)

Non-Biological Carbon Content = 0.42%

CO_2 Emission Intensity = Non-Biological Carbon Content x 3.67 / HHV

$$CO_2 \text{ Emission Intensity (Sample 288-4)} = \frac{0.42\%\ \text{kg C}}{100\%\ \text{kg fuel}} \times \frac{1000\ \text{kg fuel}}{1\ \text{tonne fuel}} \times \frac{3.67\ \text{kg } CO_2}{\text{kg C}} \times \frac{1\ \text{kg fuel}}{16.41\ \text{MJ}} \times \frac{1\ \text{tonne fuel}}{1000\ \text{kg fuel}}$$

$$CO_2 \text{ Emission Intensity (Sample 288-4)} = \frac{0.0009\ \text{kg } CO_2}{\text{MJ}}$$

Summary of Fuel Sampling Data

ALCF Material	Supplier	Sample ID	Sample Received	Report Issue Date	HHV	Total Carbon Content	Sample ID	Sample Received	Report Issue Date	Biological Carbon Content	Non-Biological Carbon Content	CO_2 Emission Intensity
					MJ/kg	% wt.				% wt.	% wt.	kg CO_2/MJ
Biomass	Supplier A1	288-4	08-Jan-26	19-Jan-26	16.41	41.54%	905 Wood - WD - 0125	13-Jan-25	21-Jan-25	99%	0.42%	0.0009
Biomass	Supplier A2	288-3	08-Jan-26	19-Jan-26	17.05	41.67%	GFL - WD - 0125	13-Jan-25	21-Jan-25	98%	0.83%	0.0018
Biomass	Supplier A3	288-2	08-Jan-26	19-Jan-26	16.28	40.65%	Woodbridge - WD - 0125	13-Jan-25	21-Jan-25	100%	0.00%	0.0000
Biomass	Supplier A4	8348-4	05-Mar-25	13-Mar-25	10.12	27.11%	York1 - WD - 0125	13-Jan-25	21-Jan-25	100%	0.00%	0.0000
Biomass	Supplier A5	9387-6	05-Sep-25	19-Sep-25	16.28	40.87%	Je Culp - WD - 0725	09-Jul-25	16-Jul-25	100%	0.00%	0.0000
Plastic	Supplier B1	9389-7	05-Sep-25	19-Sep-25	33.05	68.50%	EFS - PL - 0125	13-Jan-25	21-Jan-25	7%	63.71%	0.0707
Plastic	Supplier B2	8262-4	13-Feb-25	21-Feb-25	12.72	30.93%	Re-World - PL - 0125	13-Jan-25	21-Jan-25	47%	16.39%	0.0473
Nylon	Supplier C	8807-4	07-May-25	15-May-25	31.82	72.88%	Evolve - NY-0125	13-Jan-25	21-Jan-25	29%	51.74%	0.0597
Non-tire Derived Rubber	Supplier D	September Alternative Fuels - Rubber Belting	18-Sep-26	28-Sep-26	37.45	77.42%	Rubber-BE-0926	14-Sep-26	19-Sep-26	1%	76.65%	0.0751

Summary of Carbon Dioxide Emission Intensity

Fuel Type	Supplier	ALCF Material	Number of Samples	HHV	Total Carbon Content	Biogenic Carbon	CO_2 Emission Intensity
				MJ/kg	% wt.	% wt.	kg CO_2/MJ
ALCFs	Supplier A1	Biomass	1	16.41	42%	99%	0.0009
	Supplier A2	Biomass	1	17.05	42%	98%	0.0018
	Supplier A3	Biomass	1	16.28	41%	100%	0.0000
	Supplier A4	Biomass	1	10.12	27%	100%	0.0000
	Supplier A5	Biomass	1	16.28	41%	100%	0.0000
	Supplier B1	Plastic	1	33.05	69%	7%	0.0707
	Supplier B2	Plastic	1	12.72	31%	47%	0.0473
	Supplier C	Nylon	1	31.82	73%	29%	0.0597
	Supplier D	Non-tire Derived Rubber	1	37.45	77%	1%	0.0751

Appendix B

Conventional Fuel Laboratory Analysis Results

McCreath
SAMPLING | INSPECTION | ANALYSIS | CONSULTING

REAL Testing.
Measured RESULTS.

ACCREDITED
CERTIFICATE: ISS18.01
ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Analysis Report

September 1, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON

P.O. #6300692072

The sample received from you on August 21, 2026, marked: August Conventional Fuels-Coal, showed the following:

	As Received	Dried
Moisture	9.64 %	---------
Ash	10.12 %	11.20 %
Volatile Matter	36.04 %	39.88 %
Fixed Carbon	44.20 %	48.92 %
	100.00 %	100.00 %
Sulfur	2.28 %	2.52 %
Gross Calorific Value	12,021 BTU/lb	13,303 BTU/lb
Net Calorific Value	11,544 BTU/lb	12,888 BTU/lb
Carbon	65.20 %	72.16 %
Hydrogen	5.16 %	4.52 %
Nitrogen	1.36 %	1.51 %
Oxygen	15.88 %	8.09 %

Lab #H26082115

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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End of Report

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REAL Testing.
Measured RESULTS.

ACCREDITED
CERTIFICATE: IS18.01
ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Analysis Report

September 1, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON

P.O. #6300692072

The sample received from you on August 21, 2026, marked: August Conventional Fuels-Petcoke, showed the following:

	As Received	Dried
Moisture	8.85 %	---------
Ash	2.71 %	2.97 %
Volatile Matter	17.27 %	18.95 %
Fixed Carbon	71.17 %	78.08 %
	100.00 %	100.00 %
Sulfur	5.30 %	5.82 %
Gross Calorific Value	13,342 BTU/lb	14,637 BTU/lb
Net Calorific Value	12,902 BTU/lb	14,257 BTU/lb
Carbon	75.96 %	83.33 %
Hydrogen	4.77 %	4.15 %
Nitrogen	1.41 %	1.55 %
Oxygen	9.85 %	2.18 %

Lab #H26082114

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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CERTIFICATE #5180.01
ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Analysis Report

August 4, 2026

St. Marys Cement Inc. (U.S.)
16000 Bells Bay Road
Charlevoix, Michigan 49720

P.O. #6300692072

The sample received from you on July 27, 2026, marked: July Conventional Fuels-Coal, showed the following:

	As Received	Dried
Moisture	8.01 %	---------
Ash	9.18 %	9.98 %
Volatile Matter	37.00 %	40.22 %
Fixed Carbon	45.81 %	49.80 %
	100.00 %	100.00 %
Sulfur	2.42 %	2.63 %
Gross Calorific Value	12,413 BTU/lb	13,494 BTU/lb
Net Calorific Value	11,927 BTU/lb	13,057 BTU/lb
Carbon	67.61 %	73.50 %
Hydrogen	5.27 %	4.76 %
Nitrogen	1.43 %	1.55 %
Oxygen	14.09 %	7.58 %

Lab #H26072703

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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CERTIFICATE #51801
ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Analysis Report

August 3, 2026

St. Marys Cement Inc. (U.S.)
16000 Bells Bay Road
Charlevoix, Michigan 49720

P.O. #6300692072

The sample received from you on July 27, 2026, marked: July Conventional Fuels-Petcoke, showed the following:

	As Received	Dried
Moisture	7.17 %	---------
Ash	1.14 %	1.23 %
Volatile Matter	12.40 %	13.36 %
Fixed Carbon	79.29 %	85.41 %
	100.00 %	100.00 %
Sulfur	5.79 %	6.24%
Gross Calorific Value	13,857 BTU/lb	14,927 BTU/lb
Net Calorific Value	13,448 BTU/lb	14,567 BTU/lb
Carbon	79.60 %	85.75 %
Hydrogen	4.45 %	3.93 %
Nitrogen	1.47 %	1.58 %
Oxygen	7.55 %	1.27 %

Lab #H26072708

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Robert E. Kozicki

Analysis Report

July 15, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON L1C 7B5

P.O. #6300692072

The sample received from you on July 7, 2026, marked: Coal-June Conventional Fuels-Coal, showed the following:

	As Received	Dried
Moisture	7.36 %	---------
Ash	7.89 %	8.52 %
Volatile Matter	35.60 %	38.43 %
Fixed Carbon	49.15 %	53.05 %
	100.00 %	100.00 %
Sulfur	2.57 %	2.77 %
Gross Calorific Value	12,723 BTU/lb	13,734 BTU/lb
Gross Calorific Value	12,230 BTU/lb	13,285 BTU/lb
Carbon	70.47 %	76.07 %
Hydrogen	5.37 %	4.90 %
Nitrogen	1.45 %	1.57 %
Oxygen	12.25 %	6.17 %

Lab #H26070710

Yours very truly,

ANDREW S. McCREATH & SON, INC.

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Measured RESULTS.

