

## 18.0 Greenhouse Gas Technical Appendix

### Introduction

- 18.1 This appendix includes further technical detail regarding the magnitude of greenhouse gas (GHG) emissions and associated methodologies outlined within Chapter 18.0.
- 18.2 This greenhouse gas (GHG) technical report sets out the methodology and calculations of the GHG emissions for the proposed development. These calculations inform the assessment of the climate change impacts in Chapter 18.0. This appendix should be read in conjunction with the chapter, as supporting information.

### Scope

- 18.3 The GHGs considered in this assessment are those in the 'Kyoto basket' of global warming gases expressed as their CO<sub>2</sub>-equivalent (CO<sub>2</sub>e) global warming potential (GWP). This is denoted by CO<sub>2</sub>e units in emissions factors and calculation results. GWPs used are typically the 100-year factors in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report<sup>1</sup> or as otherwise defined for national reporting under the United Nations Framework Convention on Climate Change (UNFCCC).
- 18.4 Emissions associated with the proposed development are considered across its construction, operation, and decommissioning phases.

### Methodology Used for GHG Emissions Assessment

- 18.5 GHG emissions caused by an activity are often categorised into 'scope 1', 'scope 2' or 'scope 3' emissions, following the guidance of the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) Greenhouse Gas Protocol suite of guidance documents<sup>2</sup>.
- Scope 1 emissions: direct GHG emissions from sources owned or controlled by the company, e.g. from combustion of fuel at an installation.
  - Scope 2 emissions: caused indirectly by consumption of purchased energy, e.g. from generating electricity supplied through the national grid to an installation.
  - Scope 3 emissions: all other indirect emissions occurring as a consequence of the activities of the company, e.g. in the upstream extraction, processing and transport of materials consumed or the use of sold products or services.
- 18.6 This assessment has sought to include emissions from all three scopes, where this is material and reasonably possible from the information and emissions factors available, to capture the

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<sup>1</sup> IPCC: Fifth Assessment Report: 2013

<sup>2</sup> WRI and WBCSD: The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard: 2004

impacts attributable most completely to the proposed development. These emissions shall not be separated out by defined scopes (scopes 1, 2 or 3) in the assessment.

- 18.7 Such emissions include those resulting from the manufacturing and construction of the proposed development (associated with materials and fuel consumption), the operation of the proposed development (arising from the consumption of electricity within buildings, and fuel within vehicles and vessels), and decommissioning (associated with material disposal and fuel consumption). They have been calculated via a range of methodologies, including published benchmark carbon intensities and life cycle analysis (LCA) literature, and the application of material or fuel emission intensities to material or fuel quantities.
- 18.8 Key sources relied upon for the assessment are as follows:
- UK Government GHG Conversion Factors for Company Reporting<sup>3</sup>;
  - Inventory of Carbon & Energy (ICE) database<sup>4</sup> ; and
  - OneClick LCA<sup>5</sup>.

### Assumptions and Limitations

- 18.9 Construction-stage GHG emissions associated with the manufacturing of components may occur outside the territorial boundary of the UK and hence outside the scope of the UK's national carbon budget, policy and governance. However, in recognition of the climate change effect of GHG emissions (wherever occurring), and the need to avoid 'carbon leakage' overseas when reducing UK emissions, emissions associated with the construction stage have been presented within the assessment and quantification of GHG emissions as part of the proposed development.
- 18.10 The specific design of the proposed development, and related bill of quantities disclosing material weights and volumes that would be used to construct the proposed development have been specified at a high level. Detailed LCAs are not yet available for all materials and products specified, as such, the conservative estimate of construction materials or fuels has been scaled by relevant emissions factors. Where used to calculate the embodied carbon associated with materials, emissions factors do not account for emissions associated with the manufacture of products, and as such may underestimate embodied carbon emissions. Therefore, there is a degree of uncertainty regarding the construction stage GHG emissions resulting from the manufacturing of the proposed development.
- 18.11 Where an estimated bill of material quantities was not available (i.e. regarding the new coastguard and marine research facility), published benchmark factors were scaled by building areas to reach resultant emissions.

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<sup>3</sup> Department for Energy Security and Net Zero (DESNZ) and Department for Environment, Food and Rural Affairs (Defra): UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>4</sup> Jones and Hammond: Inventory of Carbon & Energy: 2024.

