Rigged Hill Windfarm Repowering

Technical Appendix A14.1: Carbon Calculator Assessment

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SCOTTISHPOWER RENEWABLES

Carbon Calculator v1.5.1
Rigged Hill Windfarm Repowering Location: 55.022777 -6.823415
ScottishPower Renewables

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	7	7	7	Chapter 3
Duration of consent (years)	40	25	70	Operation in perpetuity. For the purposes of this assessment, a long lifetime has been assumed.
Performance				
Power rating of 1 turbine (MW)	4	4	4	Chapter 3
Capacity factor	30.8	24	37	BEIS Energy Trends 2018 Report - Northern Ireland values
Backup				
Fraction of output to backup (%)	5	5	5	Calculated using suggested notes
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	10	10	Fixed
Total CO2 emission from turbine life (tCO2 MW^{-1}) (eg. manufacture, construction, decommissioning)	Calculate wrt installed capacity	Calculate wrt installed capacity	Calculate wrt installed capacity	
Characteristics of peatland before windfarm development				
Type of peatland	Acid bog	Acid bog	Acid bog	Chapter 8
Average annual air temperature at site (°C)	9.19	3.88	15	Publicly available Met Office data for 2018
Average depth of peat at site (m)	0.56	0.1	1	Chapter 7
C Content of dry peat (% by weight)	53.23	19.57	53.24	Scottish Government Guidance - Guidance on Developments on Peatland - Site Survey
Average extent of drainage around drainage features at site (m)	10	5	20	Technical estimation
Average water table depth at site (m)	1	0.5	1	Actual measured depths were greater than those allowed by the calculator
Dry soil bulk density (g cm^{-3})	0.132	0.072	0.293	Scottish Government Guidance - Guidance on Developments on Peatland - Site surveys
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	15	10	20	Technical Estimation
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	0.12	0.31	SNH Guidance - Carbon Payback Calculator: Guidelines on Measurements
Forestry Plantation Characteristics				
Area of forestry plantation to be felled (ha)	0	0	0	Not applicable to Development as no forestry onsite
Average rate of carbon sequestration in timber (tC ha^{-1} yr^{-1})	0	0	0	Not applicable to Development as no forestry onsite.
Counterfactual emission factors				
Coal-fired plant emission factor (t CO2 MWh^{-1})	0.918	0.918	0.918	
Grid-mix emission factor (t CO2 MWh^{-1})	0.28088	0.28088	0.28088	
Fossil fuel-mix emission factor (t CO2 MWh^{-1})	0.46	0.46	0.46	