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CERTIFICATE #S1801
ISO 17025

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ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

Analysis Report

July 15, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON L1C 7B5

P.O. #6300692072

The sample received from you on July 7, 2026, marked: Fluid Coke, June Alternative Fuels-Fluid Coke, showed the following:

	As Received	Dried
Moisture	1.32 %	---------
Ash	0.64 %	0.65 %
Volatile Matter	3.58 %	3.63 %
Fixed Carbon	94.46 %	95.72 %
	100.00 %	100.00 %
Sulfur	6.67 %	6.76 %
Gross Calorific Value	14,149 BTU/lb	14,338 BTU/lb
Net Calorific Value	13,984 BTU/lb	14,185 BTU/lb
Carbon	86.72 %	87.88 %
Hydrogen	1.80 %	1.67 %
Nitrogen	1.66 %	1.68 %
Oxygen	2.51 %	1.36 %

Lab #H26070712

Yours very truly,

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End of Report

McCreath
SAMPLING | INSPECTION | ANALYSIS | CONSULTING

REAL Testing.
Measured RESULTS.

ACCREDITED
CERTIFICATE #5181.01
ISO 17025

717.364.1440 | 1649 BOBALI DRIVE, HARRISBURG, PA 17104 | SERVICE@MCCREATHLABS.COM

Analysis Report

July 15, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON L1C 7B5

P.O. #6300692072

The sample received from you on July 7, 2026, marked: Petcoke, June Conventional Fuels-Petcoke, showed the following:

	As Received	Dried
Moisture	8.46 %	---------
Ash	2.06 %	2.25 %
Volatile Matter	14.56 %	15.91 %
Fixed Carbon	74.92 %	81.84 %
	100.00 %	100.00 %
Sulfur	5.57 %	6.08 %
Gross Calorific Value	13,543 BTU/lb	14,795 BTU/lb
Net Calorific Value	13,121 BTU/lb	14,431 BTU/lb
Carbon	77.74 %	84.92 %
Hydrogen	4.59 %	3.98 %
Nitrogen	1.41 %	1.54 %
Oxygen	8.63 %	1.23 %

Lab #H26070711

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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End of Report

eurofins | EnvironeX

Certificat d'analyses

Attention : Mike Pryde

Client : Ciment St Marys, Usine McInnis
adresse : 50 route 132
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Résultats exprimés en base humide sauf indication contraire.

Paramètres	Accrédité CEAEQ	Unités	Date Préparation	Date Analyse	June Coal Résultat(s)	June Petcoke Résultat(s)
Identification					June Coal	June Petcoke
Identification (suite)						
Matrice					Solide	Solide
Date de prélèvement					2026-05-21	2026-05-21
Lieu du prélèvement					NA	NA
Prélevé par					Mike Pryde	Mike Pryde
No de laboratoire					1	2
Humidité		%	2026-06-08	2026-06-08	6.16	7.55
Cendres		%	2026-06-09	2026-06-09	7.61	4.52
Valeur calorifique	x	kJ/kg	----	2026-07-06	30266	31204
Valeur calorifique nette		kJ/kg sec	----	2026-07-17	31158	32850
Soufre	x	% p/p	2026-07-06	2026-07-06	1.7394	3.7600
Halogènes Totaux (Cl, Br), en Cl	x	mg/kg	2026-07-06	2026-07-06	----	----
Carbone *		% sec	----	2026-06-22	77.57	80.73
Hydrogène *		% sec	----	2026-06-22	4.84	3.93
Oxygène *		% sec	----	2026-06-23	7.05	3.38
Azote *		% sec	----	2026-06-22	1.52	1.67

Commentaires:

Méthodes d'analyse : Annexe I
Contrôle de qualité : Annexe II
Cette version remplace et annule toute version antérieure, le cas échéant.

Note : Ces résultats ne se rapportent qu'aux échantillons soumis pour analyse.

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Québec
4495, boul. Wilfrid-Hamel,
bureau 150, Québec (Qc)
G1P 2J7 Téléphone : 1 (418) 977-1220

Montréal
7020 Ch de la Côte-de-Liesse
Saint-Laurent (Qc)
H4T 1E7 Téléphone : 1 (514) 332-6001

Longueuil
2325, boul. Fernand-Lafontaine Téléphone : 1 (514) 332-6001
Longueuil (Qc) Sans Frais : 1 (877) 977-1220
J4N 1N7 www.labenvironex.com

Attention : Mike Pryde

Client : Ciment St Marys, Usine McInnis
adresse : 50 route 132
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Résultats exprimés en base humide sauf indication contraire.

Identification					EFS Plastic	CRM nylon
Identification (suite)						
Matrice					Solide	Solide
Date de prélèvement					2026-05-21	2026-05-21
Lieu du prélèvement					NA	NA
Prélevé par					Mike Pryde	Mike Pryde
No de laboratoire					3	4
Paramètres	Accrédité CEAEQ	Unités	Date		Résultat(s)	Résultat(s)
			Préparation	Analyse		
Humidité		%	2026-06-08	2026-06-08	7.32	0.63
Cendres		%	2026-06-09	2026-06-09	7.19	5.45
Valeur calorifique	x	kJ/kg	----	2026-07-06	34200	36791
Valeur calorifique nette		kJ/kg sec	----	2026-07-17	34479	35431
Soufre	x	% p/p	2026-07-06	2026-07-06	0.1053	1.1294
Halogènes Totaux (Cl, Br), en Cl	x	mg/kg	2026-07-06	2026-07-06	5378	----
Carbone *		% sec	----	2026-06-22	73.26	81.54
Hydrogène *		% sec	----	2026-06-22	10.58	7.46
Oxygène *		% sec	----	2026-06-23	8.57	4.88
Azote *		% sec	----	2026-06-22	< 0.50	0.52

Commentaires:

Méthodes d'analyse : Annexe I
Contrôle de qualité : Annexe II
Cette version remplace et annule toute version antérieure, le cas échéant

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Québec
4495, boul. Wilfrid-Hamel,
bureau 150, Québec (Qc)
G1P 2J7 Téléphone : 1 (418) 977-1220

Montréal
7020 Ch de la Côte-de-Liesse
Saint-Laurent (Qc)
H4T 1E7 Téléphone : 1 (514) 332-6001

Longueuil
2325, boul. Fernand-Lafontaine Téléphone : 1 (514) 332-6001
Longueuil (Qc) Sans Frais : 1 (877) 977-1220
J4N 1N7 www.labenvironex.com

Attention : Mike Pryde

Client : Ciment St Marys, Usine McInnis
adresse : 50 route 132
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Résultats exprimés en base humide sauf indication contraire.

Identification	Accrédité CEAEQ				GFL Wood	York 1 Wood
Identification (suite)						
Matrice					Solide	Solide
Date de prélèvement					2026-05-21	2026-05-21
Lieu du prélèvement					NA	NA
Prélevé par					Mike Pryde	Mike Pryde
No de laboratoire					5	6
Paramètres		Unités	Date		Résultat(s)	Résultat(s)
			Préparation	Analyse		
Humidité		%	2026-06-08	2026-06-08	15.79	16.02
Cendres		%	2026-06-09	2026-06-09	1.41	6.84
Valeur calorifique	x	kJ/kg	----	2026-07-06	16151	15082
Valeur calorifique nette		kJ/kg sec	----	2026-07-17	17640	16425
Soufre	x	% p/p	2026-07-06	2026-07-06	0.0600	0.3141
Halogènes Totaux (Cl, Br), en Cl	x	mg/kg	2026-07-06	2026-07-06	----	----
Carbone *		% sec	----	2026-06-22	48.17	48.67
Hydrogène *		% sec	----	2026-06-22	6.11	6.07
Oxygène *		% sec	----	2026-06-23	43.25	39.19
Azote *		% sec	----	2026-06-22	0.85	< 0.50

Commentaires:

Méthodes d'analyse : Annexe I
Contrôle de qualité : Annexe II
Cette version remplace et annule toute version antérieure, le cas échéant

Note : Ces résultats ne se rapportent qu'aux échantillons soumis pour analyse.

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Attention : Mike Pryde

Client : Ciment St Marys, Usine McInnis
adresse : 50 route 132
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Résultats exprimés en base humide sauf indication contraire.

Identification					JE Culp Wood
Identification (suite)					
Matrice					Solide
Date de prélèvement					2026-05-21
Lieu du prélèvement					NA
Prélevé par					Mike Pryde
No de laboratoire					7
Paramètres	Accrédité CEAEQ	Unités	Date Préparation	Date Analyse	Résultat(s)
Humidité		%	2026-06-08	2026-06-08	15.57
Cendres		%	2026-06-09	2026-06-09	1.36
Valeur calorifique	x	kJ/kg	----	2026-07-06	17146
Valeur calorifique nette		kJ/kg sec	----	2026-07-17	18772
Soufre	x	% p/p	2026-07-06	2026-07-06	0.0352
Halogènes Totaux (Cl, Br), en Cl	x	mg/kg	2026-07-06	2026-07-06	----
Carbone *		% sec	----	2026-06-22	49.07
Hydrogène *		% sec	----	2026-06-22	6.11
Oxygène *		% sec	----	2026-06-23	42.34
Azote *		% sec	----	2026-06-22	< 0.50

Commentaires:

Méthodes d'analyse : Annexe I
Contrôle de qualité : Annexe II
Cette version remplace et annule toute version antérieure, le cas échéant

2223-053

Signature numérique de Boubekeur Bourechouche, Chimiste
Date : 2026.07.17 13:50:15 -04'00'

Chimiste : Chimiste site de Longueuil
2026-07-17

Note : Ces résultats ne se rapportent qu'aux échantillons soumis pour analyse.

