

Project

Project: Hendre Lakes EIA
 Client: Client name
 Workbook Name: Energy Benchmarking

Workbook Contents

Worksheet	Description
X1	QA
X2	Lists
1	
2	
3	
4	

Revision Control

Current Revision

Revision History					
Revision	Date	Revision Notes	Creator	Reviewer	Approver
Final Issue	14/05/2020		DC		

Emissions source	Emissions over appraisal period (tCO ₂ -e)	Annual emissions in opening year (tCO ₂ -e/year)
Construction		
Buildings	1,172	
Habitats	18,937	
Transport	4,075	679
Public realm	1,928	
Operation		
Buildings	79,958	4,097
Public realm	1,264	289
Habitats	12,948	80
Transport	192,462	3,262
Maintenance and refurbishment		
Buildings	32,796	

Cardiff emissions (2017 Data)

Sector Name	CO2 (kt)
Industry & Commercial Electricity	265
Industry & Commercial Gas	223
Large Industrial Installations	22
Industrial & Commercial Other Fuels	38
Agricultural Combustion	2.9
Domestic Electricity	130
Domestic Gas	315
Domestic Other Fuels	6
Road Transport (A roads)	250
Road Transport (Motorways)	134
Road Transport (Minor roads)	266
Diesel Railways	9.8
Transport Other	3
LULUCF Net Emissions	0.8
Total for all sectors	1,665
Hendre Lakes construction emissions as a proportion	1.57%
Hendre Lakes construction emissions as a proportion - annualised for each year over Hendre Lakes operational (2028)	0.31%
Hendre Lakes operational (2028) emissions as a proportion	0.46%

Domestic emissions	451
Cardiff Parkway emissions as a proportion	0.9%

Source:

<https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-nat>

Tables for report

Construction emissions

Building reference	Building name / purpose	Building floor area (m²)
B1	Employment Space	60,000
B2	Light industry / R&D / Warehousing	30,000
B1	Employment Space - retail/leisure	2,200
	0 Cardiff Parkway Station	2,500
	0 Station Square	6,500
	0 Central Spine (approximate)	2,800
B15	Parking - main car park	14,800
B15	Parking - drop off area	2,000
	8 Street lighting	26,100
Total		0 -

Operational emissions

Building reference	Building name / purpose	Building floor area (m²)
B1	Employment Space	60,000
B1	Employment Space - retail/leisure	2,200
B2	Light industry / R&D / Warehousing	30,000
	0 Cardiff Parkway Station	2,500
	0 Hendre Park	22,600
	0 Station Square	6,500
	0 Central Spine (approximate)	2,800
B15	Parking - main car park	14,800
B15	Parking - drop off area	2,000
	8 Street lighting	26,100
Total		0 -

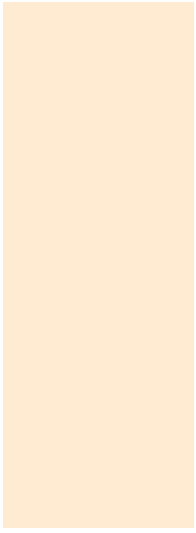
ional-statistics-2005-to-2017

RUP

Benchmark category	Typical benchmark (kgCO ₂ -e/m ²)	Emissions (tCO ₂ -e)
Office	530	31800000
Warehouse	475	14250000
Retail	705	1572150
Station	455	1137500
Other	495	3217500
Other	495	1361250
Car park	475	7030000
Car park	475	950000
Street Lighting	45	1172250
	0	0
		62,490,650

Benchmark category	Electricity consumption benchmark (kWh/m ² /year)	Emissions from fossil fuel consumption benchmark (kgCO ₂ -e/m ² /year)	Annual electricity consumption (MWh/year)	Annual emissions from fossil fuel consumption (tCO ₂ -e/year)
General Office	114	14	6,800	800
General Retail	70	8	200	-
Industrial	70	8	2,100	300
Public waiting or circulation	29	24	100	100
	0	-	-	-
	0	-	-	-
	0	-	-	-
Covered Car Park	19	-	300	-
Covered Car Park	19	-	-	-
	0	-	700	-
	0	-	10,100	1,200