<sup>5</sup> OneClick LCA: Carbon Heroes Benchmark Database: 2023

- 18.12 Detailed construction traffic estimates will be provided following detailed design. Therefore, high level daily estimates of construction traffic movements have been provided by the project's transport consultants and have informed the calculation of associated emissions. Such daily estimates have been scaled across the construction phase, and by an assumed trip distance informed by national distances for material sourcing<sup>6</sup>. As such, it is likely that associated emissions present a conservative assessment, as vehicle movements are unlikely to remain at the same level across the construction period, and many will likely source materials locally and as such cover reduced distances than those assessed. In the absence of further detailed information, it is considered that the methodology presents an appropriate assessment.
- 18.13 Movements of vessels (i.e. from fishing, leisure and commercial vessels) to and from the proposed development during its operational phase form a key emissions source associated with the use of the proposed development. However, there is some uncertainty regarding the calculation of such emissions. Leisure vessels may include both sailboats and motorboats, both of which would have greatly differing associated emissions due to fuel consumption associated with their use. Approximations of the mix of such vessels using the proposed development can be approximated, however some uncertainty would accompany this estimation. Furthermore, the distance travelled by such vessels from the proposed development and fuel consumed during that journey is not known (e.g. fuel consumption would greatly depend on weather conditions with regards to sailboat journeys). Additionally, the regional extent to which emissions associated with vessel movements can be attributed to the proposed development is undefined.
- 18.14 In order to manage such uncertainties, fuel consumption from the new refuelling capability within the proposed development has been used to inform emissions from all vessel movements associated with the proposed development. It is noted that this methodology has its limitations: vessels may not refuel at the proposed development when visiting, those that do refuel may use fuel purchased at the proposed development across a wide geographic region and for trips to other marinas/destinations which in some part might occur regardless of whether this proposed development occurs. Despite this, 100 % of the fuel consumption has been attributed to the proposed development within the assessment. Furthermore, annual fuel consumption by vessels at the proposed development has been estimated, and may present an underestimate (e.g. poor weather conditions may limit vessel movements and associated fuel consumption). Despite such uncertainties, it is considered that this methodology presents the most robust assessment of emissions associated with activities resulting from the proposed development.
- 18.15 Regarding fuel consumption by vessels at the existing marina (i.e. under baseline conditions), there is no current refuelling capability at the site. Due to the limitations set out above, it has

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<sup>6</sup> Royal Institution of Chartered Surveyors (RICS): Whole life carbon assessment for the built environment: 2024

not been possible to approximate emissions associated with baseline vessel movements from the assessment case. It is considered that this presents a conservative assessment, as all fuel consumption associated with vessel movements from the proposed development will be considered as additional.

- 18.16 Maintenance dredging will take place throughout the proposed development's operational lifetime to ensure access channels and berths are maintained at their designed depths. At this stage of the design, operational dredging schedules are currently unknown and will be determined throughout the operation of the proposed development. In order to account for indicative emissions associated with such activity within the assessment of operational GHG emissions, it has been conservatively assumed that dredging will take place annually. Specifications regarding likely operational dredging vessels are not yet available, as such the vessel specification used to inform the construction phase dredging has been used to inform that associated with operation. This is likely to present a conservative assessment as the construction dredging vessel is likely to be larger and more power intensive than that associated with the operational phase.
- 18.17 Emissions factors and UK fleet mix used for the calculation of emissions arising from the construction, operation and decommissioning of the proposed development are current, available at the time of writing, and as such do not account for any future decarbonisation. Therefore, emissions presented within the assessment indicate a conservative estimate which do not account for decarbonisation of the UK construction industry, the National Grid, or other fuels used during the construction, operation and decommissioning of the proposed development (e.g. petrol and diesel), and do not account for the increased ownership of electric vehicles within the UK fleet.