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Attention : **Mike Pryde**

Client : **Ciment St Marys, Usine McInnis**
adresse : **50 route 132**
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Annexe I

Paramètres	No. de méthode ou référence	Instruments ou techniques
Humidité	----	Gravimétrie
Cendres	ASTM D-3174	Gravimétrie
Valeur calorifique	PC-EN-PET-PON006	Calorimètre Parr
Valeur calorifique nette	ASTM D-4809	Calorimètre Parr
Soufre	PC-EN-PET-PON004	IC
Halogènes Totaux (Cl, Br), en Cl	PC-EN-PET-PON004	IC
Carbone *	----	Sous-traité
Hydrogène *	----	Sous-traité
Oxygène *	----	Sous-traité
Azote *	----	Sous-traité

Note : Ces résultats ne se rapportent qu'aux échantillons soumis pour analyse.

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Attention : Mike Pryde

Client : Ciment St Marys, Usine McInnis
adresse : 50 route 132
Port-Daniel Gascon, Québec
G0C 2N0

No de certificat : 2026-343680
Version : 1
Date de réception : 2026-06-03
Votre projet : ----

No. de commande : 6300687898
No. de client : 202966

Annexe II

Identification		Blanc analyse	Duplicata d'échantillon			Matériaux de référence		
Paramètres	Unités	Résultats	No de laboratoire	Résultats 1	Résultats 2	Valeurs attendues	Écarts	Valeurs obtenues
Humidité	%	< 0.01	----	----	----	----	----	----
Cendres	%	< 0.05	----	----	----	----	----	----
Valeur calorifique	kJ/kg	NA	----	----	----	26453	25 924 - 26 982	26552
Valeur calorifique nette	kJ/kg sec	NA	----	----	----	----	----	----
Soufre	% p/p	< 0.007	----	----	----	0.0881	0.0704-0.1057	0.0765
Halogènes Totaux (Cl, Br), en Cl	mg/kg	< 50.0	----	----	----	1171.316	937-1406	987
Carbone *	% sec	NA	----	----	----	----	----	----
Hydrogène *	% sec	NA	----	----	----	----	----	----
Oxygène *	% sec	NA	----	----	----	----	----	----
Azote *	% sec	NA	----	----	----	----	----	----

NA : Non applicable

Note : Ces résultats ne se rapportent qu'aux échantillons soumis pour analyse.

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Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 Email: petrolab@gmail.com
E-mail: petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3

Lab no.: 733-1 to 2
Date Report: May 20, 2026
Sample in: May 8 , 2026
PO. No.: 6300658930

Attention: Mike Pryde , Felix Mendez

Re: Coal and Coke samples from Apr 30,2026 for analysis.
St. Mary Low Carbon Fuel project.

		Lab No.	933-1	933-2
		Sample ID	April Coal	April Petcoke
Tests	**Method ASTM**	**Unit**	**Results**	
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	12408 28.860	13062 30.382
2. Moisture content, As Received	D3302	% wt.	7.15	9.49
3. Total Carbon, As Received	D5373	% wt.	72.53	75.96

Tested by : Q.N.(Chemist)

Approved by James Szeto

Member of ASTM
JS:LN

James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 Email: petrolab@gmail.com
E-mail: petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3

Lab no.: 742-1 to 2
Date Report: Apr 17 , 2026
Sample in: Apr 6, 2026
PO. No.: 6300658930

Attention: Mike Pryde , Felix Mendez

Re: Coal and Coke samples from Mar 31,2026 for analysis.
St. Mary Low Carbon Fuel project.

		Lab No.	742-1	742-2
		Sample ID	March Coal	March Petcoke
Tests	**Method ASTM**	**Unit**	**Results**	
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	12220 28.423	13340 31.028
2. Moisture content, As Received	D3302	% wt.	10.27	10.55
3. Total Carbon, As Received	D5373	% wt.	67.77	75.68

Tested by : Q.N.(Chemist)

Approved by James Szeto

Member of ASTM
JS:LN

James Szeto,B.Sc.
Chief Chemist

Appendix C

ALCF Laboratory Analysis Results

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
DD204ED46D363B7CE7DC4F8EC362BC8C

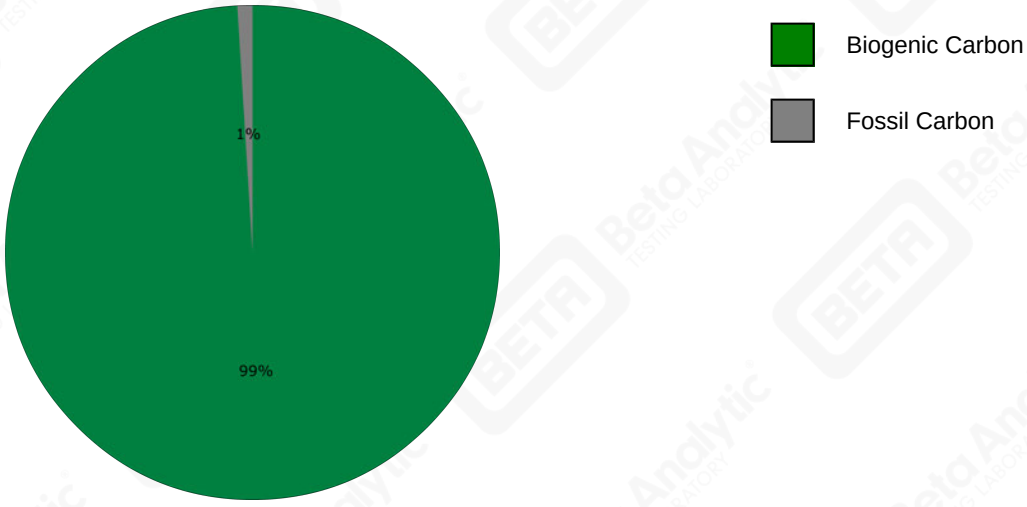
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	905 Wood - WD - 0125

Result

99% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729868
Percent modern carbon (pMC)	111.22 +/- 0.24 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.32 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

Liliana Durham
Laboratory Management Group / AMS Instrumentation Manager

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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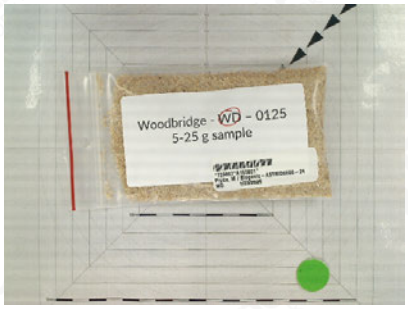
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Woodbridge - WD - 0125

Result

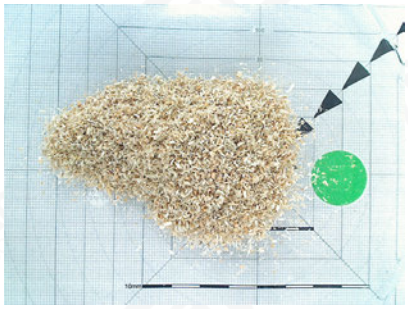
100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729867
Percent modern carbon (pMC)	116.92 +/- 0.23 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Labeling COC


VOC (1mm x 1mm scale)


3103.6mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

The published report is final and non-modifiable.

This report has been built with the information provided on the online form by the client. If different reporting information is required, a new sample analysis must be performed, with a new online form filled out to include exactly the information requested on the form.

