Tarbert Power Station - Temporary Emergency Generation

Natura Impact Statement

SSE Generation Ireland Limited

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Delivering a better world

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Table of contents

1. Introduction 1
1.1 Background 1
1.2 Project Description 1
1.3 Legislative Context 1
1.4 Overview of the Appropriate Assessment Process 2
1.5 Purpose of this Report 3
1.6 Quality Assurance and Statement of Authority 3
2. Methodology 4
2.1 Sources of Guidance 4
2.2 Data Sources 4
2.3 Air Quality and Noise Modelling 4
2.4 Field Survey 5
2.5 Scope of Assessment 6
3. Baseline Conditions 8
3.1 European Sites 8
3.2 Available Data 9
3.3 Field Survey Results 9
4. Mitigation 12
4.1 Embedded Mitigation 12
4.2 General Mitigation Measures 12
4.3 Specific Mitigation 13
5. Information for Appropriate Assessment 16
5.1 River Shannon and River Fergus Estuaries SPA 16
5.2 Lower River Shannon SAC 34
5.3 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 43
5.4 Moanveanlagh Bog SAC 44
6. Conclusion 45
7. References 46
8. Figures 49
Appendix A Information on European sites within the ZoI of the Designated Development 50
Appendix B Framework Construction Environmental Management Plan 59
Appendix C Projects Assessed for In-Combination Effects with the Designated Development 60
Appendix D Air Quality Modelling Assessment 62
Appendix E Predicted construction noise levels of the Temporary Emergency Generator at SSE Tarbert 63

1. Introduction

1.1 Background

SSE Generation Ireland Limited ('SSE') proposes to develop a Temporary Emergency Generation facility (hereafter this is referred to as the 'Designated Development', the location of which is shown on Figure 1) within the boundary of Tarbert Power Station, Tarbert, Co. Kerry. The Designated Development comprises three open cycle gas turbine (OCGT) units, which operate using distillate fuel, plus associated infrastructure. AECOM was appointed by SSE Generation Ireland Limited to conduct an Appropriate Assessment (AA) Screening for the Designated Development, which is set out in the *Tarbert Power Station – Temporary Emergency Generation Appropriate Assessment Screening Report* (AECOM, 2023).

The AA Screening exercise determined that the potential zone of influence (ZoI) of the Designated Development encompassed a total of two Special Areas of Conservation (SACs) and two Special Protection Areas (SPAs) (the location of these sites in relation to the Designated Development are shown on Figure 2):

- River Shannon and River Fergus Estuaries SPA;
- Lower River Shannon SAC;
- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA; and,
- Moanveanlagh Bog SAC.

However, not all impacts which could arise from the construction, operation or decommissioning of the Designated Development will have pathways for effects on the habitats or species for which these sites within the ZoI are designated. Consequently, some sites may be within the ZoI for certain impacts, but not for others. Therefore, for each SAC and SPA, the construction, operational and decommissioning phase impacts for which that site was determined to be within the ZoI of the Designated Development were examined for their potential to result in significant effects on the qualifying features.

The AA Screening concluded that likely significant effects on the qualifying features of these SACs / SPAs, from at least one possible impact from the Designated Development, could not be ruled out at that stage, on the basis of information available at that time and/or in the absence of avoidance or mitigation measures.

1.2 Project Description

The Designated Development consists of the installation of three units which will collectively generate up to 150MW of temporary emergency electricity, site development and associated ancillary works required for the operation of the plant. The plant will operate as an emergency plant, with a maximum running time of 500 hours per annum, spending the majority of time on standby, and will be run to complement renewable power generation sources. The operational life of the Designated Development is anticipated to be up to five years. After this time, the temporary emergency generation plan will be disconnected, dismantled, and removed from Tarbert Power Station Site. The 'Site' relates to the area contained within the red line boundary which encompasses the main development area where the Designated Development is to be located including the construction compounds and laydown areas, and access and egress.

1.3 Legislative Context

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, which is more commonly known as the 'Habitats Directive', requires Member States of the European Union (EU) to take measures to maintain or restore, at favourable conservation status, natural habitats and wild species of fauna and flora of Community interest. The provisions of the Habitats Directive require that Member States designate Special Areas of Conservation for habitats listed in Annex I and for species listed in Annex II. Similarly, Directive 2009/147/EC on the conservation of wild birds, which is more commonly known as the 'Birds Directive', provides a framework for the conservation and management of wild birds. It also requires Member States to identify and classify Special Protection Areas for rare or vulnerable species listed in Annex I of the Birds Directive, as well as for certain regularly occurring migratory species. Collectively, SACs and SPAs are known as 'European sites'.

In Ireland, the habitats and/or species which are the reason(s) for designation of an SAC are referred to as 'Qualifying Interests' (QI). In relation to SPAs, the bird species for which a particular site is designated are referred to as the 'Special Conservation Interests' (SCI).

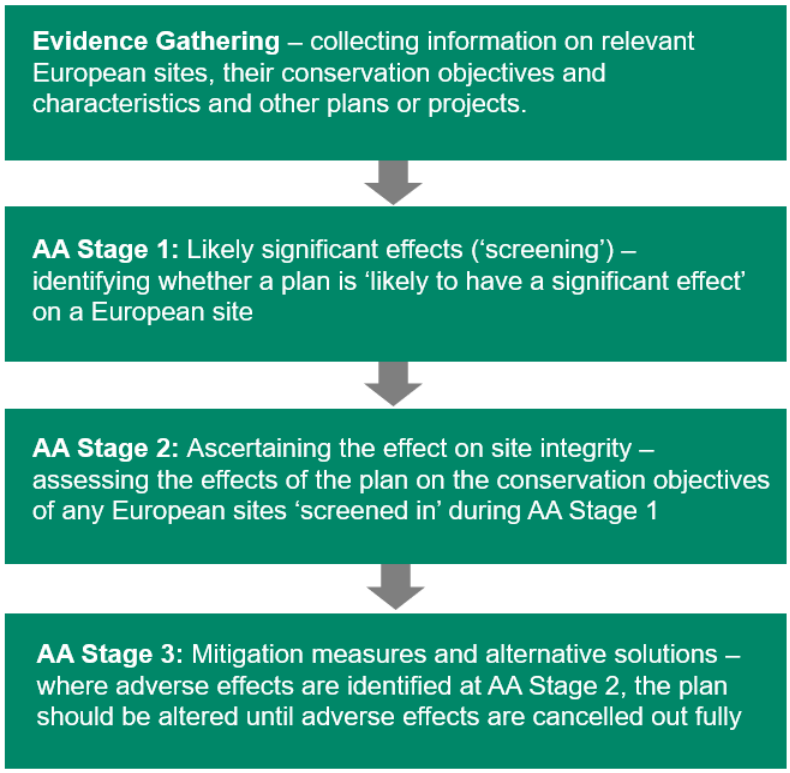
Under Article 6(3) of the Habitats Directive, any plan or project which is not directly connected with or necessary to the management of a European site, but would be likely to have a significant effect on such a site, either individually or in-combination with other plans or projects, must be subject to an Appropriate Assessment of its implications for the SAC / SPA in view of the site's Conservation Objectives.

In Ireland, the requirements of Article 6(3) are transposed inter alia by the European Communities (Birds and Natural Habitats) Regulations 2011 as amended (the 'Regulations of 2011'). Section 6 of the Development (Emergency Electricity Generation) Act 2022 provides that on receiving an application under section 4, the Minister shall arrange for an assessment of the designated development to be carried out by An Bord Pleanála (the 'Board') in accordance with Part 5 of the Regulations of 2011, subject to any modifications as to process as may be prescribed for the purposes of the Act.

1.4 Overview of the Appropriate Assessment Process

The process required by Articles 6(3) and 6(4) of the Habitats Directive is stepwise and must be followed in sequence. **Image 1** below outlines the stages of AA according to current European Commission (EC) guidance (European Commission, 2021). The stages are essentially iterative, being revisited as necessary in response to more detailed information, recommendations, and any relevant changes to the plan or project until no significant adverse effects remain.

Image 1. The stages of Appropriate Assessment (taken from European Commission (2021))



The first stage in the sequence of tests (after evidence gathering) is to establish whether an AA is required. This is often referred to as 'AA Screening'. The purpose of AA Screening is to determine, in view of best available scientific knowledge, whether a plan or project, either alone or in-combination with other plans or projects, could have likely significant effects on a European site, in view of that site's Conservation Objectives. For this purpose and as a result of case law 'likely' in practice means 'possible'[1].

If the competent authority determines that there are no likely significant effects (including 'in combination' effects from other plans or projects), then no further assessment is necessary and the plan or project can, subject to any

[1] Waddenzee (C-127/02).

other consent processes, be taken forward. If, however, the competent authority determines that there are likely significant effects or if there is reasonable scientific doubt, then the next stage in the process must be initiated and a detailed AA is undertaken.

Appropriate Assessment is not a technical term. It refers to whatever level of assessment is appropriate to form a conclusion regarding effects on the integrity (coherence of structure and function) of European sites. As such, it has no pre-ordained methodology. The work involved is essentially identical to that of the Appropriate Assessment Screening stage but involves more detail and the methodology is tailored specifically to the impact pathways and the European sites being assessed.