10% reduction in fossil-thermal typical benchmark due to changes in Part L



Hendre Lakes EIA

Embodied emissions

Energy Benchmarking

Building reference	Building Name / Purpose	Building Type	Benchmark Category (Operational)	GIA - Building floor area (m ²)
B1	Employment Space	B1	General Office	60,000
B2	Light industry / R&D / Warehousing	B1	Industrial	30,000
B1	Employment Space - retail/leisure	B1		2,230
	Cardiff Parkway Station		Public Assesmbly	2,500
0	Station Square		Landscaped - Surfaced for lightly trafficked areas	6,500
0	Central Spine (approximate)		Landscaped - Surfaced for pedestrian areas	2,750
B15	Parking - main car park	B15	Landscaped - Surfaced for lightly trafficked areas	14,800
B15	Parking - drop off area	B15	Landscaped - Surfaced for lightly trafficked areas	2,000
8	Street lighting			26,050
Total				

Pavement benchmarks - Green Guide to Specification

Type	Element	Kg of CO2 eq. (60 years)
Car park	Asphalt (85mm) over prepared sub-base	45
Footpath	Asphalt paving (75mm) over prepared sub-base	41

- Green G
- Building
- Category
- Element
- Element
- Element N
- Summary
- Climate C
- Water Ex
- Mineral R
- Stratosph
- Human To
- Ecotoxicit
- Nuclear W
- Ecotoxicit
- Waste Dis
- Fossil Fue
- Eutrophica
- Photocher
- Acidificati
- Kg of CO₂

Pavement benchmarks - derived from ICE

Area type	Material	Depth (mm)	Emissions factor (kgCO₂-e/kg)		Density (kg/m³)
<i>Footpath</i>	Concrete		60	0.107	1350
	Mortar		30	0.221	1900
	Sub base (aggregate)		225	0.0052	2240
<i>Local road</i>	Asphalt		250	0.086	2100
	Sub base (aggregate)		225	0.0052	2240
<i>Carpark</i>	Asphalt		100	0.086	2100
	Sub base (aggregate)		225	0.0052	2240

Source:

Inventory of Carbon and Energy (ICE) developed by the University of Bath: Sustainable Energy Research Tea

Embodied emissions during construction

CO ₂ benchmarks - Carbon Leadership Forum http://carbonleadershipforum.org/data-visualization/			CO ₂ benchmarks - WRAP (spreadsheet provided by George Taylor)		
Benchmark Category (Embodied)	Typical benchmark (kgCO ₂ /m ²)	Emissions (kgCO ₂)	Benchmark Category (Embodied)	Typical benchmark (kgCO ₂ /m ²)	Emissions (kgCO ₂)
Office	396	23,760,000	Office	560	33,600,000
Industrial	556	16,680,000	Education	419	12,570,000
Retail	383	854,090	Office	530	1,181,900
Train Station	429	1,072,500	Office	530	1,325,000
Footpath	45	292,500			
Footpath	41	112,750			
Carpark	45.0	666,000			
Carpark	45.0	90,000			
	45.0	1,172,250	-	45	1,172,250
		44,700,090			49,849,150

Green Guide 2008 ratings

Building type >	Domestic
Category >	Landscaping
Element type >	Surfacing for Lightly Trafficked Areas

Element	Asphalt (85mm) over prepared sub-base
Element Number	830120001
Summary Rating	A
Climate Change	A
Water Extraction	A+
Mineral Resource Extraction	B
Stratospheric Ozone Depletion	B
Human Toxicity	A+
Ecotoxicity to Freshwater	A
Nuclear Waste (higher level)	A
Ecotoxicity to Land	A+
Waste Disposal	A
Fossil Fuel Depletion	D
Eutrophication	A+
Photochemical Ozone Creation	A
Acidification	A+
Kg of CO ₂ eq. (60 years)	45.0