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
EACF6781C850C902A804FF9F532B6418

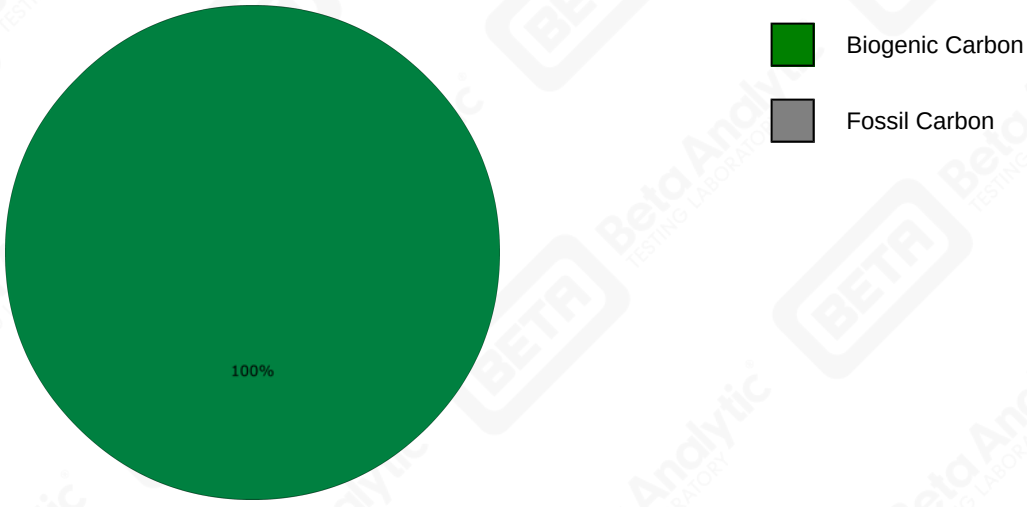
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Woodbridge - WD - 0125

Result

100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729867
Percent modern carbon (pMC)	116.92 +/- 0.23 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

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Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.32 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

Liliana Durham
Laboratory Management Group / AMS Instrumentation Manager

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4985 SW 74th Court
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Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
E578C637FA9F0C03C524B5B13F02FD2A

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Re-World - PL - 0125

Result

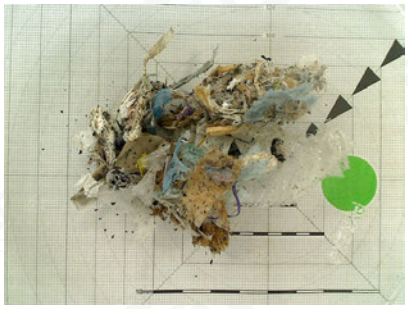
47% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729865
Percent modern carbon (pMC)	46.98 +/- 0.15 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Labeling COC


VOC (1mm x 1mm scale)


3173.7mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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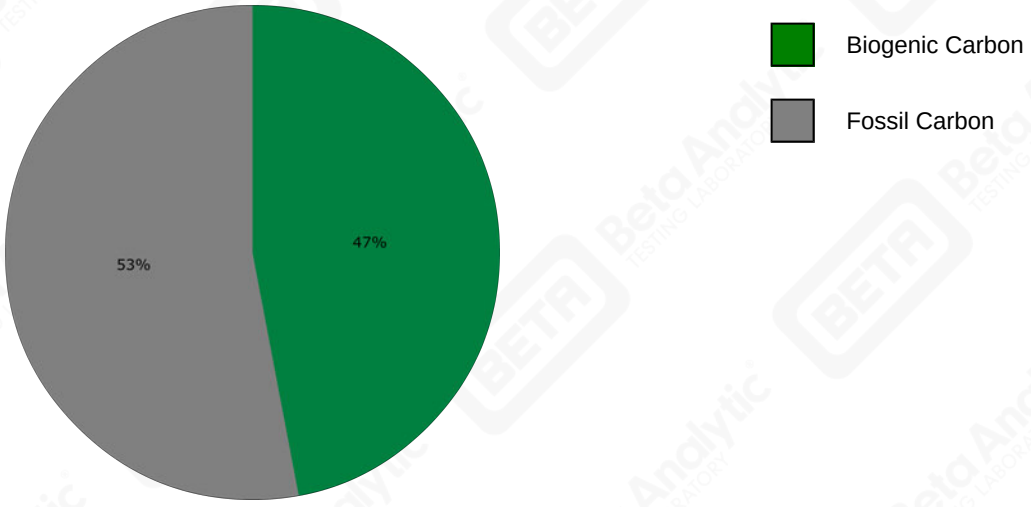
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Re-World - PL - 0125

Result

47% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729865
Percent modern carbon (pMC)	46.98 +/- 0.15 pMC
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info@betalabservices.com

% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

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Quality Assurance Report

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Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
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Reference 2	
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Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

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ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
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Canada

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The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

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Sincerely,

John Enriquez
Laboratory Management Group / AMS Chemistry Manager

Beta Analytic, Inc.
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Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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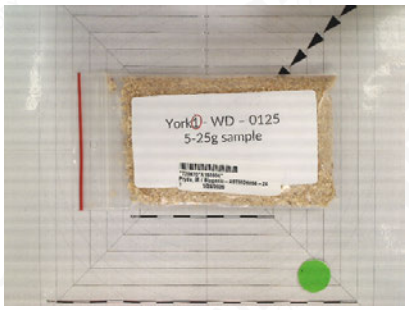
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	York1 - WD - 0125

Result

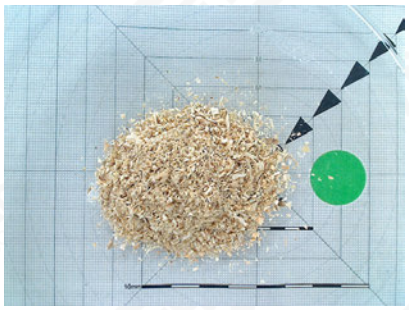
100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729870
Percent modern carbon (pMC)	112.51 +/- 0.21 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Labeling COC


VOC (1mm x 1mm scale)


3116.0mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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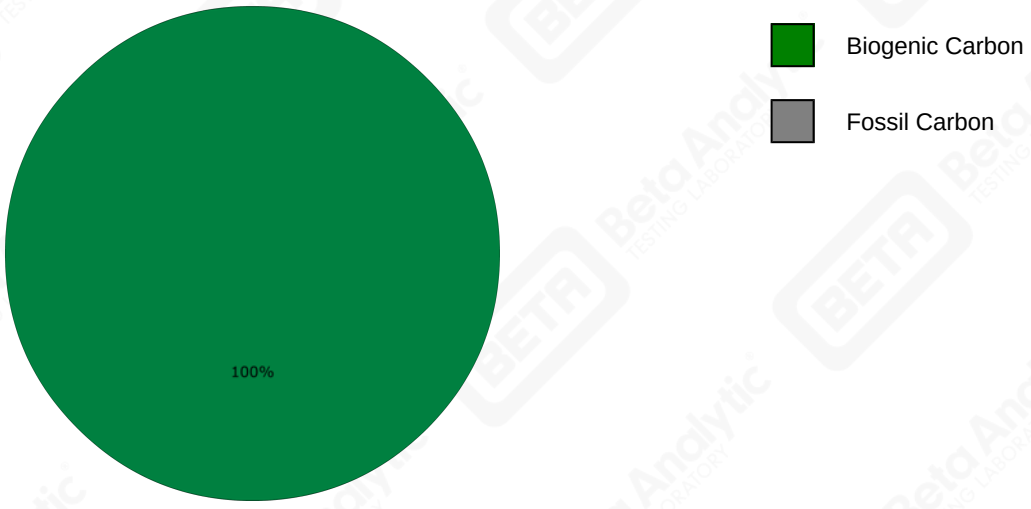
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	York1 - WD - 0125

Result

100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729870
Percent modern carbon (pMC)	112.51 +/- 0.21 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

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Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.16 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

Beta Analytic, Inc.
4985 SW 74th Court
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Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

John Enriquez
Laboratory Management Group / AMS Chemistry Manager

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Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
EF041C58754568D84B5EE6AFF8A09AEC

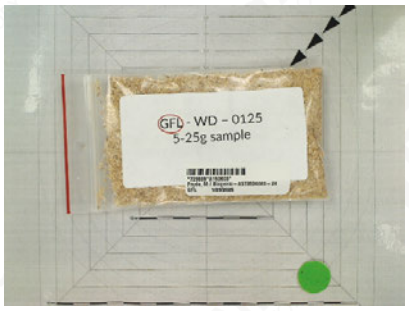
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	GFL - WD - 0125

Result

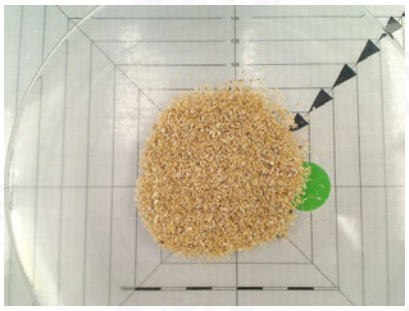
98% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729869
Percent modern carbon (pMC)	110.80 +/- 0.21 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Labeling COC


VOC (1mm x 1mm scale)