The purpose of the stage of Appropriate Assessment is to further explore the potential impacts and to determine whether a conclusion of no adverse effects on integrity can be drawn for any of the 'screened in' impacts / European sites.

One of the key considerations during the stage of Appropriate Assessment is whether there is available mitigation that would entirely address potential effects.

1.5 Purpose of this Report

Whilst the various steps involved in the AA process must be carried out by An Bord Pleanála, project proponents or their consultants may provide the information required to inform this assessment. Having already completed an AA Screening (see AECOM, 2023), this Natura Impact Statement therefore serves to provide AECOM's opinion on whether there will be an adverse effect on the integrity of any 'screened in' European site from the Designated Development, either individually or in-combination with other plans or projects.

For clarity, in the context of the Habitats Directive, the Designated Development represents a 'project' and no reference to 'plans' is made hereafter, except where required to consider the potential for in-combination effects to arise between the Designated Development and any relevant plans.

1.6 Quality Assurance and Statement of Authority

This Natura Impact Statement, and the assessment described within it, has been completed in accordance with the AECOM Integrated Management System (IMS). Our IMS places emphasis on professionalism, technical excellence, quality, as well as covering health, safety, environment and sustainability management. All AECOM staff members are committed to maintaining our accreditation to those parts of BS EN ISO 9001:2015 and 14001:2015, as well as BS OHSAS 18001:2007 that are relevant to a consultancy service.

The Appropriate Assessment has been carried out by AECOM ecologists with experience in conducting such appraisals. All are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) at the appropriate grade and adhered to their strict Code of Professional Conduct.

This NIS was written by Tony Marshall CEcol MCIEEM, AECOM Technical Director. He holds a first-class honours degree in Biological Sciences (Ecology) from the University of Edinburgh. Tony leads AECOM's ecology teams in Ireland and Scotland, and has over twelve years as a professional ecological consultant. He has substantial experience in undertaking Appropriate Assessments for projects (and plans) in Ireland and Scotland, including a recently proposed power station development on the north-east coast of Scotland. He has been involved in assessments requiring detailed appraisal of air quality and noise impacts on sensitive ecological habitats and species, including the QI / SCI of European sites relevant to this NIS.

Clare McIlwraith CEnv MCIEEM, AECOM Associate Ecologist carried out the check of this NIS in accordance with AECOM quality procedures. Clare is a Chartered Environmentalist and full member of CIEEM, with a background in terrestrial ecological assessments. She has 20 years' experience working as an ecological consultant and has significant experience of Ecological Impact Assessment (EcIA) and Appropriate Assessment for large-scale development projects. Over the course of her career, she has worked on projects in the power, transport, property, and local government sectors.

Dr James Riley CEnv MCIEEM is AECOM's Technical Director responsible for Appropriate Assessments across the UK and Ireland and undertook verification of this NIS. James is a Chartered Environmentalist with twenty years' consultancy experience. James has supervised hundreds of Appropriate Assessments including for clients such as Donegal County Council and Transport Infrastructure Ireland. He was the lead author on guidance published by the Chartered Institute of Ecology and Environmental Management on the assessment of air quality impacts on wildlife sites.

2. Methodology

2.1 Sources of Guidance

This NIS has been prepared in accordance with the European Commission guidance document Assessment of Plans and Projects in relation to Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (European Commission, 2021). In addition, the following sources of guidance were also considered:

- *Appropriate Assessment of Plans and Projects in Ireland* (DoEHLG, 2010);
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018); and,
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular Letter NPWS 1/10 & PSSP 2/10* (NPWS, 2010).

2.2 Data Sources

A desk-based study was carried out to help establish the baseline conditions relevant to the Designated Development. The following resources were analysed to inform the baseline description of the Site of the Designated Development and for assessing sensitivities of European sites:

- Environmental Protection Agency (EPA) Maps website (https://gis.epa.ie/EPAMaps/) (accessed 28 October 2022);
- National Parks and Wildlife Service (NPWS) Protected Sites in Ireland website (https://www.npws.ie/protected-sites) (accessed 28 October 2022);
- Air Pollution Information System (APIS) website (https://www.apis.ac.uk/) (accessed 04 November 2022);
- Google maps website (https://maps.google.com/) (accessed 28 October 2022);
- The Status of European Union (EU) Protected Habitats and Species in Ireland (Article 17 Report) (https://www.npws.ie/publications/article-17-reports/article-17-reports-2019) (accessed 28 October 2022);
- Kerry County Council Online Planning Enquiry website (https://www.kerrycoco.ie/planning/online-planning-enquiry/); and,
- National Planning Application Database (https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=9cf2a09799d74d8e9316a3d3a4d3a8de).

2.3 Air Quality and Noise Modelling

Dispersion modelling was carried out to predict emissions of airborne pollutants, and associated deposition of atmospheric nitrogen, during the operational phase of the Designated Development. Full details of the air quality modelling exercise are provided in **Appendix D**. With respect to this NIS, a total of fifteen modelling points were selected to provide predictions for airborne pollution at locations within European sites considered to be in the zone of influence for such impacts. For the Lower River Shannon SAC, a series of locations were selected based both on proximity to the Designated Development, and the distribution of QI habitats according to the Conservation Objectives Supporting Documents for the European site. The locations of the air quality modelling points used to inform this Appropriate Assessment are shown on Figure 3.

Similarly, noise modelling was also carried out to predict the noise levels which could be generated at various receptor locations due to construction / decommissioning and operational activities. A total of fifteen noise modelling locations were selected to inform this Appropriate Assessment, as shown on Figure 4. The locations of these points were selected with cognisance of the potential distribution of QI / SCI species both within and outside of the boundaries of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, and to take into account noise level reduction with increasing distance from the Designated Development. Full details of the noise modelling exercise are provided in **Appendix E**.

2.4 Field Survey

2.4.1 Habitat Survey

Survey of the habitats within the Site was carried out on 15 and 16 November 2022 (see Figure 5). The survey area for the Site was based on a previous iteration of the red line boundary, thus encompassed the main development area for the Designated Development. Due to the updating of the red line boundary, not all of the habitats within the Designated Development were surveyed and are thus not mapped on Figure 5. However, the habitats within the updated red line boundary have subsequently been determined through the use of aerial imagery and knowledge of the Site gained through the November 2022 habitat survey. Therefore, the robustness of this assessment is not affected. The survey was carried out AECOM Ecologists Susanne Dunne and Alison Donnelly, both of whom have more than four years' experience in conducting this type of survey across Ireland. Susanne holds a BSc (Hons) in Ecology from University College Cork and Alison holds a BSc in Marine Science from University of Galway and a MSc in Marine Biology from University College Cork.

The walkover survey involved an inspection of habitats in accordance with *A Guide to Habitats in Ireland* (Fossitt, 2000) and *Best Practice Guidance for Habitat Survey and Mapping* (Smith *et al*, 2011). The standard survey method was 'extended' to assess the suitability of the habitats present to support the QI / SCI of European sites within the potential ZoI of the Designated Development, and to search for evidence of such species.

2.4.2 Non-breeding Waterbird Survey

Targeted surveys for non-breeding waterbirds[2] were carried out to inform the Appropriate Assessment. Walkover surveys were carried out within the Designated Development plus a 500m buffer (the non-breeding bird survey area is shown on Figure 6, Figure 7, Figure 8, Figure 9, Figure 10 and Figure 11). All parts of the survey area containing suitable habitat for non-breeding waterbirds were visible during the surveys. A 500m buffer was used as beyond this distance, disturbance of non-breeding waterbirds from noise and/or visual stimuli is unlikely (see Section 5 of this NIS for further information relating to this).

Surveys were stratified according to tide times, with one survey carried out within approximately two hours either side of high tide, and the other survey carried out within approximately two hours either side of low tide. This allowed for investigation of the use of the area by birds under different tidal conditions.

The survey adopted the method used for the Irish Wetland Bird Survey (I-WeBS), as described in the *Counter Manual* for the scheme (BirdWatch Ireland and NPWS, undated), which itself is based on the 'look-see' method described by Bibby *et al* (2000).

All waterbirds encountered during the survey were counted and mapped.

Details of the non-breeding waterbird surveys are given in **Table 1.**

Table 1. Non-breeding waterbird survey details

Survey date	Tidal state	Time of high / low tide	Start time	End time	Weather conditions
15 November 2022	Low	15:13	13:30	17:00	Very light winds, force 1-2 from the west. Cloudy, dry, good visibility and temperature between 8-9ºC.
16 November 2022	High	09:04	08:30	12:30	Very light winds, force 1-2 from the west. Clear skies with only partial cloud cover, dry, good visibility and temperature between 5-7ºC.
14 December 2022	Low	15:24	12:35	15:24	Very light winds, force 2 from the southwest. Clear skies with almost no cloud cover, dry, good visibility and temperature 4 ºC.
15 December 2022	High	10:15	08:54	11:38	No wind. Clear skies, dry, excellent visibility and temperature 0 ºC.
24 January 2023	Low	13:32	12:10	15:10	Very light winds, force 1-2 from the south. Overcast, dry, excellent visibility and temperature between 8-9 ºC.