Input data	Expected value	Minimum value	Maximum value	Source of data
Borrow pits				
Number of borrow pits	0	0	0	Not applicable to Development as no borrow puts onsite
Average length of pits (m)	0	0	0	Not applicable to Development as no borrow puts onsite
Average width of pits (m)	0	0	0	Not applicable to Development as no borrow puts onsite
Average depth of peat removed from pit (m)	0	0	0	Not applicable to Development as no borrow puts onsite
Foundations and hard-standing area associated with each turbine				
Average length of turbine foundations (m)	20.8	17	25	Chapter 3
Average width of turbine foundations (m)	20.8	17	25	Chapter 3
Average depth of peat removed from turbine foundations(m)	0.6	0.5	0.7	Peat Slide Risk Assessment Technical Appendix
Average length of hard-standing (m)	62.5	62.5	62.5	Chapter 2
Average width of hard-standing (m)	25	25	25	Chapter 3
Average depth of peat removed from hard-standing (m)	0.65	0.55	0.75	Peat Slide Risk Assessment Technical Appendix
Volume of concrete used in construction of the ENTIRE windfarm				
Volume of concrete (m^3)	3500	3000	4000	Technical Estimate
Access tracks				
Total length of access track (m)	5365	5300	5430	Chapter 3
Existing track length (m)	1825	1800	1850	Chapter 3
Length of access track that is floating road (m)	0	0	0	Not applicable to Development as no floating road
Floating road width (m)	5	5	5	Not applicable to Development as no floating road
Floating road depth (m)	0	0	0	Not applicable to Development as no floating road
Length of floating road that is drained (m)	0	0	0	Not applicable to Development as no floating road
Average depth of drains associated with floating roads (m)	0	0	0	Not applicable to Development as no floating road
Length of access track that is excavated road (m)	860	840	880	Chapter 3
Excavated road width (m)	5	5	5	Chapter 3
Average depth of peat excavated for road (m)	0.5	0.5	0.5	Peat Slide Risk Assessment Technical Appendix
Length of access track that is rock filled road (m)	2680	2660	2700	Chapter 3
Rock filled road width (m)	5	5	5	Chapter 3
Rock filled road depth (m)	0.6	0.5	0.7	Chapter 3
Length of rock filled road that is drained (m)	2680	2660	2700	Chapter 3
Average depth of drains associated with rock filled roads (m)	0.5	0.5	0.5	Chapter 3
Cable trenches				
Length of any cable trench on peat that does not follow access tracks and is lined with a permeable medium (eg. sand) (m)	0	0	0	All cable trenches will follow access tracks
Average depth of peat cut for cable trenches (m)	0	0	0	All cable trenches will follow access tracks
Additional peat excavated (not already accounted for above)				
Volume of additional peat excavated (m^3)	0	0	0	Not applicable to Development
Area of additional peat excavated (m^2)	0	0	0	Not applicable to Development
Peat Landslide Hazard				

Input data	Expected value	Minimum value	Maximum value	Source of data
Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	negligible	negligible	negligible	Fixed
Improvement of C sequestration at site by blocking drains, restoration of habitat etc				
Improvement of degraded bog				
Area of degraded bog to be improved (ha)	43	43	43	Habitat Management Technical Appendix
Water table depth in degraded bog before improvement (m)	0.5	0.1	1	Technical Estimation
Water table depth in degraded bog after improvement (m)	0.2	0	0.4	Technical estimation
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	15	11	20	Technical estimation
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	40	25	70	SPR have control of land in perpetuity
Improvement of felled plantation land				
Area of felled plantation to be improved (ha)	0	0	0	Not applicable to Development as no plantation onsite
Water table depth in felled area before improvement (m)	0	0	0	Not applicable to Development as no plantation onsite
Water table depth in felled area after improvement (m)	0	0	0	Not applicable to Development as no plantation onsite
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	2	2	2	Not applicable to Development as no plantation onsite
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	2	2	2	Not applicable to Development as no plantation onsite
Restoration of peat removed from borrow pits				
Area of borrow pits to be restored (ha)	0	0	0	Not applicable to Development as no borrow pits onsite
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0	0	0	Not applicable to Development as no borrow pits onsite
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0	0	0	Not applicable to Development as no borrow pits onsite
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	1	1	1	Not applicable to Development as no borrow pits onsite
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	2	2	2	Not applicable to Development as no borrow pits onsite
Early removal of drainage from foundations and hardstanding				
Water table depth around foundations and hardstanding before restoration (m)	1.8	1.5	2.4	Dipwell Data Technical Appendix
Water table depth around foundations and hardstanding after restoration (m)	0.2	0	0.3	Dipwell data technical appendix with information from Draft Habitat Management Plan
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	5	5	5	Technical Estimate
Restoration of site after decomissioning				

Input data	Expected value	Minimum value	Maximum value	Source of data
Will the hydrology of the site be restored on decommissioning?	Yes	Yes	Yes	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Yes	Yes	Will be managed during operational life of windfarm site
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes	Yes	Yes	Will be managed during operational life of windfarm site
Will the habitat of the site be restored on decommissioning?	Yes	Yes	Yes	
Will you control grazing on degraded areas?	Yes	Yes	Yes	Will be managed during operational life of windfarm site
Will you manage areas to favour reintroduction of species	Yes	Yes	Yes	Will be managed during operational life of windfarm site
Methodology				
Choice of methodology for calculating emission factors	Site specific (required for planning applications)			