3136.5mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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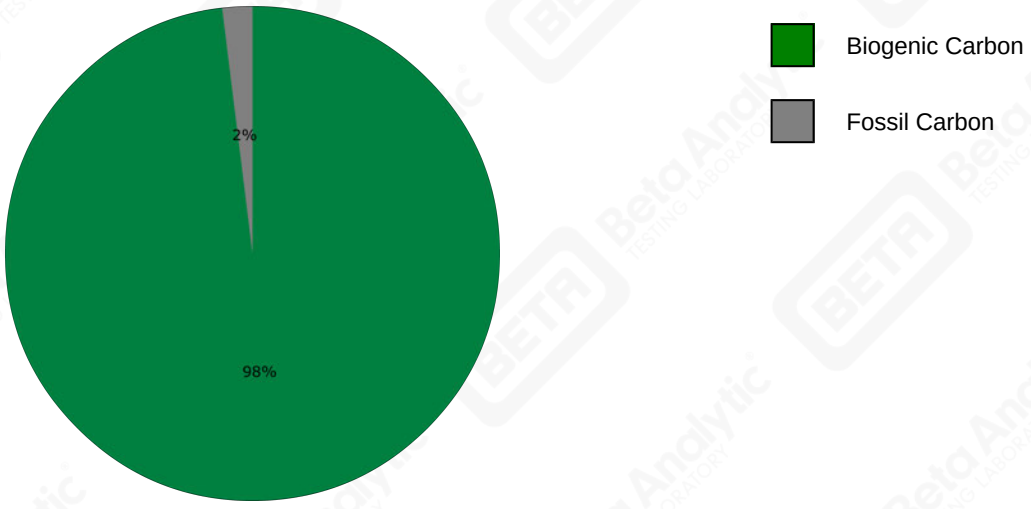
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	GFL - WD - 0125

Result

98% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729869
Percent modern carbon (pMC)	110.80 +/- 0.21 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

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Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.16 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

John Enriquez
Laboratory Management Group / AMS Chemistry Manager

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Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
1F8BD7326B36C31D69C079E782B90F8D

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Sol - WD - 0125

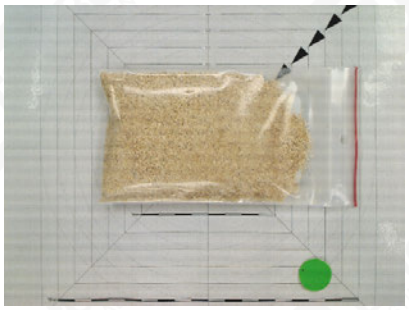
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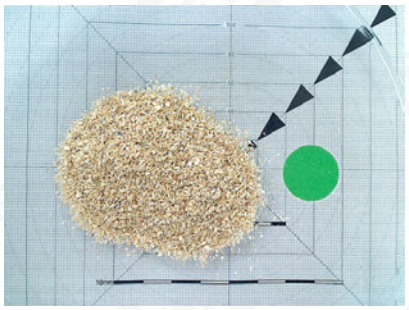
100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729866
Percent modern carbon (pMC)	114.98 +/- 0.20 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Labeling COC


VOC (1mm x 1mm scale)


3449.3mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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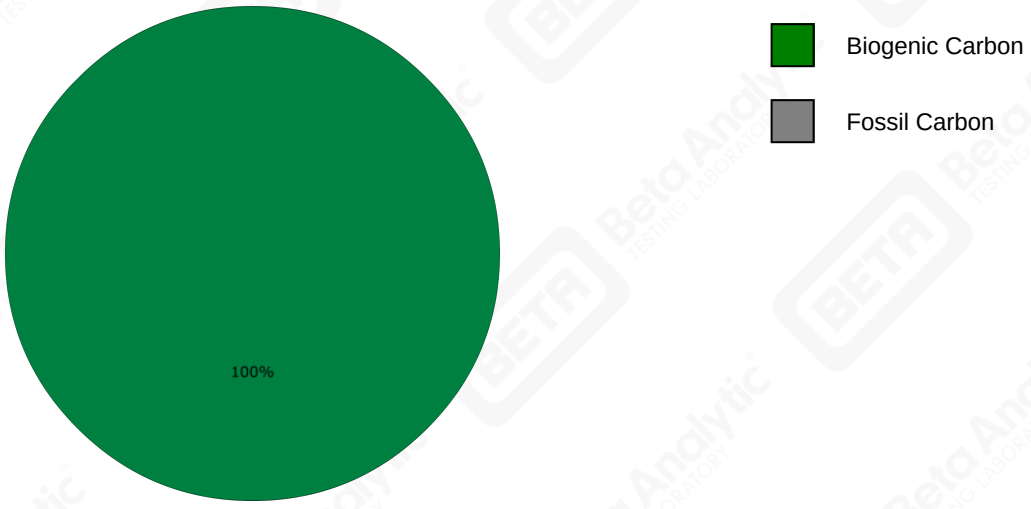
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Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Sol - WD - 0125

Result

100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729866
Percent modern carbon (pMC)	114.98 +/- 0.20 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/[1/(99.4/112)]



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

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Quality Assurance Report

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Report Date January 21, 2025

Submitter Mike Pryde

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Expected Value	129.41 +/- 0.06 pMC
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Expected Value	0.44 +/- 0.04 pMC
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Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

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January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

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The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

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John Enriquez
Laboratory Management Group / AMS Chemistry Manager

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Tel: (305) 667-5167
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ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
AF915DC0127AF3CC22B5E6EC8F238A59

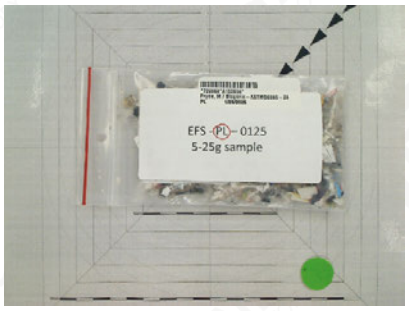
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	EFS - PL - 0125

Result

7% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729864
Percent modern carbon (pMC)	6.70 +/- 0.06 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Labeling COC


VOC (1mm x 1mm scale)


3193.9mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

The published report is final and non-modifiable.

This report has been built with the information provided on the online form by the client. If different reporting information is required, a new sample analysis must be performed, with a new online form filled out to include exactly the information requested on the form.

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
AF915DC0127AF3CC22B5E6EC8F238A59

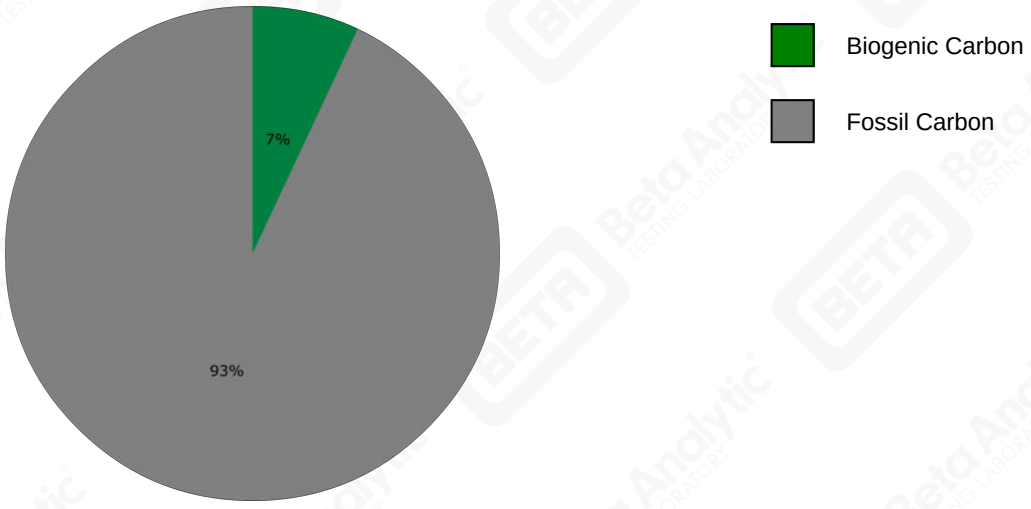
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	EFS - PL - 0125

Result

7% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729864
Percent modern carbon (pMC)	6.70 +/- 0.06 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.16 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

January 21, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

John Enriquez
Laboratory Management Group / AMS Chemistry Manager

Beta Analytic, Inc.
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Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
F6BBA1B7F21C8B0CA84CAB22C5D9C3BC

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Evolve - NY-0125

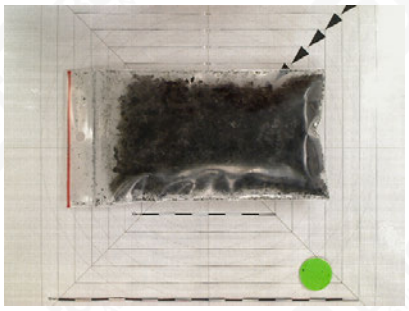
Result

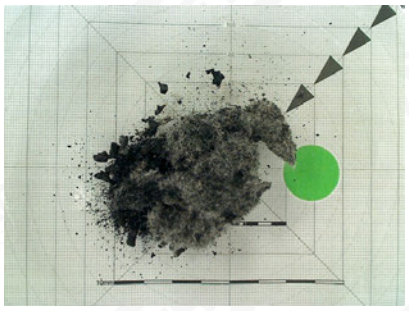
29% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729863
Percent modern carbon (pMC)	28.34 +/- 0.10 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Labeling COC


VOC (1mm x 1mm scale)


