

# Soil Organic Carbon Project Report

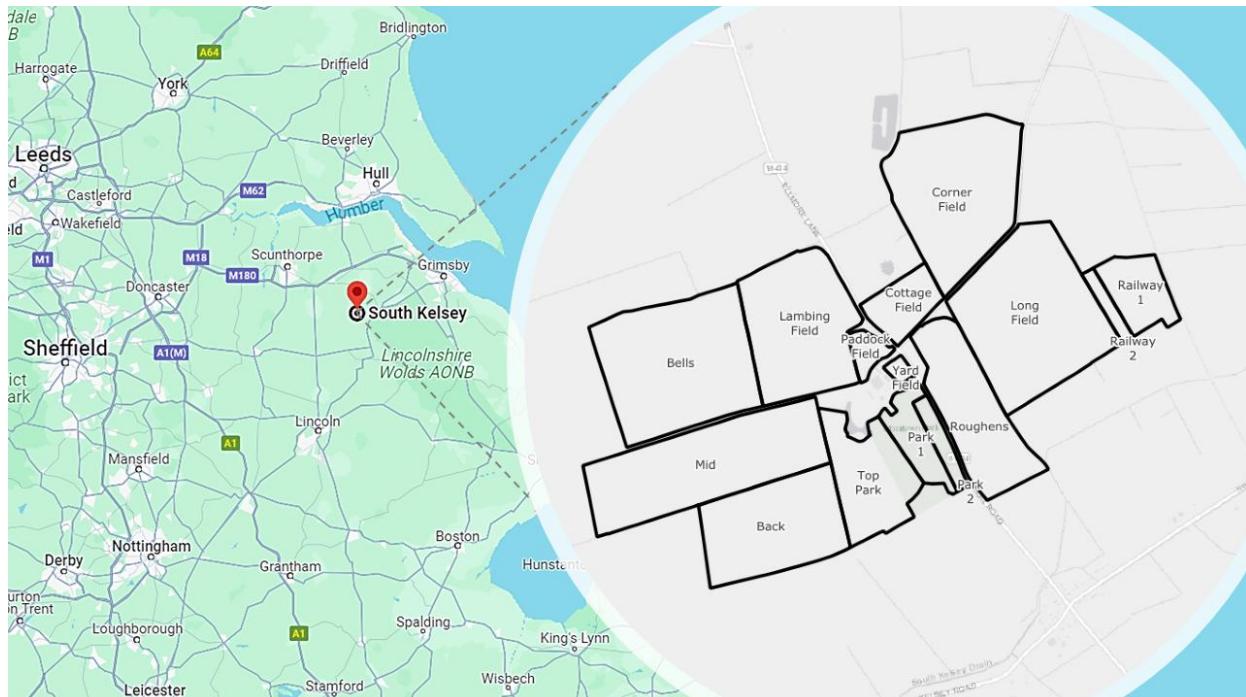
## Baseline Report

### 2023

## MOORTOWN HOUSE FARM

Brigg Road, Moortown, Market Rasen,  
Lincolnshire, LN7 6JA

Date Reported: 05/02/2025

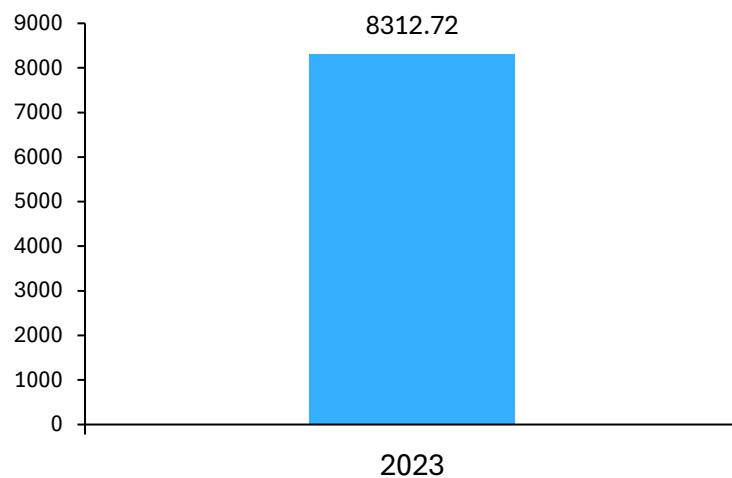


Project Location

# Executive Summary

Carbon Balance (tCO <sub>2</sub> e) <sup>1</sup>	
<b>Net SOC Change</b>	Intentionally Blank
<b>GHG Emissions</b>	Intentionally Blank
<b>Balance<sup>2</sup></b>	Intentionally Blank