Results

Payback Time and CO_2 emissions			
1. Windfarm CO_2 emission saving over...	Exp.	Min.	Max.
...coal-fired electricity generation (t CO2 / yr)	69,351	54,040	83,312
...grid-mix of electricity generation (t CO2 / yr)	21,219	16,535	25,491
...fossil fuel-mix of electricity generation (t CO_2 / yr)	34,751	27,079	41,747
Energy output from windfarm over lifetime (MWh)	3,021,850	1,471,680	6,352,751
Total CO_2 losses due to wind farm (tCO_2 eq.)	Exp.	Min.	Max.
2. Losses due to turbine life (e.g. manufacture, construction, decommissioning)	23,995	23,837	24,153
3. Losses due to backup	22,566	14,104	39,490
4. Losses due to reduced carbon fixing potential	622	115	2,313
5. Losses from soil organic matter	838	-1,475	6,971
6. Losses due to DOC & POC leaching	20	1	913
7. Losses due to felling forestry	0	0	0
Total losses of carbon dioxide	48,041	36,582	73,840
8. Total CO_2 gains due to improvement of site (t CO_2 eq.)	Exp.	Min.	Max.
8a. Change in emissions due to improvement of degraded bogs	-15,494	0	-41,773
8b. Change in emissions due to improvement of felled forestry	0	0	0
8c. Change in emissions due to restoration of peat from borrow pits	0	0	0
8d. Change in emissions due to removal of drainage from foundations & hardstanding	-1,152	72	-1,637
Total change in emissions due to improvements	-16,647	72	-43,409
RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide (t CO_2 eq.)	31,394	-6,828	73,912
Carbon Payback Time			
...coal-fired electricity generation (years)	0.5	-0.1	1.4
...grid-mix of electricity generation (years)	1.5	-0.3	4.5
...fossil fuel-mix of electricity generation (years)	0.9	-0.2	2.7
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	0.05	-0.03	No gains!
Ratio of CO_2 eq. emissions to power generation (g/kWh) (for info. only)	10.39	-1.07	50.22

1. Windfarm CO_2 Emission Saving

Capacity factor (%)	Exp.	Min.	Max.
	30.8	24	37

	Exp.	Min.	Max.
Annual energy output from windfarm (MW/yr)			
RESULTS			
Emissions saving over coal-fired electricity generation (tCO2/yr)	69,351	54,040	83,312
Emissions saving over grid-mix of electricity generation (tCO2/yr)	21,219	16,535	25,491
Emissions saving over fossil fuel - mix of electricity generation (tCO2/yr)	34,751	27,079	41,747

2. CO_2 Loss Due to Turbine Life

Calculation of emissions with relation to installed capacity	Exp.	Min.	Max.
Emissions due to turbine from energy output (t CO_2)	3270	3270	3270
Emissions due to cement used in construction (t CO_2)	1106	948	1264

RESULTS	Exp.	Min.	Max.
Losses due to turbine life (manufacture, construction, etc.) (t CO_2)	23995	23837	24153
Additional CO2 payback time of windfarm due to turbine life			
...coal-fired electricity generation (months)	4	5	3
...grid-mix of electricity generation (months)	14	17	11
...fossil fuel - mix of electricity generation (months)	8	11	7

3. CO_2 Loss Due to Backup

	Exp.	Min.	Max.
Reserve energy (MWh/yr)	12,264	12,264	12,264
Annual emissions due to backup from fossil fuel-mix of electricity generation (tCO2/yr)	564	564	564
RESULTS			
Total emissions due to backup from fossil fuel-mix of electricity generation (tCO_2)	22,566	14,104	39,490

4. Loss of CO_2 Fixing Potential

	Exp.	Min.	Max.
Area where carbon accumulation by bog plants is lost (ha)	12.33	7.47	22.61
Total loss of carbon accumulation up to time of restoration (tCO_2 eq./ha)	50	15	102
RESULTS			
Total loss of carbon fixation by plants at the site (t CO_2)	622	115	2313
Additional CO2 payback time of windfarm due to loss of CO_2 fixing potential			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	1
...fossil fuel - mix of electricity generation (months)	0	0	1