2531.1mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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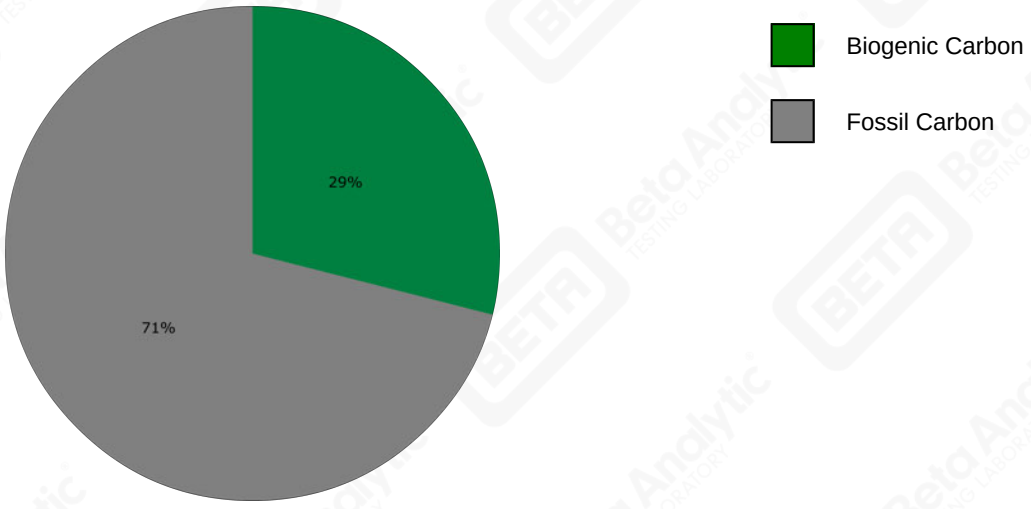
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	January 13, 2025
Report Date	January 21, 2025
Sample Code	Evolve - NY-0125

Result

29% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-729863
Percent modern carbon (pMC)	28.34 +/- 0.10 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

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Miami, FL 33155 USA
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ISO/IEC 17025:2017-Accredited Testing Laboratory

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date January 21, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.16 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	96.21 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date January 21, 2025

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

July 16, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,



Carlos Barroso
Laboratory Management Group / AMS Pretreatment Manager

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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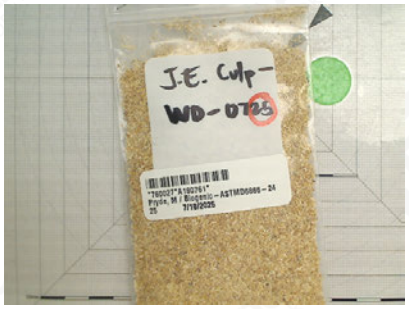
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	July 9, 2025
Report Date	July 16, 2025
Sample Code	Je Culp - WD - 0725

Result

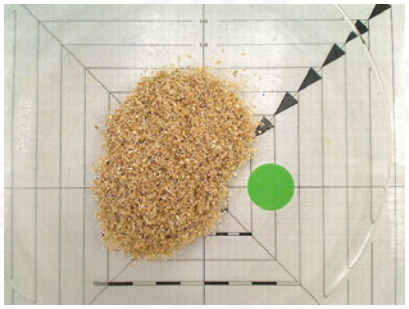
100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-760027
Percent modern carbon (pMC)	105.05 +/- 0.20 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Labeling COC


VOC (1mm x 1mm scale)


3393.8mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

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Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
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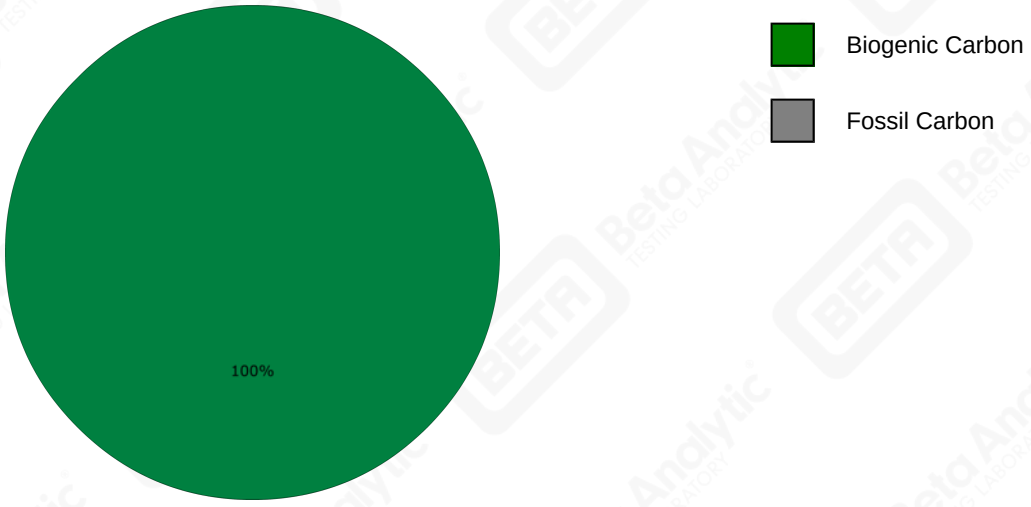
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	July 9, 2025
Report Date	July 16, 2025
Sample Code	Je Culp - WD - 0725

Result

100% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-760027
Percent modern carbon (pMC)	105.05 +/- 0.20 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

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Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

ISO/IEC 17025:2017-Accredited Testing Laboratory

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Miami, FL 33155 USA
Tel: (305) 667-5167
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Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

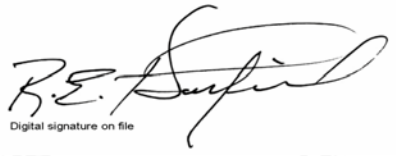
Report Date July 16, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 2	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	95.98 +/- 0.24 pMC
Agreement	Accepted
Reference 3	
Expected Value	110.69 +/- 0.40 pMC
Measured Value	110.75 +/- 0.28 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date July 16, 2025

ISO/IEC 17025:2017-Accredited Testing Laboratory

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Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

July 16, 2025

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,



Carlos Barroso
Laboratory Management Group / AMS Pretreatment Manager

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
E35A6E46EBEF10424FFD0A374A6367AE

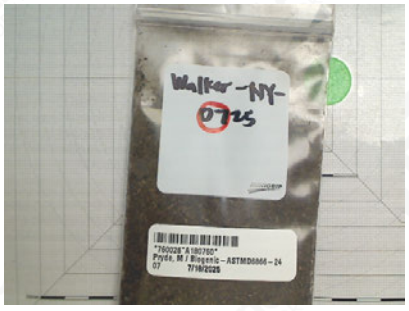
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	July 9, 2025
Report Date	July 16, 2025
Sample Code	Walker - NY - 0725

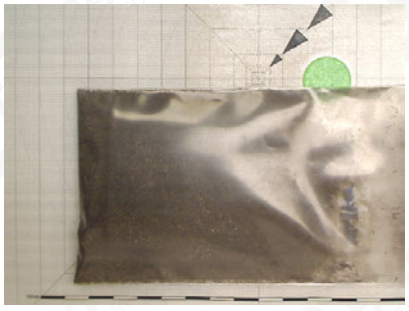
Result

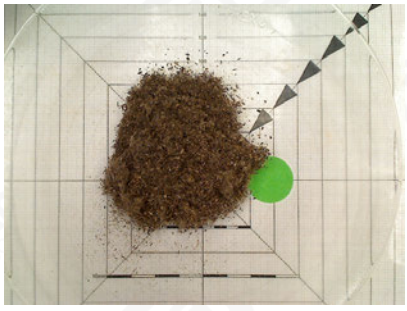
86% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-760026
Percent modern carbon (pMC)	85.93 +/- 0.18 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Labeling COC


VOC (1mm x 1mm scale)


3087.3mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

The published report is final and non-modifiable.

This report has been built with the information provided on the online form by the client. If different reporting information is required, a new sample analysis must be performed, with a new online form filled out to include exactly the information requested on the form.