### **Baseline GHG Emissions**

- 18.18 The current baseline environment for the proposed development in relation to GHG emissions comprises emissions associated with the existing Stranraer Marina, i.e. from energy consumption, vehicle movements to site, and vessel movements from and to the Marina.
- 18.19 With regards to electricity consumption at the existing Marina, there are three electricity supply points for which consumption data has been provided across a period from 2019 to 2025. This was totalled per annum, and then averaged across the period to determine average annual consumption, totalling 51,908 kWh. This figure was then scaled by the UK's current average grid electricity carbon intensity (0.177 kgCO<sub>2</sub>e/kWh)<sup>7</sup>, sourced from published benchmarks. Total emissions associated with the baseline electricity consumption amount to 9.2 tCO<sub>2</sub>e per annum.

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<sup>7</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

- 18.20 There is no existing vessel re-fuelling capacity on site (i.e. provision of petrol and/or diesel for use in vessels). As such, there are no emissions associated with the consumption of fuel purchased on site. However, the existing marina is currently used by vessels (both leisure and commercial), therefore the current baseline encompasses emissions associated with vessel movements and fuel consumed, regardless of where it was sourced. However, as stated in paragraph 18.15, emissions from baseline vessel fuel consumption has not been quantified. While it is anticipated that baseline and proposed development fishing vessel movements will remain consistent, a conservative approach has been adopted whereby all fuel associated with vessel movements from the proposed development is considered to be additional to the baseline.
- 18.21 Existing operational vehicle movements to and from the existing marina have not been quantified, but have been accounted for in the assessment of operational effects whereby only additional vehicle movements have been assessed and associated emissions quantified.

### Construction GHG Emissions

- 18.22 Construction phase emissions are associated with the upstream extraction, processing and manufacturing of materials, emissions associated with the transport of materials to site (within the UK), and on-site construction works.
- 18.23 The following sections detail the methodology used to calculate the construction phase emissions associated with the proposed development. Emissions factors and data sources for each element assessed are detailed.
- 18.24 The following project elements have been assessed in quantifying embodied carbon emissions:
- Fuel berth;
  - Marina access bridge;
  - New pontoons (additional 185 new berths and approximately 14 commercial berths);
  - New workshops;
  - New quay wall (sheet piled);
  - New coastguard and marine research facility (Solway Coast and Marine Pilot Project);
  - Redeveloped public slipway;
  - New car parking and community space on reclaimed land;
  - Upgrades to Breastworks and Marine Lake car parks;
  - Extension to the breakwater;
  - Material transport; and
  - Site construction emissions (including dredging).
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18.25 The following project elements have been scoped out of the embodied carbon assessment, as their impact is deemed to be insignificant due to the minimal works and materials associated with their construction:

- New floating harbour/marina facilities;
- Retrofitting of the existing harbour reception building; and
- New fisherman’s compound (fenced off, hardstanding area).

### *Construction Materials*

18.26 The construction phase emissions associated with the following elements of the Proposed Development have been calculated using approximate material quantities and relevant emissions factors:

- Fuel berth;
- Marina access bridge;
- New pontoons (additional 185 new berths and approximately 14 commercial berths);
- New workshops;
- New quay wall (sheet piled);
- Redeveloped public slipway;
- New car parking and community space on reclaimed land;
- Upgrades to Breastworks and Marine Lake car parks; and
- Extension to the breakwater.

18.27 Table 18.1 summarises the relevant material emission intensities sourced from the ICE data base<sup>8</sup>, and corresponding emissions values for the proposed development.

**Table 18.1: Emissions from estimated material quantities.**

Element	Emissions intensity (kgCO <sub>2</sub> e/unit)	Unit	Total Construction Emissions (tCO <sub>2</sub> e)
<b>Fuel berth</b>			
Concrete (fuel tank & fencing foundations)	0.119	kg	25.4
Steel (petrol and diesel tank)	2.620	kg	
<b>Marina access bridge</b>			
Aluminium	6.669	kg	177.9
Steel	2.620	kg	
Concrete	0.119	kg	
Glass reinforced plastic	5.010	kg	
<b>Pontoons</b>			
Concrete	0.119	kg	206.4