[2] The term 'waterbird' here refers to all wildfowl (ducks, geese and swans), waders, rails, divers, grebes, cormorants, herons, gulls and terns.

Survey date	Tidal state	Time of high / low tide	Start time	End time	Weather conditions
25 January 2023	Low	14:15	12:45	15:15	Light winds, force 2-3 from the northwest. Overcast, brief drizzle, good visibility and temperature 9 ºC.

2.4.3 Otter Survey

Survey for otter *Lutra lutra* was carried out on 15 and 16 November 2022 along all watercourses and other waterbodies within the Site plus a 150m buffer, as far as safe access permitted (it was not possible to walk across areas of mud for safety reasons; however, there is no potential for resting sites in these areas as no suitable features are present). The survey, including the use of the 150m survey buffer, followed guidance in published literature (NRA, 2008).

Evidence of otter searched for included refuges (holts and lie-ups[3]), spraints (faeces), footprints, trails and foraging signs. Where found, spraints were recorded as fresh, recent or old, according to their apparent age. Any evidence of otter or water vole found during the survey was mapped with the aid of aerial photography and GPS, as necessary, with accompanying field notes taken.

2.5 Scope of Assessment

Four European sites were identified within the potential ZoI of the Designated Development, and likely significant effects on these sites from a number of impact sources could not be excluded at the AA Screening stage. **Table 2** below summarises the results of the AA Screening, setting out which construction, operational and/or decommissioning phase impacts could lead to likely significant effects on the QI / SCI of each European site.

The scope of the Appropriate Assessment is therefore to further appraise the potential for each 'screened in' impact for each European site to result in adverse effects on the integrity of that site, in view of its conservation objectives.

[3] A holt is a well-enclosed otter refuge, such as a burrow. A lie-up (also known as a 'couch') is semi-enclosed and of lesser importance.

Table 2. Impacts screened into Appropriate Assessment for each European site

European site	Impacts screened into Appropriate Assessment for having likely significant effects									
	Direct loss of or damage to habitat within site	Loss of functionally-linked habitat	Waterborne pollution	Airborne pollution	Changes to surface water hydrology	Changes to groundwater flow or volume	Disturbance of qualifying species	Prevention of migratory movements of qualifying species	Injury or mortality of qualifying species	Spread of invasive non-native species
River Shannon and River Fergus Estuaries SPA	X	✓ c	✓ c, o, d	✓ c, o, d	X	✓ c	✓ c, o, d	X	X	✓ c, d
Lower River Shannon SAC	X	X	✓ c, o, d	✓ c, o, d	X	✓ c	✓ c, o, d	✓ c, d	✓ c, d	✓ c, d
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	X	X	X	✓ o	X	X	X	X	X	X
Moanveanlagh Bog SAC	X	X	X	✓ o	X	X	X	X	X	X

X – no likely significant effects on the QI / SCI of European site from this impact source.

✓ – likely significant effects on QI / SCI of European site from this impact source could not be ruled out at AA Screening stage.

c – applicable during the construction phase.

o – applicable during the operational phase.

d – applicable during the decommissioning phase.

3. Baseline Conditions

3.1 European Sites

Full details of the relevant European sites included within this Natura Impact Statement, including their conservation objectives, are given in **Appendix A**. A summary of the four sites and their QI / SCI is given in **Table 3**.

Table 3. European sites within the potential ZoI of the Designated Development

Site name [site code]	QI / SCI	Location in relation to the Designated Development
River Shannon and River Fergus Estuaries SPA [0004077]	• Cormorant *Phalacrocorax carbo* [A017] • Whooper swan *Cygnus cygnus* [A038] • Light-bellied brent goose *Branta bernicla hrota* [A046] • Shelduck *Tadorna tadorna* [A048] • Wigeon *Anas penelope* [A050] • Teal *Anas crecca* [A052] • Pintail *Anas acuta* [A054] • Shoveler *Anas clypeata* [A056] • Scaup *Aythya marila* [A062] • Ringed plover *Charadrius hiaticula* [A137] • Golden plover *Pluvialis apricaria* [A140] • Grey plover Pluvialis squatarola [A141] • Lapwing *Vanellus vanellus* [A142] • Knot *Calidris canutus* [A143] • Dunlin *Calidris alpina* [A149] • Black-tailed godwit *Limosa limosa* [A156] • Bar-tailed godwit *Limosa lapponica* [A157] • Curlew *Numenius arquata* [A160] • Redshank *Tringa totanus* [A162] • Greenshank *Tringa nebularia* [A164] • Black-headed gull *Chroicocephalus ridibundus* [A179] • Wetland and waterbirds [A999]	Approximately 5m from the Site of the Designated Development and encompasses the River Shannon, immediately north, west, as well as a small creek, immediately south.
Lower River Shannon SAC [002165]	• Sandbanks which are slightly covered by sea water all the time [1110] • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Coastal lagoons [1150] • Large shallow inlets and bays [1160] • Reefs [1170] • Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • *Salicornia* and other annuals colonising mud and sand [1310] • Atlantic salt meadows [1330] • Mediterranean salt meadows [1410] • Watercourses of plain to montane levels [3260] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils [6410] • Alluvial forests with alder *Alnus glutinosa* and ash *Fraxinus excelsior* [91E0] • Freshwater pearl mussel *Margaritifera margaritifera* [1029] • Sea lamprey *Petromyzon marinus* [1095] • Brook lamprey *Lampetra planeri* [1096] • River lamprey *Lampetra fluviatilis* [1099] • Atlantic salmon *Salmo salar* [1106] • Common bottlenose dolphin *Tursiops truncatus* [1349] • Otter *Lutra lutra* [1355]	Approximately 8.5m from the Site of the Designated Development and encompasses the River Shannon, adjacent intertidal habitat, and several small areas of woodland to the south.
Stack's to Mullaghareirk Mountains, West	• Hen harrier *Circus cyaneus* [A082]	Approximately 7km south-east.

Site name [site code]	QI / SCI	Location in relation to the Designated Development
Limerick Hills and Mount Eagle SPA [004161]		
Moanveanlagh Bog SAC [002351]	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]	Approximately 14km south.

3.2 Available Data

River Shannon and River Fergus Estuaries SPA Conservation Objectives Supporting Document was accessed from the NPWS website and reviewed for information on the distribution of SCI bird species in proximity to the Designated Development. The document reports on the results of low tide surveys of waterbirds carried out between October 2010 and February 2011. The results of those surveys are summarised below:

- dunlin was recorded in low numbers foraging on the area of intertidal habitat to the south-east of the Designated Development (on the opposite side of the N67 road). Larger numbers were found further afield, including on the opposite side of the Shannon Estuary, to the north-east;
- black-tailed godwit was recorded on one occasion roosting to the south of the Designated Development (approximately 1.5km distant). Black-tailed godwit was recorded mostly to the east of the SPA;
- bar-tailed godwit was recorded on the intertidal habitat south-east of the Designated Development (opposite side of the N67 road). Elsewhere, black-tailed godwit was recorded mostly to the north and east of the SPA;
- curlew was recorded foraging and/or roosting on intertidal habitats around the Designated Development (including immediately to the north of the Site of the Designated Development, and on the larger expanse to the south-east) on all four survey dates. Curlew were distributed all across the expanse of intertidal habitat south-east of the Designated Development, including very close to the N67 road and the existing power station facility;
- greenshank was recorded on all four survey visits but in low numbers (maximum of four records on a single visit) to the east and south of the Designated Development. One record was of roosting adjacent to the N67, south of the Designated Development;
- redshank was recorded foraging on intertidal habitats around the Designated Development (including immediately to the north of the Site of the Designated Development, and on the larger expanse to the south-east) on all four survey dates. Roosting was also recorded approximately 1.5km to the south of the Designated Development on one occasion;
- pintail was not recorded in proximity of the Designated Development. Pintail was recorded in the west of the SPA;
- shoveler was not recorded in proximity to the Designated Development. Shoveler was recorded in low numbers in the east of the SPA;
- scaup was not recorded in proximity of the Designated Development. Scaup was recorded in low numbers in the north and west of the SPA;
- black-headed gull was recorded in low numbers (in comparison to the total number within the SPA) foraging and roosting to the east and south of the Designated Development. Larger clusters of black-headed gull were recorded in the north, east and west of the SPA; and,
- whooper swan distribution was not mapped due to insufficient data.

3.3 Field Survey Results

3.3.1 Habitat Survey

As previously discussed, the survey area for the Site was based on a previous iteration of the red line boundary, thus encompassed the main development area for the Designated Development. Due to the updating of the red line boundary, not all of the habitats within the Designated Development were surveyed and are thus not mapped on Figure 5. The habitats within the Designated Development are those typically associated with an industrial

facility i.e., recolonising bare ground (ED3), buildings and artificial surfaces (BL3), lagoons and saline lakes (CW1), amenity grassland (GA2) and scrub (WS1).