Green Guide 2008 ratings

Building type >	Domestic
Category >	Landscaping
Element type >	Surfacing for Pedestrian Areas

Element	Asphalt paving (75mm) over prepared sub-base
Element Number	824130001
Summary Rating	B
Climate Change	A
Water Extraction	A+
Mineral Resource Extraction	B
Stratospheric Ozone Depletion	B
Human Toxicity	A+
Ecotoxicity to Freshwater	A
Nuclear Waste (higher level)	A
Ecotoxicity to Land	A
Waste Disposal	C
Fossil Fuel Depletion	E
Eutrophication	A
Photochemical Ozone Creation	A+
Acidification	A+
Kg of CO ₂ eq. (60 years)	41.0

EMISSIONS FACTOR (kgCO ₂ -e/m ²)	EMISSIONS FACTOR (kgCO ₂ -e/m ²)
8.7	23.9
12.6	
2.6	
45.2	47.8
2.6	
18.1	20.7
2.6	

im, version 2.0, updated in 2011



Embodied emissions during operation

Project Embodied Carbon Calculator - v3.5.0				CO ₂ benchmarks - b	
Benchmark Category (Embodied)	Typical benchmark (kgCO ₂ /m ²)	Emissions (kgCO ₂)	Assumptions	Benchmark Category (Embodied)	Ratio type
Office	530	31,800,000		Business park	Office
Warehouse	475	14,250,000		Business park	Warehouse
Retail	705	1,572,150		General retail	Office
Station	455	1,137,500			
Other	495	3,217,500			
Other	495	1,361,250			
Car park	475	7,030,000			
Car park	475	950,000			
Street Lighting	45	1,172,250			
		62,490,650			



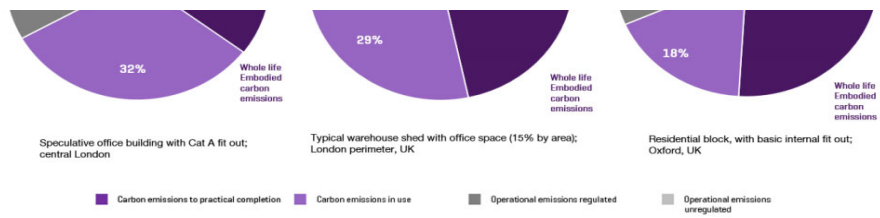


Figure 1: Total whole life carbon emissions breakdown for different building types © Sturgis Carbon Profiling

Source: RICS

http://www.rics.org/Global/Whole_life_carbon_assessment_for_the_BE_PGguidance_2017.pdf

				Units of measurement		Performance Benchmarks		
▼ Tier 4 project type ▼	New build or refurbishment ▼	Notes ▼			▼	COUNT (no. of data points) ▼	Average ▼	75th perc
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	97	49.4	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	18	43.3	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	97	49.4	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	51	56.0	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	19	40.7	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	3	28.6	
	New build			Embodied carbon emissions by gross internal floor area	tCO2e / 100m2	20	41.9	



					Robustness Grading
ent	50th percent	25th percent	Minimum	Maximum	L - M - H
57.0	41.5	38.3	14.7	101.9	H
49.5	41.0	38.5	24.5	55.9	M
57.0	41.5	38.3	14.7	101.9	H
73.0	43.8	36.6	32.6	101.9	H
44.4	38.9	38.3	14.7	50.7	M
30.9	27.7	25.8	24.0	34.1	L
42.3	40.8	40.7	30.4	55.5	H