<sup>8</sup> Jones and Hammond: Inventory of Carbon & Energy: 2024

Element	Emissions intensity (kgCO <sub>2</sub> e/unit)	Unit	Total Construction Emissions (tCO <sub>2</sub> e)
Polystyrene	3.690	kg	
<b>New workshops</b>			
Concrete	0.119	kg	163.5
Steel	2.620	kg	
Cladding	382	m <sup>3</sup>	
Blockwork	0.103	kg	
<b>New Quay Wall (sheet piles)</b>			
Concrete	0.119	kg	3,368.7
Steel	2.620	kg	
<b>Public slipway</b>			
Concrete	0.119	kg	637.3
Infill (dredged material)	0	n/a	
Steel	2.620	kg	
6A fill	0.007	kg	
<b>Hardstanding (i.e. new and upgraded car parks)</b>			
Rolled asphalt	0.054	kg	219.4
Dense macadam	0.191	kg	
Sub-base	0.007	kg	
Capping layer	0.007	kg	
Block paviments	0.131	kg	
Monoblocks	0.119	kg	
Sand bedding	0.007	kg	
Concrete (grasscrete)	0.119	kg	
6A fill	0.007	kg	
<b>Reclaimed land, breakwater, revetment</b>			
Reclaimed land	0.007	kg	1,983.6
Armourstone	0.007	kg	
Dredge fill	0.007	kg	
6A fill	0.007	kg	
<b>Total</b>			<b>6,782.3</b>

18.28 At this stage of design, material estimates with regards to the construction of the coastguard and marine research facility are not defined in detail. As such, it is not possible to calculate project-specific embodied carbon. As such, published benchmarks have been used to estimate possible emissions associated with the building under a business-as-usual scenario. The benchmark data is expressed in kgCO<sub>2</sub>e/m<sup>2</sup> of floorspace.

18.29 UK-specific benchmarks have been sourced from the Carbon Heroes Benchmarking Database, produced by OneClick LCA<sup>9</sup>. The Carbon Heroes Database is developed using data input into the LCA software OneClick LCA. Data input from projects is anonymised and included into the benchmarks based on mechanical and manual screening that considers consistency, completeness and plausibility. Projects that display aberrant values or inconsistency have been excluded from the samples. Benchmarks cover emissions associated with the product stage (i.e. raw material supply, transport and manufacturing), construction transport to site, material replacement and refurbishment during the operational phase, and end-of-life emissions (i.e. demolition, transport, waste processing and disposal). The most recent benchmark values are those published in Q3 2023. Average Carbon Heroes Database values for UK offices (most appropriate building type available) have been used to inform the calculations of embodied carbon (722 tCO<sub>2</sub>e/m<sup>2</sup>).

18.30 The RICS guide to calculation of embodied carbon<sup>10</sup> provides an estimation of the sources (in terms of lifecycle stages) of the GHG emissions involved in the construction and use of buildings (Figure 18.1).

*Figure 18.1: Examples of building GHG emissions by life cycle stage*



18.31 Informed by Figure 18.1, the Carbon Heroes Database benchmark has been scaled to cover only emissions associated with the construction product stage (662 tCO<sub>2</sub>e)<sup>11</sup>, given emissions associated with construction transport have been informed by project-specific information (see below). This value was then scaled by the total maximum area of the proposed coastguard and marine research facility (504 m<sup>2</sup>), to give total A1-A3 emissions of 333.7 tCO<sub>2</sub>e.

### *Construction Transport*

18.32 To account for the transport of materials and products to site, the following construction transport movements have informed the assessment (informed by the project team's transport consultant):

- Heavy Goods Vehicle (HGV) movements - 124 two-way trips per day.
- Light Goods Vehicle (LGV) movements - 124 two-way trips per day.

18.33 To provide a conservative emissions estimate, it has been assumed that all traffic movements (both LGV and HGV) will occur over national distances for material sourcing (120 km),

<sup>9</sup> OneClick LCA: Carbon Heroes Benchmark Database: 2023

<sup>10</sup> RICS: Information paper: methodology to calculate embodied carbon of materials: 2012

<sup>11</sup> The product stage and transport to site, material replacement and refurbishment, and end-of-life activities account for 16.9 % of a building's lifecycle carbon emissions, whilst the product stage alone accounts for 15.5 %. Therefore, a reduction of 8 % was applied to convert OneClick (2023) benchmarks to product stage emissions only.

informed by RICS guidance on whole life carbon assessment for the built environment<sup>12</sup>. Return journeys from the site therefore result in a distance of 240 km per required journey.