A summary of the habitats recorded during the walkover survey of the Site are shown on Figure 5 and are provided below:

GS2 Dry meadows and grassy verges

There are several areas of dry meadows and grassy verges scattered across the Site. They are typically infrequently mown and comprise of grasses, docks *Rumex* spp., and red clover *Trifolium pratense*. In addition to the species above, the grassland to the west of the Site also comprises bush vetch *Vicia sepium* and field horsetail *Equisetum arvense*. There is some scattered scrub within this habitat consisting of gorse *Ulex europaeus*, willow *Salix* sp. and bramble *Rubus fruticosus* agg.

WS1 Scrub

Scrub habitat is present to the east of the Site. There is a large section of dense scrub that has piles of chopped wood and gravel within it. The scrub within the Site consists of gorse, willow and bramble. Winter heliotrope *Petasites pyrenaicus* and a stand of butterfly-bush *Buddleja davidii* (both non-native species) were present within the scrub habitat to the north within the Site.

ED1 Exposed sand, gravel or till

There is a path going through a part of the Site which is made of unconsolidated sediment. This path subsequently joins with tarmac (BL3 Buildings and artificial surfaces).

ED2 Spoil and bare ground

This habitat is present within part of the Site as it is subject to ongoing disturbance from staff and vehicles.

ED3 Recolonising bare ground

There is a large area of recolonising bare ground within the centre of the Site surrounding the helicopter pad. There is also recolonising bare ground habitat within the north of the construction laydown area. This habitat is on gravel with some grasses and herbaceous species such as buttercup *Ranunculus* spp. and dandelion T*araxacum officinale* agg. growing up through it.

BL3 Buildings and artificial surfaces

There are buildings and areas of artificial surfaces within the Site.

Fence

There is a wire fence that borders the east of the Site. It is approximately 2m in height.

Invasive non-native species

During the field survey, no Scheduled invasive plant species[4] were recorded within the Site. However, winter heliotrope (a ‘low impact’ non-native species, according to the National Biodiversity Data Centre (NBDC)) and butterfly-bush (a ‘medium impact’ non-native species according to NBDC) were recorded (see Figure 5).

A large area of winter heliotrope was identified to the north-west of the Site, however this was not mapped as it was outside of the Site boundary (as the November 2022 Site boundary was based on a previous iteration of the red line boundary of the Designated Development).

3.3.2 Non-breeding Waterbird Survey

3.3.2.1 Low tide survey

The results of the non-breeding waterbird surveys carried out around low tide in November 2022, December 2022 and January 2023 for the Designated Development are shown on Figures 6, 8, 10 and 11. None of the

[4] i.e., invasive non-native plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011.

named SCI species of River Shannon and River Fergus Estuaries SPA were recorded during the survey within the Site. However, four common snipe *Gallinago gallinago* were flushed from the Site in the November survey.

Redshank and black-headed gull (both SCI species) were recorded foraging / roosting in the creek immediately south of the Designated Development (outside of the Site) during all low tide visits. Peak counts of these species within the creek were of 12 redshank (November 2022) and 37 black-headed gull (December 2022). Curlew (SCI species) was also recorded foraging in this creek in December 2022 and January 2023, both were records of a single bird. Other waterbird species, which although not specifically named as SCI species would fall under the Wetlands and Waterbirds SCI feature of the SPA, were also recorded within the survey area. This included kingfisher *Alcedo atthis* and little egret *Egretta garzetta* (both species are listed on Annex I of the Birds Directive) which were recorded roosting / resting in the creek area immediately south of the Designated Development (outside of the Site).

Beyond 150m from the Designated Development, but still within the 500m survey buffer, greenshank and dunlin (SCI species) were also present, in addition to grey heron *Ardea cinerea*, mallard *Anas platyrhynchos* and oystercatcher *Haematopus ostralegus*, which are all waterbird species.

However, similarly to the results of the surveys carried out between October 2010 and February 2011 reported by NPWS in the Conservation Objectives Supporting Document for the River Shannon and River Fergus Estuaries SPA (see Section 3.2, above), there was a particular concentration of birds in the relatively large intertidal area to the south-east of the Designated Development, beyond the 500 m survey buffer (see Figures 6, 8, 10 and 11). Species present included bar-tailed godwit, black-tailed godwit, knot, teal, wigeon and shelduck (all SCI species), amongst other waterbirds.

3.3.2.2 High Tide Survey

The results of the non-breeding waterbird survey carried out around high tide in November and December 2022 for the Designated Development are shown on Figures 7 and 9.

No named SCI species of the River Shannon and River Fergus Estuaries SPA were recorded within the Site. However, four common snipe were again flushed from the Site during the November survey.

Redshank, greenshank, dunlin, curlew, teal and black-headed gull (which are all named SCI species) were present foraging or roosting in the creek area immediately to the south of the Designated Development, in addition to kingfisher and little egret (which are both waterbirds).

Dunlin, redshank and cormorant (SCI species) were recorded foraging and roosting along the intertidal habitat to the west of the Designated Development, in addition to oystercatcher, herring gull *Larus argentatus* and little egret. Further away from the Designated Development, curlew, great crested grebe *Podiceps cristatus*, great northern diver *Gavia immer*, wigeon, teal and mallard were all recorded.

3.3.3 Otter Survey

No evidence of otter was found during the targeted field survey and no resting sites were identified. The habitats within the survey area are suitable for otter foraging and commuting, but there are very limited opportunities for shelter. On the basis of these survey results, it is considered very unlikely that there are any otter resting sites within at least 150m of the Designated Development.

4. Mitigation

Avoidance or mitigation measures cannot be considered at the AA Screening stage. It is only once the Appropriate Assessment stage is reached that such measures can be taken into account in the appraisal. This section sets out the avoidance and mitigation measures that will be adopted by the Designated Development to ensure that identified impacts on QI / SCI do not result in adverse effects on the integrity of relevant European sites, in view of the Conservation Objectives of those sites.

4.1 Embedded Mitigation

Embedded mitigation is otherwise known as 'design mitigation'. It refers to the particular aspects of the design of a project which act to avoid or minimise negative impacts on receptors, including the QI / SCI of European sites. Embedded design measures which will help to avoid significant effects from the Designated Development on the QI / SCI of European sites include:

- there will be no works directly within the boundary of any European site. The River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC are separated from the Designated Development by existing fence lines. These fences will be retained during construction, operation and decommissioning, and signage will be erected on the fencing to notify all staff that no access beyond the fence is permitted;
- the height of emissions stacks was increased from an initial design of 25m to 30m. Increasing stack height increases the dispersion of airborne pollutants and thereby reduces potential effects for pollution on the habitats in adjacent European sites;
- the temporary construction compound area has been sited on an area of existing hard-standing within the centre of the existing Tarbert Power Station Site. Existing roads and access routes will be used. This avoids the loss of semi-natural habitats and minimises potential for disturbance of QI / SCI species; and,
- the majority of the components of the new power generation units are modular and will be delivered to the Site pre-assembled. This minimises the length of time required for construction (and decommissioning, as these units will be removed at the end of the operational phase of the Designated Development).

4.2 General Mitigation Measures

In addition to embedded mitigation, there is a range of general mitigation measures that will also be implemented by the Designated Development. These measures include:

- a Framework Construction Environmental Management Plan (CEMP) has been prepared and is included within **Appendix B**. This will be implemented by the construction contractor and will ensure all of the measures are implemented in full to ensure there is no pollution of watercourses, waterbodies or terrestrial habitats, in accordance with the following guidelines; CIRIA's *Control of water pollution from construction sites* (CIRIA, 2001) and *Environmental good practice on site guide* (CIRIA, 2015), and the EPA's *Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects* (EPA, 2021). The following pollution prevention measures will be implemented:
  - controls and contingency measures to manage run-off from works areas and to manage sediment, including the use of sediment fencing and sediment traps.
  - all oils, lubricants or other chemicals to be stored in an appropriate secure container in a suitable storage area within one of the construction compounds within the Site, with spill kits provided at the storage location and at suitable places across the Designated Development;
  - in order to avoid potential pollution impacts to soils, vegetation and watercourses / waterbodies, all refuelling and servicing of vehicles and plant will be carried out in a designated area which is bunded and has an impermeable base, situated at least 50m from any watercourse and the boundary of any European site. This will also apply at the operational phase, when deliveries of liquid fuel will be carried out in a specific location, which is impermeable and bunded, and located at least 50m from any watercourse and the boundary of any European site. The bund will be sufficient to contain at least 110% of the total volume of a delivery lorry;
  - as part of the Framework CEMP (**Appendix B**) any spillages of distillate fuel during delivery / transfer will be managed. It includes provision for a licensed contractor to respond to any emergency and with capabilities to collect and safely dispose of any spilled fuel;

  - dust suppression techniques will be adopted during construction and decommissioning works to prevent emissions of dust from the movement of vehicles / plant, or from other construction / demolition activities. This will involve spraying access tracks and other areas of hard-standing (as required) with clean water;
  - as described in the Framework CEMP (**Appendix B**) concrete will be delivered to the Site ready-mixed in trucks but there will also be on-site batching. On-site batching will be undertaken on an impermeable base at least 30m from the Shannon Estuary and pollution control measures will be implemented. Concrete pours will take place outside periods when heavy rainfall is forecast. Where washout of concrete transporting vehicles chutes occurs, this will occur in a designated, carefully managed onsite wash out location prior to leaving the Designated Development. The wash-down location will be self-contained and will allow for concrete to be removed from the water, prior to disposal. Only the chutes of vehicles shall be rinsed on Site.