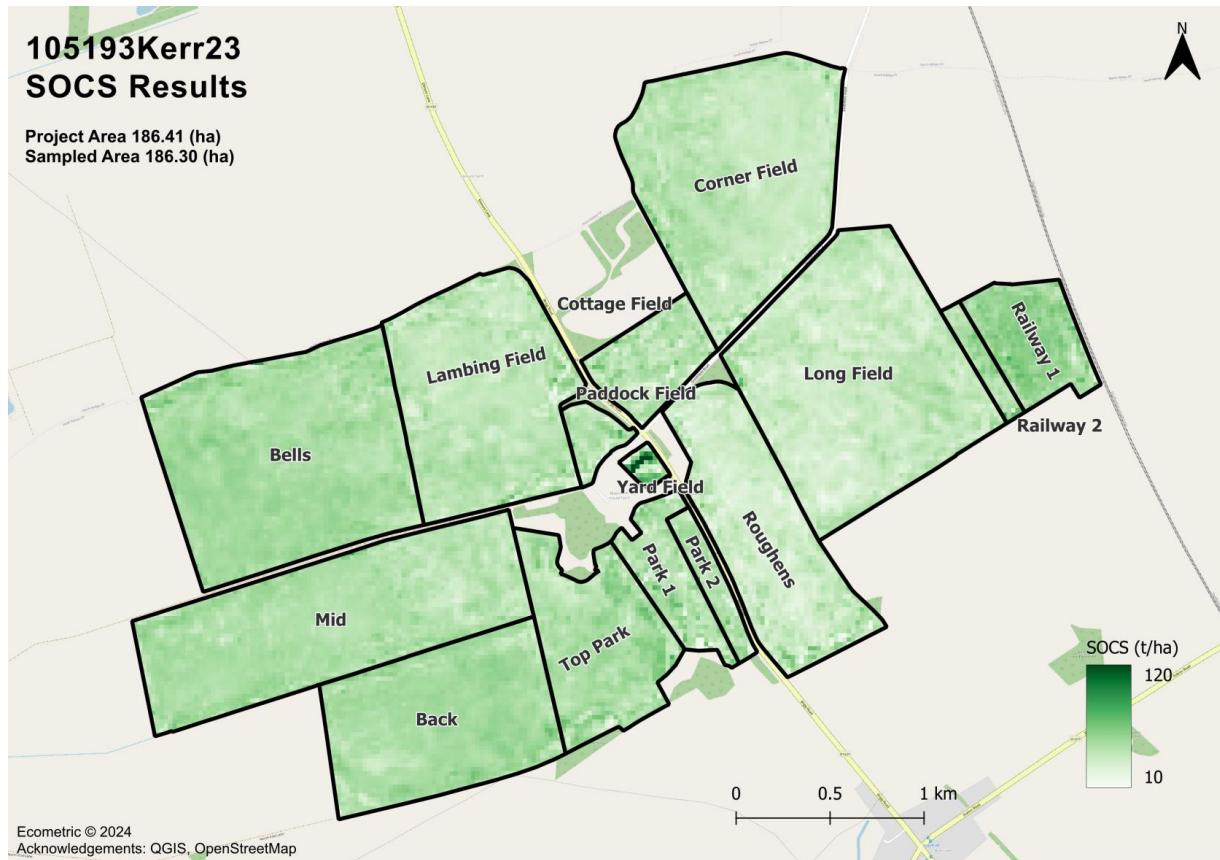
Credit Statement	
<b>Buffer Pool</b>	Intentionally Blank
<b>Credits Pending Issue</b>	Intentionally Blank
<b>Total</b>	Intentionally Blank