Operational energy

Energy Benchmarking

Building reference	Building Name / Purpose	Building Type	Benchmark Category Name
B1	Employment Space		General Office
B1	Employment Space - retail/leisure		General Retail
B2	Light industry / R&D / Warehousing		Industrial
	Cardiff Parkway Station		Public waiting or circulation
	Hendre Park		
	Station Square		
	Central Spine (approximate)		
B15	Parking - main car park		Covered Car Park
B15	Parking - drop off area		Covered Car Park
8	Street lighting	Note: per liner metre (not m ²)	

Total			
Buildings			
Public realm			

Conversion Factors 2019 (Department for Business, Energy and Industrial Strat

Activity	Country	Unit
generated	Electricity: UK	kWh

Activity	Fuel	Unit
Gaseous fuels	Natural gas	tonnes
		cubic metres
		kWh (Net CV)
		kWh (Gross CV)



Energy Benchmarks		CO ₂ benchmarks	Energy Benchmark
Electricity typical benchmark (kWh/m ²)	Fossil-thermal typical benchmark(kWh/m ²)	Illustrative fossil-thermal typical benchmark (kgCO ₂ /m ²)	10% reduction of the regulated electricity (50% of the total) due to changes in Part L (kWh/m ²)
120	68	15	114
73	41	9	70
73	41	9	70
30	120	27	29

20	-	-	19
20	-	-	19
26			

ay)

Year	kg CO ₂ e
2019	0.2556

kg CO ₂ e
2542.04
2.03053
0.20428
0.18385

Benchmark Category Name
Industrial
Educational

Energy efficiency improvements	CO ₂ benchmarks improvements	GIA - Building floor area (m ²)	Assumed Annual Consumption (kWh)	
			Electricity (kWh)	Gas (kWh)
10% reduction to fossil fuel usage due to changes in Part L (kWh/m ²)	10% reduction in fossil-thermal typical benchmark due to changes in Part L (kgCO ₂ /m ²)			
61	14	60,000	6,811,500	3,655,800
37	8	2,230	155,032	83,190
37	8	30,000	2,085,630	1,119,150
108	24	2,500	71,250	270,000
		22,600		
		6,500		
		2,750		
-	-	14,800	281,200	-
-	-	2,000	38,000	-
-	-	26,050	685,063	
			10,127,675	5,128,140
			6,966,532	3,738,990
			685,063	-

Electricity typical benchmark (kWh/m ²)	Fossil-thermal typical benchmark(kWh/m ²)
73	41
95.98	54.37

Assumed Annual Consumption (kg CO ₂ e)		CO ₂ emissions	
Electricity (kg CO ₂ e)	Gas (kg CO ₂ e)	Fossil- thermal kgCO ₂ /year	Source of GIA
1,741,019	746,807	824,748	DAS
39,626	16,994	18,768	DAS
533,087	228,620	252,480	DAS
18,212	55,156	60,912	DAS
-	-		
-	-		
-	-		
71,875	-	-	
9,713	-	-	
175,102	-		Measured (refer Public Realm Lighting tab)
		1,156,908	
		843,516	
		-	



Source for benchmark	Assumptions
BEIS building energy efficiency survey	
BEIS building energy efficiency survey	
BEIS building energy efficiency survey	
BEIS building energy efficiency survey	
CIBSE TM46	
CIBSE TM46	
Infrastructure Design Guidelines (IDG)	