- an Ecological Clerk of Works (ECoW) and Environmental Clerk of Works (EnvCoW) will be employed on a full-time basis for the duration of the construction and decommissioning of the Designated Development. The ECoW will be responsible for monitoring and ensuring the implementation of all mitigation measures and compliance with legislative requirements in relation to ecological features. The ECoW will also carry out pre-works checks for protected species, as necessary;
- all personnel and staff involved in the construction, operation and decommissioning of the Designated Development will be made aware of the presence of ecological features (including the QI / SCI features of European sites) in the vicinity of the Designated Development and the mitigation measures and working procedures which must be adopted. This will be achieved as part of the induction process through the delivery of a Toolbox Talk. In addition, as required, briefings will also be provided in advance of works which are considered to present an increased risk of impacting ecological features;
- construction works will take place only within the red line boundary of the Designated Development;
- construction compounds will be fenced to prevent encroachment of personnel, machinery and materials onto adjacent habitats. The temporary stockpiling of materials will be restricted to designated locations on Site, at least 30m away from any waterbody and distanced from the Site boundaries;
- a pre-works confirmatory survey for otter will be carried out prior to the commencement of construction or decommissioning works;
- any excavations will be left with a method of escape (ramps) for any animal that may enter overnight, and will be checked at the start of each working day to ensure no animals are trapped within them;
- any pipes will be capped or otherwise blocked at the end of each working day to ensure no animals become trapped;
- within the Site, all vehicles will be restricted to a maximum speed of 20 kilometres per hour. This will help to minimise the risk of collision with mammals, including otter; and,
- biosecurity measures will ensure that invasive non-native plant species are not spread during the construction or decommissioning of the Designated Development.

4.3 Specific Mitigation

Additional mitigation which is not part of the design of the Designated Development, or which is not standard good practice and/or implemented to comply with other environmental protection legislation, is referred to in this NIS as ‘specific mitigation’.

Further detail on the specific mitigation which will be implemented is provided in the next section of this document as part of the Appropriate Assessment.

4.3.1 Demarcation of European Sites

The boundary of the River Shannon and River Fergus Estuaries SPA and the Lower River Shannon SAC will be clearly demarcated during the construction, operational and decommissioning phases of the Designated Development by the presence of existing fence lines, which will be retained, and the erection of signage on the fences. All personnel involved in the construction, operation and/or decommissioning of the Designated Development will be made aware of the presence of these sites. This will prevent any encroachment into the European sites which could cause damage to QI habitats and/or habitats which support QI / SCI species;

however, encroachment is highly unlikely given the marine environment and that they are fenced off from personnel.

4.3.2 Air Quality Mitigation

As set out above, measures to minimise dust will be implemented during the construction and decommissioning phases. All such measures are outlined in the Framework CEMP (**Appendix B**) and include dust suppression on access routes and use of dust suppression techniques with all plant involved in demolition works or processing of aggregates.

In addition, stack height was increased from 25m to 30m. Although not specifically done for ecological benefit, this will serve to improve dispersion of airborne pollutants and reduces impacts on habitats.

4.3.3 Noise and Vibration Reduction Measures

Measures to mitigate noise generated during the construction and decommissioning phases of the Designated Development will be implemented to minimise potential disturbance of QI / SCI species. All construction / decommissioning phase noise reduction measures are outlined in the Framework CEMP (**Appendix B**).

4.3.3.1 Best practical means

The following 'best practice measures' (BPM) will be adopted as standard working practice:

- plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum;
- vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in a manner as to minimise noise emissions;
- machines in intermittent use will be shut down or throttled down to a minimum when not in use. Vehicles shall not remain stationary on the Site with engines running;
- pneumatic percussive tools will be fitted with mufflers or silencers; and,
- all compressors and generators shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers or enclosures, which shall remain closed whenever the machines are in use.

All construction / decommissioning personnel will be instructed on BPM measures to limit noise and vibration as part of their induction training and as required prior to specific work activities. The Environmental Clerk of Works will carry out regular inspections to ensure that BPM measures are being adopted and that noise levels are being minimised as far as possible. The Environmental Clerk of Works will report any non-compliance to the contractor(s) and ensure that corrective actions are taken immediately.

4.3.3.2 Other Working Practices and Restrictions

In addition to the standard BPM described above, a range of other working practices and restrictions will be adopted to mitigate the potential for disturbance of QI / SCI species:

- 'soft-start' techniques will be employed during construction / decommissioning works:
  - the required machines for each working day will be started gradually and not all at once, with starting of machines to be staggered over a period of 15-30 minutes, for example during daily safety briefings at the start of each working day;
  - machines will be brought to full throttle / speed gradually and not suddenly;
  - machines will be throttled down or switched off when not required; and
- the loudest activities (e.g., piling) will not start early in the day or late in the day (i.e., they will not start until at least one hour after sunrise and will cease not later than one hour prior to sunset).

During periods of particularly inclement weather, the loudest activities (in particular piling) will not be carried out. The approach to be taken will be based on the '*Scheme to reduce disturbance to waterfowl during severe winter weather*' promoted by the UK Joint Nature Conservation Committee (JNCC), which specifically relates to the measures adopted during the shooting season for waterbirds (https://jncc.gov.uk/our-work/severe-weather-scheme/) but the principals of which are applicable. An on-site weather station will be used to monitor temperature during the autumn, winter and spring periods (as a minimum). Should freezing conditions be recorded for a period of seven consecutive days, piling works will be suspended for a period of seven days, or

longer if freezing conditions persist. Where one or two days of temperatures above freezing are recorded within the seven-day period this would not have an effect on the process of triggering a suspension of noisy works. Only if three days of above-freezing temperatures are recorded within the seven-day period will works be permitted to continue. The implementation of this process will be closely monitored by the Ecological Clerk of Works.

Piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will not be permitted during the migratory seasons for Atlantic salmon and lamprey species, these being:

- Atlantic salmon – March to August;
- brook lamprey – April to June (according to NatureScot (https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey));
- river lamprey – October to December and July to September (Maitland, 2003); and,
- sea lamprey – April to May (Maitland, 2003).

On the basis of the above, piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will only be permitted in September, January or February.

The 20m buffer distance will be measured from the edge of the water, which may change with tidal state, meaning that some locations may be piled within the migratory seasons, but only at certain times within the tidal cycle (i.e. when water levels drop to be more than 20m away from relevant piling location).

4.3.3.3 Acoustic Barrier

An acoustic barrier, of between 4m and 8m in height, will be installed along the edge of the southern, western and northern perimeters of the Designated Development for the construction and decommissioning phases, as shown on Figure 12. This will be installed so as to ensure no gaps between joints or the ground, and will be inspected and maintained throughout the periods that works are taking place. This barrier will reduce noise levels experienced by birds and other animals within the River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC.

4.3.4 Visual Screening

The acoustic barrier installed around sections of the Designated Development will also serve a second purpose in providing visual screening of works during the construction and decommissioning phase. Being between 4m and 8m high, it will screen all personnel and all but the largest plant from birds and other animals in the adjacent European sites.

4.3.5 Lighting

Illumination of the Shannon Estuary, the creek to the immediate south of the Designated Development (which is encompassed by the River Shannon and River Fergus Estuaries SPA), and surrounding semi-natural habitats will be avoided during the construction and decommissioning phases in the following ways:

- works within 20m of the Shannon Estuary and the creek immediately south of the Designated Development will not be permitted to take place during hours of darkness; and,
- elsewhere within the Designated Development, any lighting required during the construction and decommissioning phases will be directional and will be prevented from spilling light onto watercourses or other habitats through the use of cowling.

Any permanent lighting required during the operational phase will be restricted to the absolute minimum required for security and safety purposes. It will be designed using appropriate design software (such as Lighting Reality PRO) so that light levels at the Shannon Estuary and the creek to the immediate south of the Designated Development do not increase from the current baseline by more than 0.2 lux (this being the approximate brightness of a full moon (Austin *et al*, 1976)). No direct illumination of the Shannon Estuary or creek to the south of the Designated Development will be permitted.

5. Information for Appropriate Assessment

This section sets out the Appropriate Assessment for each of the European sites for which likely significant effects on the QI / SCI could not be excluded at the AA Screening stage. It accounts for the mitigation in Section 4 and is informed by the data collected through the desk study and field surveys, and the air quality and noise modelling described in Section 2, where relevant. Each European site is considered in turn, with assessment of the potential for the construction, operational and/or decommissioning phase impacts screened into assessment in **Table 2** to have adverse effects on the integrity of the Site.