Project Outline		
<b>Total Project Area</b>	186.41	(ha)
<b>Total Sampled Area</b>	186.30	(ha)
<b>Field Boundaries</b>	RPA	
<b>Soil Sampling Start</b>	16/11/2023	
<b>Soil Sampling Finish</b>	16/11/2023	
<b>No of Samples</b>	41	
<b>Laboratory Analysis</b>	NRM	
<b>MAPE</b>	9.14	(%)
<b>Gross SOC Total</b>	8312.72	(tonnes)
<b>Gross SOC Change</b>	Intentionally Blank	(tonnes)
<b>Max MAPE</b>	Intentionally Blank	(%)
<b>Net SOC Change</b>	Intentionally Blank	(tonnes)

<sup>1</sup> Not applicable if this is a baseline report.

<sup>2</sup> Balance = Net SOC Change – GHG Emissions – Leakage



*Figure 1 - Project SOCS*



*Figure 2 - Monitoring Period Gross SOCS Change<sup>3</sup>*

<sup>3</sup> Not applicable if this is a baseline report.



## Contents

Project Information.....	1
Results .....	2
Gross SOC Total (t).....	4
Carbon Balance.....	4
GHG Emissions.....	4
Yield Reduction Leakage .....	5
Sampling Method .....	A-1
Laboratory Analysis .....	A-1
SOCS Calculation .....	A-2
AI Processing .....	A-2
Accuracy .....	A-2
Greenhouse Gas Emissions Monitoring.....	A-2
Leakage Deduction.....	A-3
Monitored Impact Information .....	A-3
Carbon Balance .....	A-3
Accredited Ecometric Methodology: .....	B-1
Accredited Ecometric Credit Class: .....	B-1
GHG Emissions Calculation .....	B-1
Regen Network.....	B-1
Regen Registry .....	B-1
Regen Marketplace.....	B-1
Regen Ledger .....	B-1
Ecometric Roles and Responsibilities .....	B-1
Verifier .....	B-1

## List of Tables

Table 1: SOC Results .....	2
Table 2: Gross Total SOC and Gross SOC Change (t) .....	4
Table 3: Carbon Balance of Monitoring Period .....	4
Table 4: Emissions Report Files.....	4
Table 5: Yield Reduction Leakage.....	5

## List of Figures

Figure 1 - Project SOCS .....	ii
Figure 2 - Monitoring Period Gross SOCS Change .....	ii
Figure 3 - SOC Results Map .....	3

## List of Terms

### **Soil Organic Carbon**

Soil Organic Carbon (SOC) is the organic carbon component of the total carbon content of soil.

### **Soil Organic Carbon Stock**

Soil Organic Carbon Stock (SOCS) is the amount of SOC contained within a defined area, normally measured as tonnes per hectare (t/ha).

### **Carbon Dioxide Equivalent**

To allow comparison between different emissions relevant to climate change, SOC is converted to Carbon Dioxide Equivalent (CO<sub>2</sub>e) by multiplying by the molecular weight of carbon dioxide (3.67).

### **Carbon Balance**

Carbon Balance was calculated by deducting total farm enterprise Greenhouse Gas (GHG) emissions from the net SOC change, over the monitoring period. A positive balance indicates that more CO<sub>2</sub>e has been added to the soil within the project area than has been emitted by the food and fibre production within the project area during the monitoring period.

### **Mean Absolute Percentage Error**

Mean Absolute Percentage Error (MAPE) is defined as the mean of the absolute difference between the sampled (SOCS(S)) and AI (SOCS(AI)) as a percentage:

$$MAPE = \frac{1}{n} \sum_{t=1}^n \left| \frac{SOCS(S)_t - SOCS(AI)_t}{SOCS(S)_t} \right| \quad (1)$$



## Project Information

Organisation Name: **Ecometric Ltd**

Project Name: **105193Kerr23**

Monitoring Year: **2023**

Project Proponent and Monitoring Provider: **Ecometric Ltd**

Contact: [David Wright](#) / [Hannah Baldwin](#)

Crediting Term Period (Start + 10 Years): **01/01/2023 – 31/12/2032**

Project Location: **53.48646, -0.39589 WGS84**

Applied methodology: *Soil Organic Carbon Estimation in Regenerative Cropping and Managed Grassland Ecosystems v1.2.2*

Credit Class: *GHG Benefits in Managed Crop and Grassland Systems v1.5.1*

Project Status: Active

Project Filename: **105193Kerr23 Soil Organic Carbon Project Report**

Remarks: The net SOC change was calculated by deducting the maximum MAPE for the monitoring period from the gross SOC change.