Hendre Lakes EIA

Operational emissions
Energy Benchmarking

Opening year 2028

Appraisal period 60

Year	Operation year	In appraisal period?	CO ₂ emissions factor (gCO ₂ /kWh)	Building electricity consumption (kWh/year)
2015	0	No	422	6,966,532
2016	0	No	351	6,966,532
2017	0	No	300	6,966,532
2018	0	No	290	6,966,532
2019	0	No	273	6,966,532
2020	0	No	243	6,966,532
2021	0	No	214	6,966,532
2022	0	No	197	6,966,532
2023	0	No	168	6,966,532
2024	0	No	176	6,966,532
2025	0	No	165	6,966,532
2026	0	No	147	6,966,532
2027	0	No	145	6,966,532
2028	1	Yes	122	6,966,532
2029	2	Yes	106	6,966,532
2030	3	Yes	103	6,966,532
2031	4	Yes	97	6,966,532
2032	5	Yes	91	6,966,532
2033	6	Yes	79	6,966,532
2034	7	Yes	78	6,966,532
2035	8	Yes	65	6,966,532
2036	9	Yes	58	6,966,532
2037	10	Yes	52	6,966,532
2038	11	Yes	46	6,966,532
2039	12	Yes	40	6,966,532
2040	13	Yes	34	6,966,532
2041	14	Yes	32	6,966,532
2042	15	Yes	30	6,966,532
2043	16	Yes	29	6,966,532
2044	17	Yes	27	6,966,532
2045	18	Yes	25	6,966,532
2046	19	Yes	23	6,966,532
2047	20	Yes	22	6,966,532
2048	21	Yes	20	6,966,532
2049	22	Yes	18	6,966,532
2050	23	Yes	18	6,966,532
2051	24	Yes	18	6,966,532
2052	25	Yes	18	6,966,532
2053	26	Yes	18	6,966,532

2054	27	Yes	18	6,966,532
2055	28	Yes	18	6,966,532
2056	29	Yes	18	6,966,532
2057	30	Yes	18	6,966,532
2058	31	Yes	18	6,966,532
2059	32	Yes	18	6,966,532
2060	33	Yes	18	6,966,532
2061	34	Yes	18	6,966,532
2062	35	Yes	18	6,966,532
2063	36	Yes	18	6,966,532
2064	37	Yes	18	6,966,532
2065	38	Yes	18	6,966,532
2066	39	Yes	18	6,966,532
2067	40	Yes	18	6,966,532
2068	41	Yes	18	6,966,532
2069	42	Yes	18	6,966,532
2070	43	Yes	18	6,966,532
2071	44	Yes	18	6,966,532
2072	45	Yes	18	6,966,532
2073	46	Yes	18	6,966,532
2074	47	Yes	18	6,966,532
2075	48	Yes	18	6,966,532
2076	49	Yes	18	6,966,532
2077	50	Yes	18	6,966,532
2078	51	Yes	18	6,966,532
2079	52	Yes	18	6,966,532
2080	53	Yes	18	6,966,532
2081	54	Yes	18	6,966,532
2082	55	Yes	18	6,966,532
2083	56	Yes	18	6,966,532
2084	57	Yes	18	6,966,532
2085	58	Yes	18	6,966,532
2086	59	Yes	19	6,966,532
2087	60	Yes	20	6,966,532
2088	61	No	21	6,966,532

Public realm emissions over appraisal period (tCO₂-e)

1,264

Public realm electricity consumption (kWh/year)	Public realm emissions (tCO ₂ -e/year)
685,063	289
685,063	240
685,063	206
685,063	199
685,063	187
685,063	166
685,063	147
685,063	135
685,063	115
685,063	121
685,063	113
685,063	101
685,063	99
685,063	83
685,063	73
685,063	70
685,063	66
685,063	63
685,063	54
685,063	53
685,063	44
685,063	40
685,063	36
685,063	32
685,063	27
685,063	23
685,063	22
685,063	21
685,063	20
685,063	18
685,063	17
685,063	16
685,063	15
685,063	14
685,063	12
685,063	12
685,063	12
685,063	12
685,063	12