- 18.34 An emissions factor of 0.89121 kgCO<sub>2</sub>e/km for 'average laden (All HGV's)' <sup>13</sup> has been scaled by 280 km, resulting in 0.21 tCO<sub>2</sub>e per estimated HGV movement, or 26.5 tCO<sub>2</sub>e per day.
- 18.35 Similarly, an emissions factor of 0.25430 kgCO<sub>2</sub>e/km for 'Van - average (Up to 3.5 tonnes)' <sup>14</sup> has been scaled by 280 km, resulting in 0.06 tCO<sub>2</sub>e per estimated LGV movement, or 7.6 tCO<sub>2</sub>e per day.
- 18.36 Once combined, the daily emissions arising from construction transport amounts to 34 tCO<sub>2</sub>e per day. This is then scaled by the proposed development's estimated 24 month construction period<sup>15</sup>, amounting to a total of 17,181.6 tCO<sub>2</sub>e.

### *Site Construction Activities*

- 18.37 As detailed information of construction site based emissions is not known at this stage, the total area (m<sup>2</sup>) of the site (51,900 m<sup>2</sup>) has been scaled by a benchmark factor sourced from OneClick LCA<sup>16</sup> for construction site emissions (Average construction site impacts – temperate climate (North) (per GFA)). The emissions factor stated is 50 kgCO<sub>2</sub>e/m<sup>2</sup>. This factor accounts for construction waste, electricity and fuel consumption (diesel) during site construction activities. It should be noted that the factor stated is not UK-specific, in the absence of available information for the UK context.
- 18.38 By applying the emissions factor stated above to the total onshore area of the project site, this amounts to 2,595.0 tCO<sub>2</sub>e.
- 18.39 In addition to standard construction site emissions arising from the construction of the proposed development, dredging is required to prepare the marine area. Emissions associated with this activity during construction has also been captured.
- 18.40 As detailed within Chapter 2: Project Description of the EIAR, over the duration of the construction phase, 132,616 m<sup>3</sup> sediment will be dredged from the marina, with 84,276 m<sup>3</sup> disposed outside of the site (conservatively assumed to be at Beaufort's Dyke, approximately 30 km from Stranraer) and the remaining 48,340 m<sup>3</sup> used on-site within the reclaimed land. A typical hopper capacity is 1,500 m<sup>3</sup> (with an assumed water content of 50 %) and takes approximately four hours to fill (see Dredging Plume Modelling document of the EIAR). Therefore, it can be approximated that a total of 112 return movements are required to dredge and transport the disposed sediment, with a further 64 movements required to dredge the sediment to be used on-site.

<sup>12</sup> Royal Institution of Chartered Surveyors (RICS): Whole life carbon assessment for the built environment: 2024

<sup>13</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>14</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>15</sup> The 24 month construction period, assumes 252 working days per annum, in line with average UK working days per annum, this totals 504 days over the 24 month construction period.

<sup>16</sup> OneClick LCA: Construction Site Operations: 2025

18.41 An appropriate vessel specification, detailing vessel speed and installed power (from propulsion and pumps) informed the anticipated number of activity hours required for the construction period (i.e. for the above number of return movements and on-site dredging hours), and the subsequent energy consumption from the activity. This value was then scaled by the emissions factor for marine gas oil (0.27869 kgCO<sub>2</sub>e/kWh)<sup>17</sup>, totalling 1,576.7 tCO<sub>2</sub>e.

### Summary

18.42 Table 18.2 below summarises the above detailed emissions associated with the construction of the proposed development.

**Table 18.2: Summary of construction phase emissions**

Item	Total Emissions (tCO <sub>2</sub> e)
Fuel berth	25.4
Marina access bridge	177.9
New pontoons	206.4
New workshops	163.5
New quay wall	3,368.7
Redeveloped public slipway	637.3
New car parking and upgrades to Breastworks and Marine Lake car parks	219.4
Reclaimed land, breakwater, revetment	1,983.6
Coastguard and marine research facility	333.7
Vehicle movements	17,181.6
Site construction activity	2,595.0
Dredging	1,576.7
<b>Total</b>	<b>28,469.3</b>

### Operational GHG Emissions

18.43 The following sections detail the methodology used to calculate the operational phase emissions associated with the proposed development.