Each impact is considered in isolation, and an in-combination assessment is also included, considering the multiple impacts which could arise from the Designated Development and/or the impacts of other plans or projects. The temporary emergency electricity generation proposed at the ESB site at Shannonbridge, West Offaly is a part of the 450MW of emergency electricity generation plant designated under the Development (Emergency Electricity Generation) Act 2022, and thus will be assessed for in-combination effects. A total of seven other projects were identified which could potentially act cumulatively with the Designated Development to result in significant in-combination effects. These are described in **Appendix C**. No plans were identified which could act in-combination with the Designated Development to give rise to adverse effects on the integrity of any European site.

Summarised information on the QI / SCI is provided for each European site. However, further information, including Conservation Objectives and existing threats, pressures and activities with impacts on the sites can be found in **Appendix A**, and on NPWS website (https://www.npws.ie/protected-sites).

5.1 River Shannon and River Fergus Estuaries SPA

5.1.1 Overview

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The SPA comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. The site has large expanses of intertidal flats which contain a diverse macroinvertebrate community which provides a rich food resource for the wintering birds. Saltmarsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the SPA the shoreline comprises stony or shingle beaches.

The SPA is designated for 20 species of non-breeding waterbirds, as well as breeding cormorant. The wetland habitats which support these species is also an SCI, as is the general assemblage of wintering waterbirds, which regularly exceeds 20,000 individuals.

5.1.2 Loss of functionally-linked habitat during the Construction Phase

At its closest, the River Shannon and River Fergus Estuaries SPA is approximately 5m from the Designated Development boundary. Although the Conservation Objectives Supporting Document for the SPA (available from the NPWS website) does not indicate records of SCI species within the Designated Development during low tide surveys carried out between October 2010 and February 2011, in the absence of more recent, extensive and targeted surveys, it is assumed on a precautionary basis that several SCI species may use the site for roosting. Construction of the Designated Development could thus potentially result in a loss of functionally-linked habitat outside of the boundary of the SPA, recognising however that the Designated Development lies within the footprint of the operational Tarbert Power Station Site and will be developed on brownfield land.

The total area of land which will be lost to the construction of the Designated Development is approximately 0.1355km^2. The River Shannon and River Fergus Estuaries SPA is extremely large, covering an area of approximately 322 km^2. The Designated Development area is therefore tiny in comparison to the SPA. Moreover, outside of the SPA boundary there is abundant alternative roosting habitat which could (and very likely is) used by SCI for roosting and is located away from the existing operational power station. Furthermore, given the small size of the area that will comprise the Designated Development, the number of SCI birds it could potentially support even for roosting is limited.

Therefore, due to the small size of the Designated Development site, the limited number of SCI birds it could support, and the presence of abundant alternative areas within and outside of the SPA for roosting, the loss of potentially functionally-linked habitat is unlikely to adversely affect any SCI bird species.

With specific reference to the Conservation Objectives of the SPA, for all species (with the exception of breeding cormorant, which are not relevant as this species could make no use of the terrestrial habitats which will be lost to construction of the Designated Development), the aim is to "*maintain the favourable conservation condition*", which for each species is defined by two attributes and targets:

- population trend – long-term population trend stable or increasing; and,
- distribution – there should be no significant decrease in the range, timing, or intensity of use of areas by the SCI species other than that occurring from natural patterns of variation.

The target to maintain the distribution of SCI species relates to the distribution of birds within the SPA, and is not affected by changes to distribution of birds outside of the European site boundary, even if using functionally-linked land. Furthermore, for the reasons set out above, the loss of a small area of potentially functionally-linked habitat which could be used by some SCI birds for roosting will not significantly affect these species and, beyond reasonable scientific doubt, will not have an adverse effect on the population trend of any SCI species.

Consequently, the loss of potentially functionally-linked habitat will not compromise any of the Conservation Objectives of River Shannon and River Fergus Estuaries SPA for any SCI species. It is therefore concluded that there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA from the loss of functionally-linked habitat during the construction of the Designated Development.**

5.1.3 Waterborne Pollution during the Construction, Operational and Decommissioning Phases

5.1.3.1 Construction and Decommissioning Phases

Waterborne pollution could arise during the construction and decommissioning phases as a result of the run-off of sediment or other pollutants such as fuels, oils or chemicals. There will only be discharge of stormwater run-off to existing outfalls. This discharge will be uncontaminated and will be of no greater volume than the existing volumes discharged due to the existing industrial nature of the Site. There are no process or cooling effluent streams associated with the Designated Development, nor is there a need to abstract water from the estuary. Although the Shannon Estuary naturally contains large quantities of sediment in the vicinity of the Designated Development, the other aforementioned pollutants could affect the habitats used by foraging SCI bird species. If sufficiently severe, these pollutants could also directly affect the birds themselves.

As described in Section 4, a range of pollution prevention measures have been prescribed and will be implemented in full during the construction and decommissioning of the Designated Development. These are outlined in the Framework CEMP (**Appendix B**). Adherence to the pollution prevention measures committed to in the CEMP will be monitored by an Ecological or Environmental Clerk of Works.

Pollution prevention measures of the type which will be implemented are routinely used on construction / demolition projects and are proven to be effective. There is thus a high degree of confidence in their success.

With the implementation of these pollution prevention measures it is therefore concluded that there will be no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of waterborne pollution during the construction or decommissioning phases of the Designated Development.

5.1.3.2 Operational phase

The Designated Development will run on distillate fuel which will be delivered by lorries. When transferring this fuel into the storage tanks there is the potential for spills to migrate off Site that could theoretically reach the Shannon Estuary or the creek to the south of the of the Designated Development which is also encompassed by the SPA boundary. As described for the construction / decommissioning phases, above, such an event would be very likely to degrade habitat supporting SCI species but is also likely to be sufficiently severe so as to directly affect individual SCI birds.

Delivery and transfer of distillate fuel will therefore be carried out at a specific designated location away from the Site boundary which will have an impermeable base and will be bunded, with a capacity at least 110% of the total volume of a fuel delivery lorry. Emergency spill response measures will ensure any spillages of distillate fuel during delivery / transfer are mitigated.

There will only be discharge of stormwater run-off to existing outfalls from the Site. This discharge will be uncontaminated and will be of no greater volume than the existing volumes discharged due to the existing industrial nature of the Tarbert Power Station Site.

With the implementation of reliable pollution prevention measures, it is therefore concluded that there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of waterborne pollution during the operational phase of the Designated Development.**

5.1.4 Airborne Pollution during the Construction, Operational and Decommissioning Phases

To assess the potential impacts of airborne pollution on European sites, it is important to understand key air quality concepts. This section describes those concepts.

The guideline atmospheric concentrations for gaseous pollutants such as oxides of nitrogen (NO_x) and ammonia (NH_3) above which adverse effects on vegetation might occur is termed the 'critical level'[5]. The rate of nitrogen deposition (or acid deposition) below which there is confidence that adverse effects on vegetation would not occur is known as the 'critical load'[6].

Air quality authorities consider that concentrations of less than 1% of the critical level or critical load are insignificant. For example, the UK Environment Agency and Scottish Environment Protection Agency (SEPA) indicate that screening for long-term air emissions should use a threshold of 1% of the environmental benchmark (i.e., the critical level or critical load), and states that "*this is based on judgement of the level at which it is unlikely that an emission will make a significant contribution to any impact even if a* [critical level or critical load] *is exceeded"* (Environment Agency and SEPA, 2003). More recent guidance from Natural England (2018) similarly states that *"…1% of critical load / level are considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible…. There can therefore be a high degree of confidence in its application to screen for risks of an effect"*. Therefore where contributions from a development (which are known as the 'process contribution') are less than 1% of critical level or critical load, this can be taken as insignificant and it can be concluded that there will be no significant effect on environmental receptors, including ecological features.

Where the process contribution does exceed 1% of the critical level or critical load, further investigation is warranted but does not immediately imply a significant adverse effect. For example, Natural England (2018) states that *"an exceedance* [of the critical level or load] *alone is insufficient to determine the acceptability (or otherwise) of a project"*. Consideration must also be given to the 'predicted environmental concentration', which includes both process contribution and existing background levels. Should the background level already exceed the critical level or load, an assessment of effect in the context of the particular habitat and situation is required. Thus, if the critical level for NO_x or critical load for nitrogen is already exceeded, this is not a legitimate basis to immediately conclude that any further NO_x or nitrogen deposition (even very small) will result in an adverse effect.

For NO_x, the critical level advocated by APIS for the protection of vegetation is 30µgm^{-3}, and relates to growth effects of nitrogen derived from NO_x on vegetation. At high concentrations (e.g., 75µgm^{-3} or above) NO_x can be directly toxic to vegetation but its main importance is as a source of nitrogen, which is then deposited on adjacent habitats[7]. Therefore, exceedance of 1% of the critical level for NO_x certainly indicates that nitrogen deposition requires consideration but does not itself lead to a conclusion of adverse effects on vegetation.