5. Loss of Soil CO_2

5. Loss of CO_2	Exp.	Min.	Max.
CO2 loss from removed peat (t CO_2 equiv.)	838.11	-1474.82	6970.74
CO2 loss from drained peat (t CO_2 equiv.)	0	0	0
RESULTS			
Total CO_2 loss from peat (removed + drained) (t CO_2 equiv.)	838.11	-1474.82	6970.74
Additional CO_2 payback time of windfarm due to loss of soil CO_2			
...coal-fired electricity generation (months)	0.15	-0.33	1
...grid-mix of electricity generation (months)	0.47	-1.07	3.25
...fossil fuel - mix of electricity generation (months)	0.29	-0.65	2

5a. Volume of Peat Removed	Exp.	Min.	Max.
Peat removed from borrow pits			
Area of land lost in borrow pits (m^2)	0	0	0
Volume of peat removed from borrow pits (m^3)	0	0	0
Peat removed from turbine foundations			
Area of land lost in foundation (m^2)	3028.48	2023	4375
Volume of peat removed from foundation area (m^3)	1817.09	1011.5	3063.5
Peat removed from hard-standing			
Area of land lost in hard-standing (m^2)	10937.5	10937.5	10937.5
Volume of peat removed from hard-standing area (m^3)	7109.38	6015.63	8203.13
Peat removed from access tracks			
Area of land lost in floating roads (m^2)	0	0	0
Volume of peat removed from floating roads (m^3)	0	0	0
Area of land lost in excavated roads (m^2)	4300	4200	4400
Volume of peat removed from excavated roads (m^3)	2150	2100	2200

Area of land lost in rock-filled roads (m^2)	13400	13300	13500
Volume of peat removed from rock-filled roads (m^3)	8040	6650	9450
Total area of land lost in access tracks (m^2)	17700	17500	17900
Total volume of peat removed due to access tracks ($m^{3)}$	10190	8750	11650
RESULTS			
Total area of land lost due to windfarm construction (m^2)	31665.95	30460.5	33212.5
Total volume of peat removed due to windfarm construction (m^3)	19116.46	15777.13	22915.63

5b. CO_2 Loss from Removed Peat	**Exp.**	**Min.**	**Max.**
CO_2 loss from removed peat (t CO_2)	4925.08	815.13	13107.29
CO_2 loss from undrained peat left in situ (t CO_2)	4086.97	2289.95	6136.55
RESULTS			
CO_2 loss attributable to peat removal only (t CO_2)	838.11	-1474.82	6970.74

5c. Volume of Peat Drained	**Exp.**	**Min.**	**Max.**
Total area affected by drainage around borrow pits (m^2)	0	0	0
Total volume affected by drainage around borrow pits (m^3)	0	0	0
Peat affected by drainage around turbine foundation and hardstanding			
Total area affected by drainage of foundation and hardstanding area (m^2)	20874	9205	49700
Total volume affected by drainage of foundation and hardstanding area (m^3)	6784.05	2531.38	18637.5
Peat affected by drainage of access tracks			
Total area affected by drainage of access track(m^2)	70800	35000	143200
Total volume affected by drainage of access track(m^3)	17700	8750	35800
Peat affected by drainage of cable trenches			
Total area affected by drainage of cable trenches(m^2)	0	0	0
Total volume affected by drainage of cable trenches (m^3)	0	0	0
Drainage around additional peat excavated			
Total area affected by drainage (m^2)	0	0	0
Total volume affected by drainage (m^3)	0	0	0
RESULTS			
Total area affected by drainage due to windfarm (m^2)	91674	44205	192900
Total volume affected by drainage due to windfarm (m^3)	24484.05	11281.38	54437.5