Electricity emissions factor source

<https://www.gov.uk/government/ur>



:

oads/system/uploads/attachment_data/file/501265/Web_Figures_2015.xls

Year	Emissions without development (tCO2-e)	Emissions with development (tCO2-e)
Construction		
2022	315,312	315,991
2023	315,312.3	315,991.4
2024	315,312.3	315,991.4
2025	315,312.3	315,991.4
2026	315,312.3	315,991.4
2027	315,312.3	315,991.4
2028	315,312.3	315,991.4
Total	1,891,874	1,895,949
Operation		
2028	331,850	335,112
2029	331,850	335,112
2030	331,850	335,112
2031	331,850	335,112
2032	331,850	335,112
2033	331,850	335,112
2034	331,850	335,112
2035	331,850	335,112
2036	331,850	335,112
2037	331,850	335,112
2038	331,850	335,112
2039	331,850	335,112
2040	331,850	335,112
2041	331,850	335,112
2042	331,850	335,112
2043	331,850	335,112
2044	331,850	335,112
2045	331,850	335,112
2046	331,850	335,112
2047	331,850	335,112
2048	331,850	335,112
2049	331,850	335,112
2050	331,850	335,112
2051	331,850	335,112
2052	331,850	335,112
2053	331,850	335,112
2054	331,850	335,112
2055	331,850	335,112
2056	331,850	335,112
2057	331,850	335,112

2058	331,850	335,112
2059	331,850	335,112
2060	331,850	335,112
2061	331,850	335,112
2062	331,850	335,112
2063	331,850	335,112
2064	331,850	335,112
2065	331,850	335,112
2066	331,850	335,112
2067	331,850	335,112
2068	331,850	335,112
2069	331,850	335,112
2070	331,850	335,112
2071	331,850	335,112
2072	331,850	335,112
2073	331,850	335,112
2074	331,850	335,112
2075	331,850	335,112
2076	331,850	335,112
2077	331,850	335,112
2078	331,850	335,112
2079	331,850	335,112
2080	331,850	335,112
2081	331,850	335,112
2082	331,850	335,112
2083	331,850	335,112
2084	331,850	335,112
2085	331,850	335,112
2086	331,850	335,112
Total	19,579,151	19,771,613



**Additional emissions due
to development (tCO₂-e)**

679

679.2

679.2

679.2

679.2

679.2

679.2

4,075

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

3,262

192,462



Habitat type	Area (m)	Area (ha)
1. Standing water	10246.17	1.024617
2. Intact hedge	1583	0.47478
3. Defunct hedge	394	0.118338
4. Hedge with trees	5342	1.602456
5. Dry ditch		0
6. Semi-natural broadleaved woodland		7.85
7. Dense scrub		0.81
8. Semi-improved neutral grassland		15.7
9. Improved grassland		26.86
10. Marshy grassland		1.13
11. Poor semi-improved grassland		17.99
12. Tall ruderal		0.74
13. Arable		9.76
14. Buildings		0.004
15. Tarmac		0.09
Total		84.060191
Total + increase in sequestered		

Total CO2 change

		Retained Carbon without development (tCO2-e)	Retained Carbon with development (tCO2-e)
Construction	2023 - 2028	22058	3120.779709

Operation	Total	Net C rate without development tCo2/yr	Net C rate with development tCo2/yr	
		2028	-184.9324202	-104.5103444
		2029	-184.9324202	-104.5103444
		2030	-184.9324202	-104.5103444
		2031	-184.9324202	-104.5103444
		2032	-184.9324202	-104.5103444
		2033	-184.9324202	-104.5103444
		2034	-184.9324202	-104.5103444
		2035	-184.9324202	-104.5103444
		2036	-184.9324202	-104.5103444
		2037	-184.9324202	-104.5103444
		2038	-184.9324202	-104.5103444
		2039	-184.9324202	-104.5103444
		2040	-184.9324202	-104.5103444
		2041	-184.9324202	-104.5103444
		2042	-184.9324202	-104.5103444
		2043	-184.9324202	-104.5103444
		2044	-184.9324202	-104.5103444
		2045	-184.9324202	-104.5103444
		2046	-184.9324202	-104.5103444
		2047	-184.9324202	-104.5103444
		2048	-184.9324202	-104.5103444
		2049	-184.9324202	-104.5103444
		2050	-184.9324202	-104.5103444
		2051	-184.9324202	-104.5103444
		2052	-184.9324202	-104.5103444
		2053	-184.9324202	-104.5103444
		2054	-184.9324202	-104.5103444