The critical load for nitrogen deposition is expressed in kilograms of nitrogen per hectare per year (kgNha^{-1}yr^{-1}). This is generally the most important nitrogen metric. Addition of nitrogen to vegetation is a form of fertilisation, which can have a negative effect over time by encouraging more competitive plant species that can force out less competitive species, potentially leading to reduction or loss of characteristic or notable plants and overall reduced species-richness. The critical load for nitrogen deposition varies according to habitat and is given as a range for each habitat, although data is lacking for some habitats. Critical loads for each habitat as well as background deposition rates are provided by APIS (www.apis.ac.uk).

Ammonia can also have adverse effects on vegetation. Ammonia can contribute to nitrogen deposition and at higher concentrations can be directly toxic to vegetation. The critical level for ammonia for protection of

[5] Specifically, the critical level is defined by APIS as *"concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as… plants* [and] *ecosystems, may occur according to present knowledge".*
[6] The critical load is defined by APIS as *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"* (both definitions taken from https://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788050).
[7] For example, APIS states that *"it is likely that the strongest effect of emissions of nitrogen oxides across the UK is through their contribution to total nitrogen deposition…"* (http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm).

vegetation is given by APIS as 1-3µgm^{-3}, with the upper end of the range applicable to most vegetation and the lower end applicable to particularly sensitive plants (such as lichens).

For sulphur dioxide (SO_2), which can similarly have adverse effects on vegetation, APIS recommends an air quality standard of 20µgm^{-3}.

5.1.4.1 Construction and Decommissioning Phases

A Framework Construction Traffic Management Plan (FCTMP) has been prepared for the Designated Development. The FCTMP estimates that during the construction and decommissioning phases there is expected to be a maximum of 200 staff on site each day. Staff are expected to travel to the Site via a combination of carsharing and single occupancy vehicles, resulting in a maximum of 50 Light Goods Vehicles (LGVs) movements per day (100 two-way movements). It is predicted that the construction and decommissioning phases of the Designated Development will lead to an increase of 186 two-way Heavy-Good Vehicles (HGVs) movements per day. This is below the threshold number of vehicle movements that would trigger a requirement for air quality modelling under the Transport Infrastructure Ireland (TII) construction screening criteria (TII, 2022). This screening criteria (as outlined in Section 4.9.3.4 of the TII guidance) is as follows:

- road alignment will change by 5m or more; or,
- annual average daily traffic (AADT) flows will change by 1,000 or more; or,
- HGV (vehicles greater than 3.5 tonnes, including buses and coaches) flow will change by 200 AADT or more; or,
- daily average speed change by 10kph or more; or,
- peak hour speed will change by 20kph or more.

As both the HDV and AADT vehicle movements are well below the relevant criteria and the fact that these will access the Designated Development along the existing public road network, no significant change in air quality is likely from traffic during the construction or decommissioning phases. Therefore, consideration of vehicle effects has been screened out of this assessment.

For dust emissions, guidance published by the Institute of Air Quality Management (IAQM) indicates that significant dust deposition arising from earthworks, construction / demolition and vehicles tracking out of the Site is not likely to extend more than 50m from these activities, and adjacent to roads used by construction vehicles up to 500m from the works (Holman *et al*, 2016). The predominant habitats within this distance of works are agricultural grasslands, mudflats and the Shannon Estuary, none of which are particularly sensitive to impacts from dust deposition. However, where required (e.g., during periods of dry weather, or during demolition works), dust suppression will be implemented as standard good practice. This will be achieved by wetting access tracks used by vehicles.

It is therefore concluded that airborne pollution **will not result in adverse effects on the integrity of River Shannon and River Fergus Estuaries SPA during the construction or decommissioning phases.**

5.1.4.2 Operational Phase

With regard to operational traffic emissions, the numbers of vehicles associated with the operational phase of the Designated Development will be well below relevant screening criteria referred to in the section above on construction and decommissioning, thus an assessment is not required.

There is no expectation of dust emissions during operation.

As set out above, airborne pollution is primarily a concern for habitats, and potentially individuals of flora or fauna if very high levels of airborne pollution reaching toxic concentrations are predicted. The SCI birds themselves are highly unlikely to be directly affected by airborne pollution, given that bird physiology is not radically different to that of mammals and that air pollution levels are predicted to be below human health risk levels even in proximity to the Designated Development. Although 'wetlands' are an SCI in their own right, a range of habitat types support the SCI birds of River Shannon and River Fergus Estuaries SPA. The critical loads for these habitats varies depending on their sensitivity to deposition of nitrogen. Several habitats which may be used by SCI birds are not sensitive to atmospheric nitrogen deposition or have no critical load on which to base an assessment, including sandbanks, and mudflats and sandflats. However, according to APIS, saltmarsh has a minimum critical load for nitrogen deposition of 20kgNha^{-1}yr^{-1}, with a range of 20-30kgNha^{-1}yr^{-1}. Effects are most likely to be found in the tall vegetation of the closed upper marsh communities where inter-specific competition is at its greatest. Consequently, APIS recommends using a critical load of 30kgNha^{-1}yr^{-1} for most of the marsh, with the lower value

of 20 $kgNha^{-1}yr^{-1}$ being applied to more densely vegetated upper marsh. On a precautionary basis, air quality modelling to inform this Appropriate Assessment used a critical load of $20kgNha^{-1}yr^{-1}$ when determining whether there could be adverse effects on any habitats within the River Shannon and River Fergus Estuaries SPA which support SCI species.

Full details of the air quality modelling exercise which has informed this Appropriate Assessment are provided in **Appendix D**. However, a summary of the results of the modelling are provided in **Table 4, Table 5** and **Table 6**, below. It can be seen from these results that at all modelled locations, concentrations of NO_x and SO_2 and rates of deposition of nitrogen are, in all cases, below 1% of the critical level or load, respectively. The cumulative emissions are discussed in the In-combination assessment section for each European site.

Table 4. Modelled emissions at receptor locations for NO_x impacts

ID	Location	Habitat	NOx (µg/m3) Designated Development emissions only					NOx (µg/m3) cumulative emissions				
			PC	PC / AQS (%)	BC	PEC	PEC/AQS (%)	PC	PC/ AQS (%)	BC	PEC	PEC/AQS (%)
E1a	River Shannon and River Fergus Estuaries SPA	Intertidal	<0.01	<1	14.2	14.2	47	1.27	4.2	14.2	15.5	51.6
E1b	River Shannon and River Fergus Estuaries SPA	Intertidal	0.04	<1	14.2	14.2	47	1.18	3.9	14.2	15.4	51.3
E1c	River Shannon and River Fergus Estuaries SPA	Intertidal	0.15	<1	14.2	14.3	48	1.43	4.8	14.2	15.6	52.1
E2a	Lower River Shannon SAC	Coastal saltmarsh	0.01	<1	14.2	14.2	47	0.99	3.3	14.2	15.2	50.6
E2b	Lower River Shannon SAC	Atlantic salt meadows	0.01	<1	14.2	14.2	47	0.99	3.3	14.2	15.2	50.6
E2c	Lower River Shannon SAC	Molina meadows on calcareous, peaty or clayey-silt-laden soils	0.01	<1	14.2	14.2	47	0.99	3.3	14.2	15.2	50.6
E2d	Lower River Shannon SAC	Salicornia and other annuals colonising mud and sand	0.01	<1	14.2	14.2	47	0.68	2.3	14.2	14.9	49.6
E2e	Lower River Shannon SAC	Mediterranean salt meadows	0.01	<1	14.2	14.2	47	1.31	4.4	14.2	15.5	51.7
E2f	Lower River Shannon SAC	Estuaries	0.02	<1	14.2	14.2	47	1.17	3.9	14.2	15.4	51.2
E2g	Lower River Shannon SAC	Coastal lagoons	0.01	<1	14.2	14.2	47	0.91	3.0	14.2	15.1	50.4
E2h	Lower River Shannon SAC	Large shallow inlets and bays	0.01	<1	14.2	14.2	47	1.42	4.7	14.2	15.6	52.1
E2i	Lower River Shannon SAC	Perennial vegetation of stony banks	0.02	<1	14.2	14.2	47	1.23	4.1	14.2	15.4	51.4
E2j	Lower River Shannon SAC	Broadleaved deciduous woodland	<0.01	<1	14.2	14.2	47	0.38	1.3	14.2	14.6	48.6
E3	Stack's to Mullaghareirk	Bog	0.01	<1	14.2	14.2	47	0.51	1.7	14.2	14.7	49.0

ID	Location	Habitat	NOx (µg/m3) Designated Development emissions only					NOx (µg/m3) cumulative emissions				
	Mountains, West Limerick Hills and Mount Eagle SPA											
E4	Moanveanlagh Bog SAC	Bog	<0.01	<1	14.2	14.2	47	0.15	0.5	14.2	14.4	47.8

PC – Process Contribution (i.e., the amount generated by the Designated Development)
AQS – Air Quality Standard (i.e., the concentration of NOx or SO2 above which adverse effects on vegetation may arise, according to APIS)
BC – Background Contribution (baseline levels of airborne pollutants)
PEC – Predicted Environmental Concentration (the sum of the process concentration plus the back contribution)
EAL – Environmental Assessment Level (i.e., the critical load for relevant habitats, according to APIS)