5d. CO_2 Loss from Drained Peat	**Exp.**	**Min.**	**Max.**
Calculations of C Loss from Drained Land if Site is NOT Restored after Decommissioning			
Total GHG emissions from Drained Land (t CO_2 equiv.)	6307.96	582.86	31137.18
Total GHG emissions from Undrained Land (t CO_2 equiv.)	6307.96	582.86	31137.18
Calculations of C Loss from Drained Land if Site IS Restored after Decommissioning			
Losses if Land is Drained			
CH_4 emissions from drained land (t CO_2 equiv.)	-65.5	-109.01	921.63
CO_2 emissions from drained land (t CO_2)	11897.4	3432.24	34719.77
Total GHG emissions from Drained Land (t CO_2 equiv.)	11831.9	3323.23	35641.4
Losses if Land is Undrained			
CH_4 emissions from undrained land (t CO_2 equiv.)	-65.5	-109.01	921.63
CO_2 emissions from undrained land (t CO_2)	11897.4	3432.24	34719.77
Total GHG emissions from Undrained Land (t CO_2 equiv.)	11831.9	3323.23	35641.4
RESULTS			
Total GHG emissions due to drainage (t CO_2 equiv.)	0	0	0

5e. Emission Rates from soils	**Exp.**	**Min.**	**Max.**
Calculations following IPCC default methodology			
Flooded period (days/year)	178	178	178
Annual rate of methane emission (t CH_4-C/ha year)	0.04	0.04	0.04
Annual rate of carbon dioxide emission (t CO_2/ha year)	35.2	35.2	35.2
Calculations following ECOSSE based methodology			
Total area affected by drainage due to wind farm construction (ha)	9.17	4.42	19.29
Average water table depth of drained land (m)	1	1	0.5
Selected emission characteristics following site specific methodology			
Rate of carbon dioxide emission in drained soil (t CO_2/ha year)	23.6	22.18	20
Rate of carbon dioxide emission in undrained soil (t CO_2/ha year)	23.6	22.18	20
Rate of methane emission in drained soil (t CH_4-C/ha year)	0	-0.02	0.02
Rate of methane emission in undrained soil (t CH_4-C/ha year)	0	-0.02	0.02
RESULTS			
Selected rate of carbon dioxide emission in drained soil (t CO_2/ha year)	23.6	22.18	20
Selected rate of carbon dioxide emission in undrained soil (t CO_2/ha year)	23.6	22.18	20
Selected rate of methane emission in drained soil (t CH_4-C/ha year)	0	-0.02	0.02
Selected rate of methane emission in undrained soil (t CH_4-C/ha year)	0	-0.02	0.02

6. CO_2 Loss by DOC and POC Loss

	Exp.	Min.	Max.
Gross CO_2 loss from restored drained land (t CO_2)	0	0	0
Gross CH_4 loss from restored drained land (t CO_2 equiv.)	0	0	0
Gross CO_2 loss from improved land (t CO_2)	0	0	0
Gross CH_4 loss from improved land (t CO_2 equiv.)	654.82	109.69	20355.33
Total gaseous loss of C (t C)	16.01	2.68	497.82
Total C loss as DOC (t C)	4.16	0.19	199.13
Total C loss as POC (t C)	1.28	0.11	49.78
RESULTS			
Total CO_2 loss due to DOC leaching (t CO_2)	15.27	0.69	730.14
Total CO_2 loss due to POC leaching (t CO_2)	4.70	0.39	730.14
Total CO_2 loss due to DOC & POC leaching (t CO_2)	19.97	1.08	912.68
Additional CO_2 payback time of windfarm due to DOC & POC			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	0
...fossil fuel - mix of electricity generation (months)	0	0	0

7. Forestry CO_2 Loss

	Exp.	Min.	Max.
Area of forestry plantation to be felled (ha)	0	0	0
Carbon sequestered (t C ha-1 yr-1)	0	0	0
Lifetime of windfarm (years)	40	25	70
Carbon sequestered over the lifetime of the windfarm (t C ha-1)	0	0	0
RESULTS			
Total carbon loss due to felling of forestry (t CO_2)	0	0	0
Additional CO_2 payback time of windfarm due to management of forestry			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	0
...fossil fuel - mix of electricity generation (months)	0	0	0