2126	-184.9324202	-104.5103444
2127	-184.9324202	-104.5103444
2128	-184.9324202	-104.5103444
2129	-184.9324202	-104.5103444
2130	-184.9324202	-104.5103444
2131	-184.9324202	-104.5103444
2132	-184.9324202	-104.5103444
2133	-184.9324202	-104.5103444
2134	-184.9324202	-104.5103444
2135	-184.9324202	-104.5103444
2136	-184.9324202	-104.5103444
2137	-184.9324202	-104.5103444
2138	-184.9324202	-104.5103444
2139	-184.9324202	-104.5103444
2140	-184.9324202	-104.5103444
2141	-184.9324202	-104.5103444
2142	-184.9324202	-104.5103444
2143	-184.9324202	-104.5103444
2144	-184.9324202	-104.5103444
2145	-184.9324202	-104.5103444
2146	-184.9324202	-104.5103444
2147	-184.9324202	-104.5103444
2148	-184.9324202	-104.5103444
2149	-184.9324202	-104.5103444
2150	-184.9324202	-104.5103444
2151	-184.9324202	-104.5103444
2152	-184.9324202	-104.5103444
2153	-184.9324202	-104.5103444
2154	-184.9324202	-104.5103444
2155	-184.9324202	-104.5103444
2156	-184.9324202	-104.5103444
2157	-184.9324202	-104.5103444
2158	-184.9324202	-104.5103444
2159	-184.9324202	-104.5103444
2160	-184.9324202	-104.5103444
2161	-184.9324202	-104.5103444
2162	-184.9324202	-104.5103444
2163	-184.9324202	-104.5103444
2164	-184.9324202	-104.5103444
2165	-184.9324202	-104.5103444
2166	-184.9324202	-104.5103444
2167	-184.9324202	-104.5103444
2168	-184.9324202	-104.5103444
2169	-184.9324202	-104.5103444
2170	-184.9324202	-104.5103444
2171	-184.9324202	-104.5103444
2172	-184.9324202	-104.5103444
2173	-184.9324202	-104.5103444
2174	-184.9324202	-104.5103444
2175	-184.9324202	-104.5103444
2176	-184.9324202	-104.5103444
2177	-184.9324202	-104.5103444
2178	-184.9324202	-104.5103444
2179	-184.9324202	-104.5103444
2180	-184.9324202	-104.5103444
2181	-184.9324202	-104.5103444
2182	-184.9324202	-104.5103444
2183	-184.9324202	-104.5103444
2184	-184.9324202	-104.5103444
2185	-184.9324202	-104.5103444
2186	-184.9324202	-104.5103444
2187	-184.9324202	-104.5103444
2188	-184.9324202	-104.5103444

Equivalent CO2 if released (tCO2)	Retained (ha)	Retained tC	Proposed (ha)	Increased Sequestered carbon
180.332592	1.019817	48.951216		
153.19568	0.46598	41.00624	0.4765	41.932
38.183728	0.109538	9.639344		
517.059136	1.593656	140.241728		
0		0		
3943.316667	5.00256	685.35072		
267.3	0.654688	58.92192		
3511.566667	3.524168	214.974248		
5909.2	13.83732	830.2392		
198.88	1.135324	54.495552		
4023.763333	14.017046	855.039806		
165.5133333	0.043763	2.669543		
3149.226667	1.560434	137.318192		
0	0.003908	0		
0	4.06	0		
22057.5378	47.504702	3078.847709		
		3120.779709		
		18936.75809		



Land use change/measure

Area Carbon Exchange (+emissions; - sequestration) tCo2/ha/yr

Restored Grassland

Maintained Grassland - Grazed

Restore unimproved Grasslands (Soil+Veg 1st Year)