Signature:

A handwritten signature in black ink, appearing to read "David".

David Wright BSc

Ecometric

CEO

## Results

The SOC results, for the project, are shown in Table 1 and Figure 3.

*Table 1: SOC Results*

Project Area AI SOC				MAPE	9.14
Field	Crop Type	Area	Gross Mean	Gross Total	Stone Content
		[ha]	[t/ha]	[t]	[%]
Back	AB15	17.43	50.28	876.45	0.00%
Bells	AB15	26.32	50.36	1325.38	0.00%
Corner Field	AB15	23.76	41.33	981.98	0.00%
Cottage Field	AB9	4.95	44.29	219.21	0.00%
Lambing Field	AB15	19.66	42.11	827.80	0.00%
Long Field	AB15	26.91	37.68	1013.87	0.00%
Mid	AB15	24.55	47.03	1154.58	0.00%
Paddock Field	AB8	1.76	44.26	77.90	0.00%
Park 1	AB8	4.51	45.31	204.35	0.00%
Park 2	AB9	2.13	45.85	97.66	0.00%
Railway 1	AB8	5.87	55.65	326.67	0.00%
Railway 2	AB9	1.47	49.12	72.21	0.00%
Roughens	AB15	14.95	35.77	534.73	0.00%
Top Park	AB15	11.47	48.50	556.34	0.00%
Yard Field	Grass Ley	0.67	65.05	43.59	0.00%
<b>Totals &amp; Mean</b>					
AB15		165.05	44.13	7271.12	0.00
AB8		12.14	48.41	608.93	0.00
AB9		8.55	46.42	389.09	0.00
Grass Ley		0.67	65.05	43.59	0.00
<b>Totals &amp; Mean</b>		<b>186.41</b>	<b>46.84</b>	<b>8312.72</b>	<b>0.00</b>