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
E35A6E46EBEF10424FFD0A374A6367AE

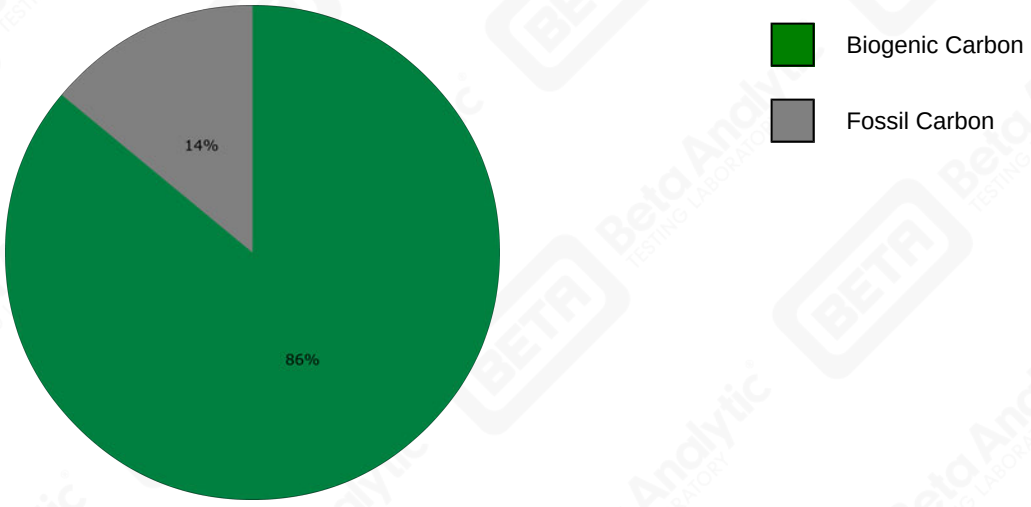
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	July 9, 2025
Report Date	July 16, 2025
Sample Code	Walker - NY - 0725

Result

86% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-760026
Percent modern carbon (pMC)	85.93 +/- 0.18 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

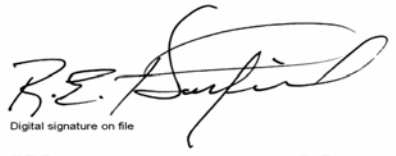
Report Date July 16, 2025

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 2	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	95.98 +/- 0.24 pMC
Agreement	Accepted
Reference 3	
Expected Value	110.69 +/- 0.40 pMC
Measured Value	110.75 +/- 0.28 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date July 16, 2025

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
liliana.durham@sgs.com

September 19, 2026

Mike Pryde
St. Marys Cement (Canada) - Ontario - Bowmanville Plant
410 Bowmanville Avenue
Bowmanville, Ontario (ON) L1C 7B5
Canada

Dear Mike Pryde,

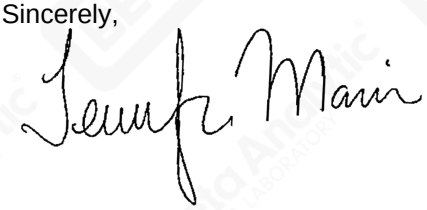
Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biogenic Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,



Jennifer Marin
Chemistry Department / Technical Laboratory Supervisor

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
liliana.durham@sgs.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
26B33A0D70776690069D3CCCAC054313

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	September 14, 2026
Report Date	September 19, 2026
Sample Code	Rubber- BE-0926

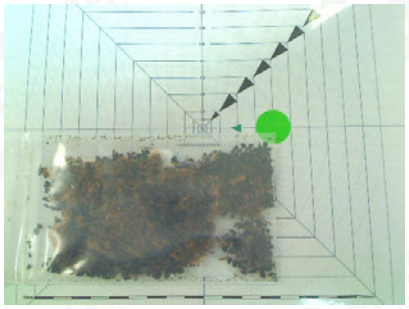
Result

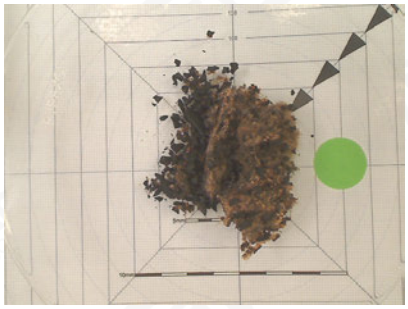
1% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-842041
Percent modern carbon (pMC)	0.60 +/- 0.04 pMC
Atmospheric adjustment factor (REF)	99.1; = pMC/0.991



Labeling COC


VOC (1mm x 1mm scale)


3367.3mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free 14C facility that does not accept or analyze materials that might contain artificial 14C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

The published report is final and non-modifiable.

This report has been built with the information provided on the online form by the client. If different reporting information is required, a new sample analysis must be performed, with a new online form filled out to include exactly the information requested on the form.

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

ISO/IEC 17025:2017-Accredited Testing Laboratory

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Miami, FL 33155 USA
Tel: (305) 667-5167
liliana.durham@sgs.com

Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
26B33A0D70776690069D3CCCAC054313

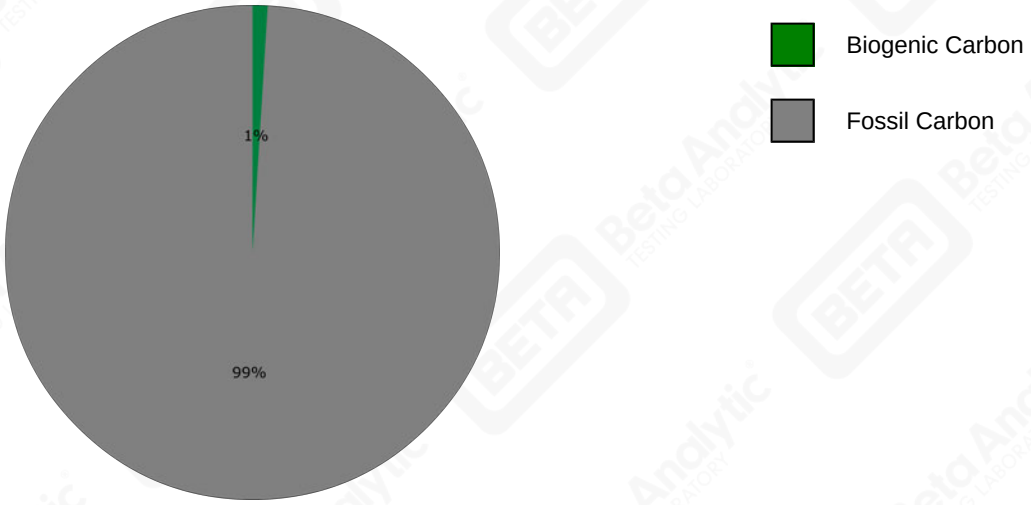
To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Submitter	Mike Pryde
Company	St. Marys Cement (Canada) - Ontario - Bowmanville Plant
Received Date	September 14, 2026
Report Date	September 19, 2026
Sample Code	Rubber- BE-0926

Result

1% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-842041
Percent modern carbon (pMC)	0.60 +/- 0.04 pMC
Atmospheric adjustment factor (REF)	99.1; = pMC/0.991



Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO2 in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.

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Miami, FL 33155 USA
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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO2 emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-ba sed). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegra tions per minute per gram (dpm/g) or radiocarbon age.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

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Miami, FL 33155 USA
Tel: (305) 667-5167
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Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date September 19, 2026

Submitter Mike Pryde

QA MEASUREMENTS

Reference 1	
Expected Value	23.05 +/- 0.20 pMC
Measured Value	23.22 +/- 0.09 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.42 +/- 0.05 pMC
Measured Value	0.42 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	95.86 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation Lothia Suárez - Prieto Date September 19, 2026

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 , Email : petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3
Attention: Jason Schultz , Felix Mendez

Lab no.: 288- 1 to 4 (A)
Date Report: Jan 19 , 2026
Sample in: Jan 8, 2026
PO no.: 6300601922

Re:4 Wood Chip samples from Dec 30,2025 for analysis.

	Lab no.		288-1	288-2	288-3	288-4
	Sample ID.		JE Culp	Woodbridge Wood	GFL	905-Wood
Tests	**Method ASTM**	**Unit**	**Results**			
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	6587 15.321	7001 16.284	7330 17.049	7054 16.407
2. Moisture content, As Received	E870	% wt.	24.27	19.05	14.07	11.77
3. Total Chlorine, As Received	D4208	% wt.	0.01	0.02	0.02	0.02
4. Sulfur, As Received	D1552	% wt.	0.17	0.01	0.09	0.04
5. Total Carbon, As Received	D5373	% wt.	38.11	40.65	41.67	41.54
6. Total Organic Carbon	D4129	% wt.	37.04	39.51	40.65	40.48
7. Ash content As Received	D4129	% wt.	1.10	0.89	1.35	1.22
8. Hydrogen. As Received	D3176	% wt.	6.43	7.63	5.66	6.68
9. Nitrogen As Received	D3176	% wt.	0.30	0.01	0.49	0.24

Tested by : P.S / QN.(Chemist)
Member of ASTM
JS:LN

Approved by James Szeto
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 Fax: (905) 361-2411
E-mail: petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3

Lab no.: 8262- 1 to 4 (A)
Date Report: Feb 21 , 2025
Sample in: Feb 13, 2025
PO no.: 6300601922

Attention: Jason Schultz , Mike Pryde

Re: 3 Wood Chip & 1 Plastic Scrap sample from Jan 30,2025 for analysis.

Lab no.			8262-1	8262-2	8262-3	8262-4
Sample ID.			**905 Wood**	**GFL Wood**	**Woodbridge**	**Re-World**
Tests	**Method ASTM**	**Unit**	**Results**			
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	7576 17.621	7440 17.305	6857 15.949	5469 12.721
2. Moisture content, As Received	E870	% wt.	12.40	15.02	18.39	25.36
3. Total Chlorine, As Received	D4208	% wt.	0.06	0.01	0.01	0.17
4. Sulfur, As Received	D1552	% wt.	0.14	0.22	0.19	0.26
5. Total Carbon, As Received	D5373	% wt.	44.49	44.15	42.03	30.93
6. Total Organic Carbon	D4129	% wt.	43.60	43.06	41.08	29.26
7. Ash content As Received	D4129	% wt.	0.95	0.81	0.85	9.21

Tested by : P.S / A.C.(Chemist)
Member of ASTM
JS:LN

Approved by *James Szeto*
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 Fax: (905) 361-2411
E-mail: petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3

Lab no.: 8348- 1 to 5 (A)
Date Report: Mar 13 , 2025
Sample in: Mar 5, 2025
PO no.: 6300601922

Attention: Jason Schultz , Mike Pryde

Re: 4 Wood Chip & 1 Plastic Scrap sample from Feb 28,2025 for analysis.