18.44 The use of the proposed development will result in direct and indirect GHG emissions due to the use of electricity within the buildings, road traffic generated by the proposed development, fuel consumed by vessels, and emissions associated with periodic maintenance, refurbishment and repair.

18.45 The methodology used to calculate emissions associated with electricity and fuel consumption, and road traffic are detailed below. It is not considered that emissions associated with periodic

<sup>17</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

maintenance, refurbishment and repair materially contribute to emissions arising from the proposed development. The proposals account for repairs to the existing harbour and quay walls, with any works required to enhance and prolong the service life of the existing marina forming part of the marina upgrades. Therefore, it is anticipated that any further routine maintenance required during the proposed development's lifetime will require a minimal scope of work (and associated emissions).

### *Electricity Consumption*

18.46 With regards to the electricity consumption, Statement of Energy reports have been prepared as part of the planning application for the proposed workshop, coastguard building and marine research facility. Each strategy details the anticipated operational regulated energy consumption<sup>18</sup> intensity associated with each building as relevant, alongside the energy demand intensity to be met by renewable sources (i.e. on-site solar PV).

18.47 Table 18.3 below details the treated floor areas as provided within each Statement of Energy report, reported regulated energy consumption intensities, energy consumption met by on-site renewable provision, and final total regulated energy consumption.

**Table 18.3: Operational energy consumption**

Building	Treated floor area (m <sup>2</sup> )	Regulated energy demand intensity (kWh/m <sup>2</sup> /year)		Annual consumption (kWh/year)		
		Total	Solar PV provision	Total regulated	Solar PV provision	Grid electricity
Workshop	168.1	27.65	31.6	4,648	5,312	0 <sup>1</sup>
Research Facility	570.4	33.91	12.69	19,342	7,238	12,104
Coastguard Building	209.3	37.49	10.49	7,840	2,196	5,645
<b>Total</b>				<b>31,831</b>	<b>14,746</b>	<b>17,749</b>

<sup>1</sup>Reported consumption as 0 kWh per annum as energy demand met by on-site renewable provision exceeds regulated energy demand.

18.48 Regulated energy consumption associated with the proposed development totals 31,831 kWh per annum (of which 17,749 kWh will be sourced from grid electricity, the remainder will be sourced from on-site solar PV). This accounts for energy reduction measures, including efficient heating and hot water systems, mechanical ventilation with heat recovery, low energy lighting, and solar PV provision.

<sup>18</sup> Regulated energy consumption arises from the specification of controlled, fixed building services and fittings (i.e. including space heating and cooling, hot water, ventilation and lighting).

- 18.49 Total regulated energy consumption estimated to be sourced from grid electricity has been scaled by the UK emissions factor for grid electricity (0.177 kgCO<sub>2e</sub>/kWh)<sup>19</sup> to total 3.1 tCO<sub>2e</sub> per annum.
- 18.50 Estimates of unregulated energy consumption<sup>20</sup> are not detailed within the Statement of Energy reports, given such energy demand does not fall under Building Regulation requirements. In order to provide a complete assessment of emissions sources associated with the proposed development, unregulated energy demand and associated emissions have been approximated.
- 18.51 Whole building energy consumption intensities (assumed to account for both regulated and unregulated energy demand) have been used from (enter source ref) for data 'other' non-domestic building use for the period from 2012 to 2022<sup>21</sup> and averaged, indicating a total building electricity intensity of 52 kWh/m<sup>2</sup>. This intensity was applied to the treated floor areas of each building (see Table 18.3), with annual electricity consumption totalling 48,818 kWh per annum. The regulated consumption (see Table 18.3) was subtracted from this total, to give 16,987 kWh per annum assumed to arise from unregulated consumption. Consistent with the calculation of emissions arising from regulated energy consumption, this total was scaled by the UK emissions factor for grid electricity (0.177 kgCO<sub>2e</sub>/kWh)<sup>22</sup> to total 3.0 tCO<sub>2e</sub> per annum.
- 18.52 It is important to note that such estimates of unregulated energy consumption are for the purpose of the climate change assessment only. Unregulated energy consumption is directly dependent on the exact end use of the buildings, therefore any estimation at this stage in the design has inherent uncertainty. Furthermore, the whole building intensity data sourced to inform the assessment only details the energy intensity of non-domestic buildings in England and Wales. In the absence of similar data available for Scotland, this data is considered applicable for use in the context of the assessment, i.e. indicating approximate additional emissions arising from unregulated energy demand in order to inform the assessment on climate change.
- 18.53 Additional sources of electricity consumption associated with the proposed development arise from the use of electricity by vessels berthed at the marina. Given the increased number of berths associated with the proposed development, it is anticipated that associated electricity consumption will increase beyond that associated with baseline consumption. As detailed within paragraph 18.19, there are three electricity supply points for which consumption data has been provided across a period from 2019 to 2025. Of these, two are associated with the pier; when totalled and averaged across the period, average consumption amounts to