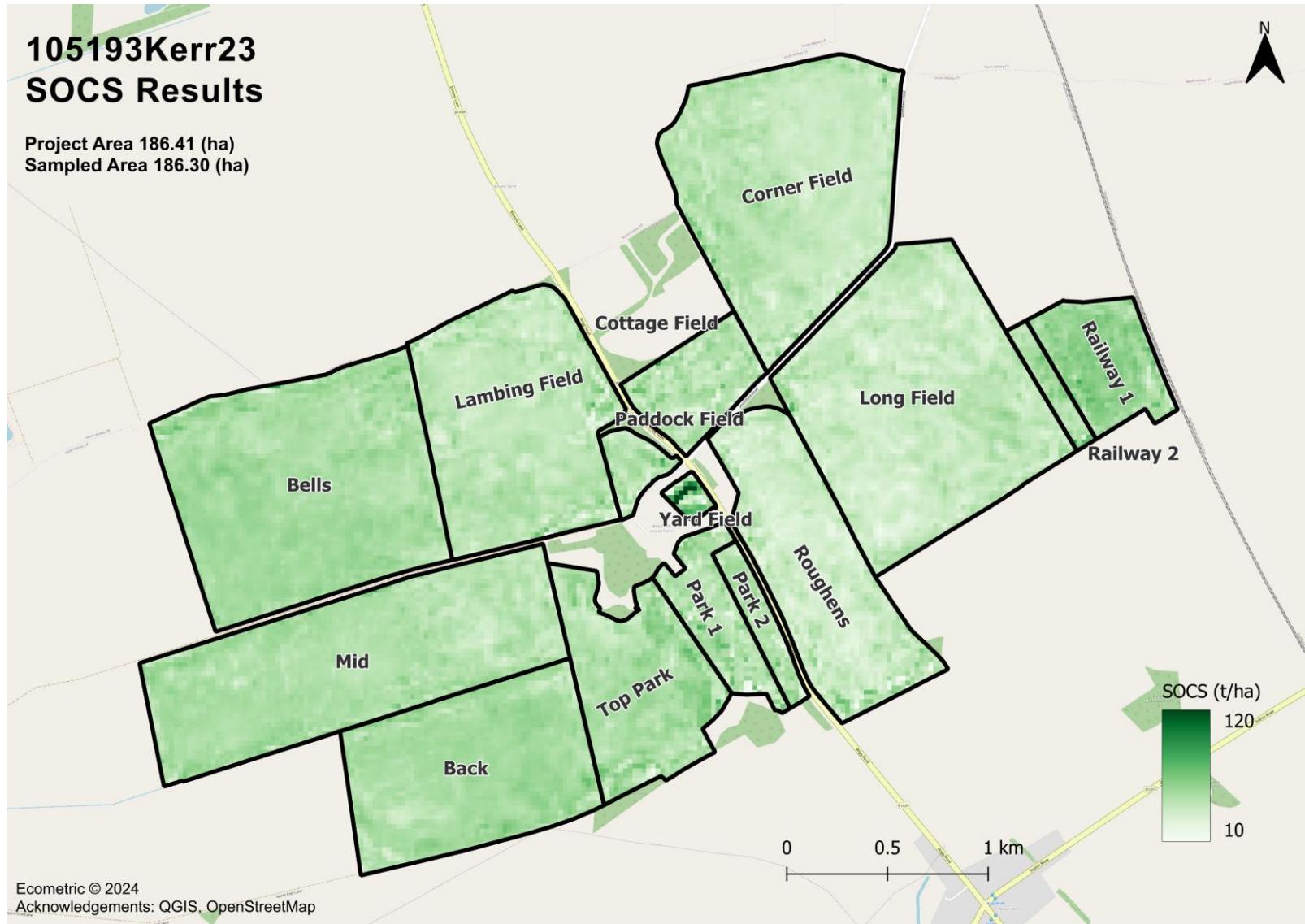


Figure 3 - SOC Results Map

## Gross SOC Total (t)

The Gross SOC Total (t) after the baseline year and subsequently each monitoring period is shown in Table 2.

*Table 2: Gross Total SOC and Gross SOC Change (t)*

Year No	Year	MAPE	Gross SOC Total	Gross SOC Change
		[%]	[t]	[t]
0	2023	9.14	8,312.72	Not Applicable
1				
2				
3				
4				
5				

## Carbon Balance

The carbon balance for each monitoring period is shown in Table 3. The methodology deducts total emissions and leakage from SOC Gains (converted to tCO<sub>2</sub>e for equivalence) to calculate the carbon balance. The GHG emissions report file names are shown in Table 4.

*Table 3: Carbon Balance of Monitoring Period*

Year No	Year	Net SOC Change <sup>4</sup>	Net SOC Change	Monitoring Period GHG Emissions	Carbon Balance
		[t]	[tCO <sub>2</sub> e]	[tCO <sub>2</sub> e]	[tCO <sub>2</sub> e]
0	2023	Not Applicable	Not Applicable	Not Reported	Not Applicable

## GHG Emissions

*Table 4: Emissions Report Files*

Baseline	Intentionally Blank
Monitoring Period	Intentionally Blank

<sup>4</sup> The net SOC change was calculated by deducting the maximum MAPE for the monitoring period from the gross SOC change.

## **Yield Reduction Leakage**

Yield reduction leakage, shown as the historic 5-year and monitoring period average yield, is shown in Table 5. A leakage deduction is only applied if the project average yield across all crop types is shown to decrease by more than 10%. Full details of the leakage deduction calculation are shown in Appendix A.

*Table 5: Yield Reduction Leakage*

Crop Type	Historic 5-year Average Yield	Monitoring Period Average Yield
	(t/ha)	(t/ha)
AB15	Not Applicable	Not Applicable
AB8	Not Applicable	Not Applicable
AB9	Not Applicable	Not Applicable