Restore unimproved Grasslands (Soil + Veg Yr 2-39)

Lowland Heath - Scrub Removed

Lowland Heath - Trees Removed

Upland Heath - Convert to Grassland

Lowland Heath - from Arable (Soil yrs 1-100)

Lowland Heath - From Arable (Vegetation yr 1)

Lowland Heath - From Arable (Vegetation yrs 2-55)

Lowland Heath - From Arable (Vegetation from yr 56)

Carbon Stocks by broad habitat (Soils+Vegetation) tC/Ha

Dwarf Shrub Heath

Acid Grassland

Fen, Marsh and Swamp

Bog Soils

Coniferous Woodland

Broad Leaf, Mixed and Yew Woodland

Neutral Grassland

Improved Grasslands

Arable & Horticulture

Coastal Margins

Net C rate and Uncertainty (tC/Ha-1 year-1) - u Study Location Reference

Link

-11.65	UK	Natural England Research Report	NERR043 edition 1.pdf
-2.2	UK	Natural England Research Report	NERR043 edition 1.pdf
-6.96	UK	Natural England Research Report	NERR043 edition 1.pdf
-4.03	UK	Natural England Research Report	NERR043 edition 1.pdf
+2.56	UK	Natural England Research Report	NERR043 edition 1.pdf
+4.46	UK	Natural England Research Report	NERR043 edition 1.pdf
+3.3 to +4.03	UK	Natural England Research Report	NERR043 edition 1.pdf
-3.32	UK	Natural England Research Report	NERR043 edition 1.pdf
+7.45	UK	Natural England Research Report	NERR043 edition 1.pdf
-0.62	UK	Natural England Research Report	NERR043 edition 1.pdf
0	UK	Natural England Research Report	NERR043 edition 1.pdf
90	UK	Natural England Research Report	NERR043 edition 1.pdf
88	UK	Natural England Research Report	NERR043 edition 1.pdf
76	UK	Natural England Research Report	NERR043 edition 1.pdf
76	UK	Natural England Research Report	NERR043 edition 1.pdf
140	UK	Natural England Research Report	NERR043 edition 1.pdf
137	UK	Natural England Research Report	NERR043 edition 1.pdf
61	UK	Natural England Research Report	NERR043 edition 1.pdf
60	UK	Natural England Research Report	NERR043 edition 1.pdf
44	UK	Natural England Research Report	NERR043 edition 1.pdf
48	UK	Natural England Research Report	NERR043 edition 1.pdf

Phase 1	Phase 1 Habitat	Baseline		
		Area (ha)	Length (m)	Number of Polygons
A1.1.1	Semi-natural broadleaved wood	6.42		
A2.1	Dense scrub	0.65		
B2.2	Semi-improved neutral grassland	16.91		
B4	Improved grassland	25.88		
B5	Marshy grassland	1.14		
B6	Poor semi-improved grassland	17.49		
C3.1	Tall ruderal	0.04		
G1	Standing water	0.71		
J1.1	Arable	11.59		
J3.6	Buildings	0.00		
J5	Hardstanding	5.00		
Lines				
G1	Standing water		10246	
J2.1.1	Native species-rich intact hedge		225	
J2.1.2	Native species-poor intact hedge		1358	
J2.2.2	Native species-poor defunct hedge		394	
J2.3.2	Native species-poor hedge with trees		5342	
Points				
A2.2	Scattered scrub			4

A3.1	Scattered broadleaved trees			10
------	-----------------------------	--	--	----



Loss			Retained		
Area (ha)	Length (m)	Number	Area (ha)	Length (m)	Number
1.41			5.00		
0.00			0.65		
13.39			3.52		
12.04			13.84		
0.00			1.14		
3.47			14.02		
0.00			0.04		
0.07			0.64		
10.03			1.56		
0.00			0.00		
0.94			4.06		
	4803			5443	
	210			15	
	162			1196	
	161			233	
	3041			2301	
		3			1