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<sup>19</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>20</sup> Unregulated energy consumption arises from building system or processes that are not 'controlled', i.e. from systems on which Building Regulations do not impose a requirement ((i.e. IT equipment, refrigeration systems, external lighting).

<sup>21</sup> DESNZ: Non-domestic National Energy Efficiency Data-Framework (ND-NEED): 2024

<sup>22</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

22,868 kWh per annum. This value was scaled by the existing 45 no. berths, and proposed total 230 no. berths, to reach an approximate electricity consumption of 116,879 kWh per annum. This was scaled by the UK emissions factor for grid electricity (0.177 kgCO<sub>2</sub>e/kWh)<sup>23</sup> to total 20.7 tCO<sub>2</sub>e per annum.

- 18.54 When compared to total baseline electricity consumption and associated emissions resulting from the existing site use, total additional emissions arising from electricity consumption at the proposed development total 17.6 tCO<sub>2</sub>e.

### *Vehicle Movements*

- 18.55 Road traffic generated by the proposed development has been informed by the project's transport consultant, and totals an additional 253 two-way daily trips as a result of the marina extension, and an additional 84 two-way daily trips as a result of the coastguard and marine research facility.
- 18.56 Such movements largely comprise car movements associated with marina users; however, a proportion will arise from delivery/maintenance vans. It has been assumed that approximately 13% of the above movements will arise from commercial delivery/maintenance van movements (informed by the Society of Motor Manufacturers and Traders statistics). Such movements have been scaled by a 20 km travel distance (informed by RICS guidance<sup>24</sup> for local transport scenarios) and an appropriate emissions factor per km<sup>25</sup>.
- 18.57 The remaining car movements have been scaled by the current make-up of the UK car fleet<sup>26</sup>, average personal journey distances<sup>27</sup>, and an appropriate emissions factor per km<sup>28</sup> for each vehicle type.
- 18.58 Total daily emissions were then scaled to give annual emissions, which total 129.7 tCO<sub>2</sub>.
- 18.59 The proportion of zero- and low-emission cars in the UK road fleet (such as EVs and hybrid cars) is expected to increase over time in line with national decarbonisation policy goals. For the purpose of this assessment however, present-day values have been used (appropriately representative of the construction period and initial year of operation) to be conservative. It is noted that the proposed development's operational emissions from transport emissions are likely to decrease during its lifetime due to the decarbonisation of UK road transport.

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<sup>23</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>24</sup> RICS: Whole life carbon assessment for the built environment: 2024

<sup>25</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>26</sup> Department for Transport, and Driver and Vehicle Licensing Agency: Vehicle licencing statistics data tables 1103: 2024

<sup>27</sup> Transport Scotland: Scottish Transport Statistics 2024: 2025

<sup>28</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

### *Vessel Movements*

- 18.60 To approximate emissions associated with vessel movements to and from the proposed development, the total anticipated refuelling capability of the proposed development has been used.
- 18.61 Two fuel tanks will be installed at the proposed development with a total capacity of 10,000 litres (approximately 2,500 litres petrol, and 7,500 litres diesel). It has been conservatively assumed that annual petrol and diesel sales would total 12,000 litres and 50,000 litres, respectively.
- 18.62 Such consumption has been scaled by appropriate emissions factors for petrol and diesel (2.069 kgCO<sub>2e</sub>/litre and 2.571 tCO<sub>2e</sub>/litre, respectively)<sup>29</sup> to approximate associated annual emissions arising from such fuel consumption, totalling 153.4 tCO<sub>2e</sub>.
- 18.63 As stated at paragraph 18.14 to 18.15, such emissions present an approximate estimate informed by available information and should therefore be treated as an indicative emissions total associated with vessel activity.