## Appendix-A      Methodology

### Sampling Method

Compact Geographical Stratification (CGS) was the chosen sampling design. The use of CGS and equal size strata ensured that the average SOCS per stratum did not bias the total SOCS value for each field. Fields were divided into an average of 4 (ha) strata (exact stratum size was dependent on field size and shape). An average of 43 cores were taken in a grid pattern within each stratum. The core depth was 0-30 cm. The cores within each stratum were conflated to form an individual sample for laboratory analysis. Sampling was performed by Agri-Soil using a WINTEX 1000S system. The sample plan was saved as Shapefiles and uploaded into the sample team's control system. Each sample stratum was assigned a unique label so that the location could be correlated with the data returned by the laboratory. The location of each core was recorded by the sample team using a Trimble Nav 500 Global Navigation Satellite System (GNSS), with an accuracy of +/- 0.2 meters. The positions were recorded in WGS84, EPSG:4326 geographical coordinates. The core positions were within 2m of the requested sampling plan locations.

Some baseline sample plans only covered 50% of the project fields. Conflated samples of 40 cores were taken for each hectare block. Subsequent monitoring round sample plans were designed to cover 100% of the fields to ensure coverage of all crop and soil types. The density of the samples and cores was changed in proportion to the overall area of the project fields. The effect on this change, on the results, was tested on the previous sample plan designs by combining the blocks to form various larger block sizes. The effect of the change in core and sample density was mathematically modelled to estimate the change in the uncertainty of the sample results. The block size was chosen that provided the best balance between sample numbers (cost) and SOC uncertainty.

### Laboratory Analysis

Laboratory analysis was conducted by a laboratory meeting BS EN ISO/IEC 17025, the British, European, and international standard for analytic laboratories. The United Kingdom Accreditation Service (UKAS) inspects and accredits laboratories that wish to claim compliance with this standard. A laboratory that has been accredited by UKAS to ISO 17025 is permitted to display a Royal Crown Mark.

To give a complete audit of the carbon contained within the soil sampled, the following analysis and calculations were conducted:

- Soil Organic Carbon Stock (t/ha).
- Soil Organic Carbon (%).
- Organic Matter (%).
- Total Nitrogen (%).
- Total Carbon (%).
- Carbon: Nitrogen Ratio.
- Soil Inorganic Carbon (%).
- Carbonate Class.
- Bulk Density (kg/l).
- Stone Fraction (%).

The carbon analysis was carried out using DUMAS method.



## SOCS Calculation

SOCS was calculated from core depth (d), Bulk Density (BD) and SOC:

$$SOCS = d * BD * SOC \quad (2)$$

Changes in depth, BD or SOC will result in a change in SOC stock.

## AI Processing

Multispectral reflectance data from satellite imagery was extracted for each sample location and paired with its respective laboratory analysed soil sample value to create a training dataset for the ecometric Artificial Neural Network (ANN). The trained ANN used the original multispectral satellite image to estimate SOCS values for every 10sqm pixel within the project area digital field boundaries.

The ecometric AI System requires predictors and responses to train. The predictors were the pixel values from multispectral satellite imagery and the responses were SOCS values reported by the laboratory.

The sampling plan allocated a laboratory SOCS value to each CGS stratum, representing an average SOCS for the stratum. The average SOCS value was then allocated to each core location within the relevant stratum. A QGIS tool was used to extract spectral values at each core location for all bands used in the analysis. The predictors and responses were correlated by location to create the AI training dataset.

A percentage of the training data was automatically partitioned by the AI and used during the training cycle for validation and testing. The AI-estimated SOCS values (t/ha) were exported as the georeferenced map. The MAPE was calculated from the difference between the sampled and AI SOCS results.

## Accuracy

To quantify AI performance a direct comparison was made between coincident AI calculated SOCS and all laboratory reported SOCS values, reported as Mean Absolute Percentage Error (MAPE). Although this is a comparison rather than an error it is applied as a deduction as a potential source of overestimation. The net SOC change was calculated by deducting the maximum MAPE from the gross SOC change, a conservative assumption of error.

## Greenhouse Gas Emissions Monitoring

The estimation of Greenhouse Gas (GHG) emissions was carried out by the independent 3rd party expert contractor, Cross Compliance Solutions (CXCS), a DEFRA-approved Agricultural Auditor, using the Farm Carbon Toolkit IPCC Tier 2 calculator as defined in Appendix B. CXCS are responsible for independent GHG emissions data gathering directly from the farm management team and carry out all emissions calculator data entry to ensure consistency and accuracy. This calculation process appropriately accounts for all Scope 1, 2 and 3 GHG sources emitted during the cropping season coinciding with the monitoring interval.