Lab no.			8348-1	8348-2	8348-3	8348-4	8348-5
Sample ID.			**905 Wood**	**GFL Wood**	**Woodbridge**	**York -1**	**Re-World**
Tests	**Method ASTM**	**Unit**	**Results**				
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	7494 17.431	7333 17.056	6727 15.647	4349 10.116	13467 31.324
2. Moisture content, As Received	E870	% wt.	11.38	21.82	19.78	37.19	4.06
3. Total Chlorine, As Received	D4208	% wt.	0.01	0.01	0.02	0.02	1.05
4. Sulfur, As Received	D1552	% wt.	0.14	0.17	0.21	0.14	0.20
5. Total Carbon, As Received	D5373	% wt.	44.60	43.92	41.39	27.11	64.05
6. Total Organic Carbon	D4129	% wt.	43.74	42.51	40.53	26.51	63.01
7. Ash content As Received	D4129	% wt.	0.77	0.67	0.69	10.65	7.07

Tested by : P.S / A.C.(Chemist)
Member of ASTM
JS:LN

Approved by *James Szeto*
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 , Email : petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3

Lab no.: 8807- 1 to 4 (A)
Date Report: May 15, 2025
Sample in: May 7, 2025
PO no.: 6300601922

Attention: Jason Schultz , Mike Pryde

Re: 3 Wood Chip & 1 Nylon sample from April 30,2025 for analysis.

Lab no.			8807-1	8807-2	8807-3	8807-4
Sample ID.			**905 Wood**	**GFL Wood**	**Woodbridge Wood**	**Evolve Nylon**
Tests	**Method ASTM**	**Unit**	**Results**			
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	6937 16.135	7557 17.577	7112 16.542	13679 31.817
2. Moisture content, As Received	E870	% wt.	17.48	9.54	15.46	0.98
3. Total Chlorine, As Received	D4208	% wt.	0.04	0.06	0.04	0.04
4. Sulfur, As Received	D1552	% wt.	0.23	0.16	0.20	0.67
5. Total Carbon, As Received	D5373	% wt.	41.17	45.44	42.37	72.88
6. Total Organic Carbon	D4129	% wt.	40.21	44.33	41.15	71.72
7. Ash content As Received	D4129	% wt.	2.19	0.87	1.23	5.84

Tested by : P.S / QN.(Chemist)
Member of ASTM
JS:LN

Approved by *James Szeto*
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 , Email : petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3
Attention: Jason Schultz , Mike Pryde

Lab no.: 9387- 1 to 6 (A)
Date Report: Sep 19 , 2025
Sample in: Sep 5 , 2025
PO no.: 6300601922

Re:6 Wood Chip samples from Aug 30,2025 for analysis.

Lab no.			9387-1	9387-2	9387-3	9387-4	9387-5	9387-6
Sample ID.			GFL Wood	Woodbridge Wood	905 Wood	York -1	Reworld - Mianco	JE Culp
Tests	**Method ASTM**	**Unit**	**Results**					
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	6403 14.893	7599 17.675	7627 17.740	7528 17.510	7245 16.851	6999 16.279
2. Moisture content, As Received	E870	% wt.	15.01	11.04	11.95	10.89	15.63	16.07
3. Total Chlorine, As Received	D4208	% wt.	0.04	0.04	0.03	0.03	0.03	0.03
4. Sulfur, As Received	D1552	% wt.	0.17	0.12	0.10	0.09	0.18	0.14
5. Total Carbon, As Received	D5373	% wt.	43.40	44.63	44.15	43.75	42.21	40.87
6. Total Organic Carbon	D4129	% wt.	42.15	43.54	43.18	42.86	41.31	39.78
7. Ash content As Received	D4129	% wt.	0.78	0.28	0.91	2.02	3.18	2.10
8. Hydrogen. As Received	D3176	% wt.	6.63	6.02	5.81	5.45	6.09	6.14
9. Nitrogen As Received	D3176	% wt.	0.38	0.20	0.40	0.01	0.27	0.01

Tested by : P.S / QN.(Chemist)
Member of ASTM
JS:LN

Approved by *James Szeto*
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 , Email : petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3
Attention: Jason Schultz , Mike Pryde

Lab no.: 9387- 7 to 9 (A)
Date Report: Sep 19 , 2025
Sample in: Sep 5 , 2025
PO no.: 6300601922

Re: Plastic and Nylon samples from Aug 30,2025 for analysis.

Lab no.			9389-7	9387-8	9387-9
Sample ID.			**EFS Plastic**	**Culp Nylon**	**Evolve, Nylon**
Tests	**Method ASTM**	**Unit**	**Results**		
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	14210 33.052	2003 4.659	13503 31.407
2. Moisture content, As Received	E870	% wt.	4.20	50.54	1.42
3. Total Chlorine, As Received	D4208	% wt.	1.14	0.21	0.03
4. Sulfur, As Received	D1552	% wt.	0.13	0.24	0.83
5. Total Carbon, As Received	D5373	% wt.	68.50	2.11	70.72
6. Total Organic Carbon	D4129	% wt.	67.54	2.15	69.85
7. Ash content As Received	D4129	% wt.	5.97	45.07	8.46
8. Hydrogen. As Received	D3176	% wt.	9.51	6.11	5.88
9. Nitrogen As Received	D3176	% wt.	0.01	0.01	1.00

Tested by : P.S / QN.(Chemist)
Member of ASTM
JS:LN

Approved by James Szeto
James Szeto,B.Sc.
Chief Chemist

Petro Laboratories Inc.

1295 Matheson Blvd. East, Mississauga, Ontario, L4W 1R1 Tel: (905) 361-2388 , Email : petrolab@gmail.com

Laboratory Report

St. Marys Cement
400 Waverly Road South,
Bowmanville, Ontario
L1C 3K3
Attention: Jason Schultz , Mike Pryde

Lab no.: 9537- 1 to 5 (A)
Date Report: Oct 15 , 2025
Sample in: Oct 3 , 2025
PO no.: 6300601922

Re:5 Wood Chip samples from Sep 30,2025 for analysis.

	Lab no.		9537-1	9537-2	9537-3	9537-4	9537-5
	Sample ID.		GFL Wood	Woodbridge Wood	905 Wood	JE Culp	Reworld - Mianco
Tests	**Method ASTM**	**Unit**	**Results**				
1. Calorific Value, As Received	D5865	BTU/lb MJ/kg	7208 16.765	7325 17.038	7631 17.749	7209 16.768	7064 16.430
2. Moisture content, As Received	E870	% wt.	16.90	17.14	14.70	16.68	14.25
3. Total Chlorine, As Received	D4208	% wt.	0.03	0.01	0.02	0.01	0.02
4. Sulfur, As Received	D1552	% wt.	0.33	0.22	0.13	0.16	0.16
5. Total Carbon, As Received	D5373	% wt.	41.48	42.39	43.78	42.42	42.14
6. Total Organic Carbon	D4129	% wt.	40.02	41.38	42.94	41.51	40.28
7. Ash content As Received	D4129	% wt.	1.43	0.53	0.62	0.82	2.46
8. Hydrogen. As Received	D3176	% wt.	6.37	6.58	6.24	6.06	6.40
9. Nitrogen As Received	D3176	% wt.	0.21	0.10	0.06	0.18	0.05

Tested by : P.S / QN.(Chemist)
Member of ASTM
JS:LN

Approved by James Szeto
James Szeto,B.Sc.
Chief Chemist

McCreath
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Analysis Report

September 28, 2026

St. Marys Cement Bowmanville Plant
410 Bowmanville Ave
Bowmanville ON

P.O. #6300692072

The sample received from you on September 18, 2026, marked: September Alternative Fuels- Rubber Belting, showed the following:

	As Received	Dried
Moisture	0.83 %	---------
Ash	6.68 %	6.74 %
Volatile Matter	75.76 %	76.39 %
Fixed Carbon	16.73 %	16.87 %
	100.00 %	100.00 %
Sulfur	0.64 %	0.65 %
Gross Calorific Value	16,100 BTU/lb	16,235 BTU/lb
Net Calorific Value	15,269 BTU/lb	15,406 BTU/lb
Carbon	77.42 %	78.07 %
Hydrogen	9.09 %	9.07 %
Nitrogen	1.75 %	1.76 %
Oxygen	4.42 %	3.71 %

Lab #H26091810

Yours very truly,

ANDREW S. McCREATH & SON, INC.

Robert E. Kozicki

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End of Report

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