### *Dredging*

- 18.64 In the absence of information regarding an operational dredging schedule, and for the purpose of this assessment to provide indicative emissions associated with activities likely to result from the proposed development, it has been conservatively assumed that dredging will take place annually, with one week-long dredging event.
- 18.65 This assumption has been informed by the dredging history at the existing marina, whereby dredging movements over the past 15 to 20 years have indicated an accumulation of circa 2,000 m<sup>3</sup> of sediment per year removed<sup>30</sup>. When applied to the assumptions regarding hopper capacity stated within paragraph 18.40, it can be assumed that approximately three return movements are required to dispose of the accumulated sediment annually.
- 18.66 Associated emissions have been informed by the methodology detailed at paragraphs 18.40 and 18.41, and have assumed three return movements per annum, and that the same specification of dredging vessel will be used during both construction and operation (further detailed at paragraph 18.16). As such, and given it is unlikely that such dredging activity will take place annually, it is likely that the approximation of operational dredging emissions presents a conservative scenario.
- 18.67 Emissions associated with annual operational dredging movements have been approximated to total 35.1 tCO<sub>2e</sub>. It should be noted that this is a conservative assessment to provide context regarding potential emissions.

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<sup>29</sup> DESNZ and Defra: UK Government GHG Conversion Factors for Company Reporting: 2025

<sup>30</sup> Chapter 7.0: Coastal Processes of the EIAR.

## Summary

18.68 Table 18.4 below summarises the above detailed emissions associated with the construction of the proposed development.

**Table 18.4: Summary of operational phase emissions**

Item	Total Emissions (tCO <sub>2</sub> e)
Electricity consumption	17.6
Transport movements	129.7
Vessel movements	153.4
Dredging	35.1
<b>Total</b>	<b>335.8</b>

## Assessment of Decommissioning Effects

- 18.69 The majority of emissions during this phase relate to the use of plant for decommissioning, disassembly, transportation to a waste site, and ultimate disposal and/or recycling of the equipment and other site materials.
- 18.70 While detailed information is not yet available regarding the decommissioning of the Stranraer Marina expansion at the end of the proposed development's operational phase, it is anticipated that it would be undertaken in accordance with the environmental legislation and technology available at the time. The components of the proposed development, are considered to be highly recyclable (largely concrete and steel). When disposing of such elements, recycling is the preferred option. This not only prevents materials from being sent to landfills, but also reduces the need for the extraction of primary materials. Material which cannot be recycled might be used for incineration or energy from waste. As such, emissions associated with the disposal of materials at the end of their lifetime is considered to be immaterial and may even result in future avoided emissions.
- 18.71 In the absence of detailed information regarding transport movements and plant use during the decommissioning phase, it has been assumed that such emissions equal those associated with the construction phase, totalling 19,776.6 tCO<sub>2</sub>e. Given carbon emissions associated with use of plant and fuel is expected to have achieved good levels of decarbonisation at the decommissioning phase of the proposed development, this is likely to present a conservative estimate.
- 18.72 The calculation of emissions associated with the decommissioning of the proposed development totals 19,776.6 tCO<sub>2</sub>e.

## Net Whole Life GHG Emissions

18.73 Whole lifetime emissions associated with the proposed development, arising from the construction, operation, and decommissioning phases are summarised within Table 18.5, below.

**Table 18.5: Whole lifetime emissions summary**

Phase	Item	Total Emissions (tCO <sub>2</sub> e)
Construction	Fuel berth	25.4
	Marina access bridge	177.9
	New pontoons	206.4
	New workshops	163.5
	New quay wall	3,368.7
	Redeveloped public slipway	637.3
	New car parking and upgrades to Breastworks and Marine Lake car parks	219.4
	Reclaimed land, breakwater, revetment	1,983.6
	Coastguard and marine research facility	333.7
	Vehicle movements	17,181.6
	Site construction activity	2,595.0
Operation (per annum)	Dredging	1,576.7
	Electricity consumption	17.6
	Transport movements	129.7
	Vessel movements	153.4
Decommissioning	Dredging	35.1
	Vehicle and plant movements	19,776.6
<b>Total</b>		<b>48,581.7</b>