## Leakage Deduction

For each crop type in the project area, the average yield in the monitoring round is compared with the average yield in the 5-year historical period. The change in average yield for all crop types are averaged to give a project average percentage change in yield. If there is a reduction in project average yield exceeding -10%, a leakage deduction is applied.

Equation 2 is used to calculate yield leakage for each crop type. A positive figure quantifies yield reduction exceeding the 10% threshold. A negative figure demonstrates that any change in yield is within the 10% threshold, hence no leakage penalty will be applied for the relevant crop type.

$$\text{Yield Leakage} = (5 \text{ Year Average Yield} \times 0.9) - \text{Project Average Yield} \quad (2)$$

Equation 3 is then used to calculate the leakage deduction for any crop type with a positive yield leakage.

$$\text{Leakage Deduction} = \text{Yield Leakage} \times \text{Crop Area} \times \text{Crop Average Emissions} \quad (3)$$

The leakage deduction for each crop type in the project are summed to give a total project leakage deduction.

## Monitored Impact Information

- Data Unit: tonnes Carbon Dioxide equivalent (tCO<sub>2</sub>e).
- Collection Dates: as listed in Implementation Dates.
- SOC quantities are monitored and reported as tSOC and tCO<sub>2</sub>e.
- SOC change is the difference between the previous and current year SOC.
- GHG emissions, for all food and fibre production emitted within the project area during the monitoring period, and leakage from yield reduction are subtracted from SOC gains to report the Carbon Balance.
- A positive balance will be issued EcoCredits on the Regen Registry.

## Carbon Balance

One EcoCredit will be issued per tCO<sub>2</sub>e positive carbon balance:

$$\text{Carbon Balance [tCO}_2\text{e]} = \text{SOC change} - \text{Monitoring Period GHG Emissions} - \text{Leakage Deduction} \quad (4)$$



## Appendix-B      Soil Organic Carbon Project Report Notes

### Accredited Ecometric Methodology:

[Soil Organic Carbon Estimation in Regenerative Cropping & Managed Grassland Ecosystems - Regen Registry](#)

### Accredited Ecometric Credit Class:

[GHG Benefits in Managed Crop and Grassland Systems Credit Class - Regen Registry](#)

### GHG Emissions Calculation

Whole Farm Enterprise emissions will be calculated for all food and fibre production within the geographic boundaries of the Project Area. This calculation will be conducted using the most suitable among three tools related to farm enterprise activities:

[The Farm Carbon Calculator \(farmcarbontoolkit.org.uk\)](#)

[Cool Farm Tool | An online greenhouse gas, water, and biodiversity calculator](#)

[Farm carbon calculator | Home | Agrecalc](#)

### Regen Network

A digital platform based on blockchain technology to originate and invest in high-integrity carbon and biodiversity credits from ecological regeneration projects. Ecometric completed the Regen Network 12-month methodology review process in February 2023 to be accepted onto the Regen Library.

### Regen Registry

Regen Network creates, develops and approves methodologies to verify and sell ecological credits from nature-based solutions. Regen Registry also creates and governs the requirements for quantification, monitoring, reporting, verification, project registration, administration and issuance of credits and governance of the registry standards.

### Regen Marketplace

[Regen Marketplace](#) is a storefront for creating, bundling and selling ecocredits for Regen Network projects, operating in the voluntary carbon and ecosystem service market.

### Regen Ledger

[Regen Ledger](#) is a proof-of-stake blockchain ledger that immutably stores all data about projects, ecocredits and claims as a publicly verifiable, transparent, auditable record of assets stored on the platform.

### Ecometric Roles and Responsibilities

Methodology Developer, Credit Class Owner, Monitoring Service Provider and Project Proponent as defined in the Regen Registry Handbook:

[Definitions - Regen Registry](#)

Ecometric will operate according to the Program Rules and Requirements as defined in the Regen Registry Program Guide.

### Verifier

To be appointed independently by Regen Network to audit and verify originated CDR Credits.



Ecometric

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<http://www.ecometric.co.uk>

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