8. CO_2 Gain – Site Improvement

Degraded Bog	Exp.	Min.	Max.
1. Description of site			
Area to be improved (ha)	43	0	43
Depth of peat above water table before improvement (m)	0.5	0.1	1
Depth of peat above water table after improvement (m)	0.2	0.1	0
2. Losses with improvement			
Improved period (years)	25	59	5
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.038	0.123	0.516
CH4 emissions from improved land (t CO_2 equiv.)	613.151	0	19587.875
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	6.772	1.293	1.865
CO2 emissions from improved land (t CO_2 equiv.)	3729.75	0	2423.748
Total GHG emissions from improved land (t CO_2 eqiv.)	4342.901	0	22011.624
3. Losses without improvement			
Improved period (years)	25	59	5
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	-0.003	0.123	0.016
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	18.453	1.293	25.142
CO2 emissions from unimproved land (t CO_2 equiv.)	19837.36	0	63784.305
Total GHG emissions from unimproved land (t CO_2 eqiv.)	19837.36	0	63784.305
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	15494.459	0	41772.681

Felled Forestry	Exp.	Min.	Max.
1. Description of site			
Area to be improved (ha)	0	0	0
Depth of peat above water table before improvement (m)	0	0	0
Depth of peat above water table after improvement (m)	0	0	0
2. Losses with improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.496	0.477	0.516
CH_4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	0.319	-1.093	1.865
CO_2 emissions from improved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO_2 eqiv.)	0	0	0
3. Losses without improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.496	0.477	0.516
CH_4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	0.319	-1.093	1.865
CO_2 emissions from unimproved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from unimproved land (t CO_2 eqiv.)	0	0	0
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	0	0	0

Borrow Pits	Exp.	Min.	Max.
1. Description of site			
Area to be improved (ha)	0	0	0
Depth of peat above water table before improvement (m)	0	0	0
Depth of peat above water table after improvement (m)	0	0	0
2. Losses with improvement			
Improved period (years)	1	1	1
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.496	0.477	0.516
CH_4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	0.319	-1.093	1.865
CO_2 emissions from improved land (t CO2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO_2 eqiv.)	0	0	0
3. Losses without improvement			
Improved period (years)	1	1	1
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.496	0.477	0.516
CH_4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	0.319	-1.093	1.865
CO_2 emissions from unimproved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from unimproved land (t CO_2 eqiv.)	0	0	0
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	0	0	0

Foundations and Hard Standings	Exp.	Min.	Max.
1. Description of site			
Area to be improved (ha)	2.087	0.921	4.97
Depth of peat above water table before improvement (m)	0.56	0.1	1
Depth of peat above water table after improvement (m)	0.2	0.1	0
2. Losses with improvement			
Improved period (years)	35	20	65
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	0.038	0.123	0.516
CH_4 emissions from improved land (t CO_2 equiv.)	41.671	109.691	767.456
Selected annual rate of carbon dioxide emissions (t CO_2 ha-1 yr-1)	6.772	1.293	1.865
CO_2 emissions from improved land (t CO_2 equiv.)	253.481	39.642	94.963
Total GHG emissions from improved land (t CO_2 eqiv.)	295.152	149.333	862.418
3. Losses without improvement			
Improved period (years)	35	20	65
Selected annual rate of methane emissions (t CH_4-C ha-1 yr-1)	-0.004	0.123	0.016
CH_4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbon dioxide emissions (t CO2 ha-1 yr-1)	19.809	1.293	25.142
CO_2 emissions from unimproved land (t CO_2 equiv.)	1447.213	77.376	2499.078
Total GHG emissions from unimproved land (t CO_2 eqiv.)	1447.213	77.376	2499.078
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	1152.061	-71.957	1636.659