Table 5. Modelled emissions at receptor locations for nitrogen deposition

ID	Location	Habitat	Nitrogen deposition ($kgNha^{-1}yr^{-1}$) Designated Development emissions only					Nitrogen deposition ($kgNha^{-1}yr^{-1}$) cumulative emissions				
			PC	PC / AQS (%)	BC	PEC	PEC/AQS (%)	PC	PC/ AQS (%)	BC	PEC	PEC/AQS (%)
E1a	River Shannon and River Fergus Estuaries SPA	Intertidal	<0.01	<1	12.1	12.1	60.5	0.18	<1	12.1	12.3	61.4
E1b	River Shannon and River Fergus Estuaries SPA	Intertidal	0.01	<1	12.1	12.1	60.5	0.17	<1	12.1	12.3	61.4
E1c	River Shannon and River Fergus Estuaries SPA	Intertidal	0.02	<1	12.1	12.1	60.6	0.21	1.0	12.1	12.3	61.5
E2a	Lower River Shannon SAC	Coastal saltmarsh	<0.01	<1	12.1	12.1	60.5	0.14	<1	12.1	12.2	61.2
E2b	Lower River Shannon SAC	Atlantic salt meadows	<0.01	<1	12.1	12.1	60.5	0.14	<1	12.1	12.2	61.2
E2c	Lower River Shannon	Molina meadows on calcareous,	<0.01	<1	12.1	12.1	80.7	0.14	<1	12.1	12.2	81.6

ID	Location	Habitat	Nitrogen deposition ($kgNha^{-1}yr^{-1}$) emissions only			Designated	Development	Nitrogen deposition ($kgNha^{-1}yr^{-1}$) cumulative emissions				
	SAC	peaty or clayey-silt-laden soils										
E2d	Lower River Shannon SAC	Salicornia and other annuals colonising mud and sand	<0.01	<1	12.1	12.1	60.5	0.10	<1	12.1	12.2	61
E2e	Lower River Shannon SAC	Mediterranean salt meadows	<0.01	<1	12.1	12.1	60.5	0.19	<1	12.1	12.3	61.4
E2f	Lower River Shannon SAC	Estuaries	<0.01	<1	12.1	12.1	60.5	0.17	<1	12.1	12.3	61.3
E2g	Lower River Shannon SAC	Coastal lagoons	<0.01	<1	12.1	12.1	60.5	0.13	<1	12.1	12.2	61.2
E2h	Lower River Shannon SAC	Large shallow inlets and bays	<0.01	<1	12.1	12.1	60.5	0.41	2.0	12.1	12.5	62.5
E2i	Lower River Shannon SAC	Perennial vegetation of stony banks	<0.01	<1	12.1	12.1	151.3	0.18	2.2	12.1	12.3	153.5
E2j	Lower River Shannon SAC	Broadleaved deciduous woodland	<0.01	<1	12.1	12.1	121	0.11	1.1	12.1	12.2	122.1
E3	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Bog	<0.01	<1	12.1	12.1	242	0.07	1.5	12.1	12.2	243.5
E4	Moanveanlagh Bog SAC	Bog	<0.01	<1	12.1	12.1	242	0.02	<1	12.1	12.1	242.4

PC – Process Contribution (i.e., the amount generated by the Designated Development)

AQS – Air Quality Standard (i.e., the concentration of NO_x or SO_2 above which adverse effects on vegetation may arise, according to APIS)

BC – Background Contribution (baseline levels of airborne pollutants)

PEC – Predicted Environmental Concentration (the sum of the process concentration plus the back contribution)

EAL – Environmental Assessment Level (i.e., the critical load for relevant habitats, according to APIS)

Table 6. Modelled emissions at receptor locations for SO_2

ID	Location	Habitat	SO_2 ($\mu g/m^3$) Designated Development emissions only				
			PC	PC / AQS (%)	BC	PEC	PEC/ AQS (%)
E1a	River Shannon and River Fergus Estuaries SPA	Intertidal	<0.01	<1	4.2	4.2	21
E1b	River Shannon and River Fergus Estuaries SPA	Intertidal	0.03	<1	4.2	4.2	21
E1c	River Shannon and River Fergus Estuaries SPA	Intertidal	0.10	<1	4.2	4.3	21
E2a	Lower River Shannon SAC	Coastal saltmarsh	<0.01	<1	4.2	4.2	21
E2b	Lower River Shannon SAC	Atlantic salt meadows	<0.01	<1	4.2	4.2	21
E2c	Lower River Shannon SAC	Molina meadows on calcareous, peaty or clayey-silt-laden soils	<0.01	<1	4.2	4.2	21
E2d	Lower River Shannon SAC	Salicornia and other annuals colonising mud and sand	<0.01	<1	4.2	4.2	21
E2e	Lower River Shannon SAC	Mediterranean salt meadows	0.01	<1	4.2	4.2	21
E2f	Lower River Shannon SAC	Estuaries	0.01	<1	4.2	4.2	21
E2g	Lower River Shannon SAC	Coastal lagoons	0.01	<1	4.2	4.2	21
E2h	Lower River Shannon SAC	Large shallow inlets and bays	<0.01	<1	4.2	4.2	21
E2i	Lower River Shannon SAC	Perennial vegetation of stony banks	0.01	<1	4.2	4.2	21
E2j	Lower River Shannon SAC	Broadleaved deciduous woodland	<0.01	<1	4.2	4.2	21
E3	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Bog	<0.01	<1	4.2	4.2	21
E4	Moanveanlagh Bog SAC	Bog	<0.01	<1	4.2	4.2	21

PC – Process Contribution (i.e., the amount generated by the Designated Development)
AQS – Air Quality Standard (i.e., the concentration of NO_x or SO_2 above which adverse effects on vegetation may arise, according to APIS)
BC – Background Contribution (baseline levels of airborne pollutants)
PEC – Predicted Environmental Concentration (the sum of the process concentration plus the back contribution)
EAL – Environmental Assessment Level (i.e., the critical load for relevant habitats, according to APIS)

The results of air quality modelling of operational emissions in relation to the Designated Development suggests that there will be no effect on the habitats within River Shannon and River Fergus Estuaries SPA, meaning that the Conservation Objectives of the site will not be compromised. It is therefore concluded that there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of airborne pollution during the operational phase of the Designated Development.**

5.1.5 Changes to Groundwater Flows or Volume During the Construction Phase

Construction of the Designated Development will require piling to a maximum depth of 30m. According to the EPA Maps website, the bedrock aquifer within the Site of the Designated Development is a locally important aquifer, thus it is moderately productive in local zones.

The habitats within the River Shannon and River Fergus Estuaries SPA which support the SCI bird species are typically not dependent on groundwater (being largely intertidal), and this is certainly the case within 250m of the Designated Development (this being the distance at which SEPA considers impacts on groundwater dependent terrestrial ecosystems (GWDTE) are possible (SEPA, 2017). Therefore, although piling activities could potentially have impacts on groundwater, this will not have any subsequent effects on habitats which support SCI birds as none of these habitats depend on groundwater for their maintenance.

It is therefore concluded that there will be no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of changes to groundwater during construction of the Designated Development.

5.1.6 Disturbance of Qualifying Species During the Construction, Operational and Decommissioning Phases

5.1.6.1 Noise disturbance

Hearing in birds is not as well developed as in humans, in that most birds cannot hear as high or as low frequencies as humans (the exception to this being owls, which are not relevant to this NIS). There are physiological reasons for this (summarised in Dooling and Popper (2007) and Beason (2004)). Additionally, the ability of birds to resolve similar frequencies is only about one-half to one-third that of humans within the range of peak sensitivity, which is similar to that of humans at 1-4 kHz (Beason, 2004).

Much of the published literature in relation to disturbance of birds uses ‘dB(A)’ to measure sound levels. dB(A) is the sound level in decibels in the range of human hearing which, as set out above, is better than in most birds. In simple terms, these studies sought to show where a response by a given species may be elicited by noise levels measured in dB(A). For these reasons, it is appropriate to use dB(A) in this NIS because, if anything, dB(A) is likely to slightly overestimate effects on birds, and is conveniently the most often used unit in environmental noise assessments.

By virtue of its logarithmic nature, the decibel (dB) scale covers many orders of magnitude of sound pressure within a relatively small numerical range, which can be counterintuitive to those not familiar with it. The following points, based on information provided by the UK Civil Aviation Authority (https://www.caa.co.uk/Consumers/Environment/Noise/Measuring-and-modelling-noise/) and in the *Fundamentals of Acoustics* by Hansen (1951) may be helpful:

- a difference of less than 3dB is often not perceived by humans and perhaps, given the general inferiority of bird hearing compared to human hearing, not by birds either;
- a difference of 10dB is perceived as roughly a doubling or halving; and,
- without barriers and varying also according to other physical aspects of the environment, sound levels from point sources tend to decrease by about 6dB with each doubling of distance.

Many scientific studies into disturbance of non-breeding waterbirds have related to the flights of aircraft, particularly low-flying light aircraft, military jets and helicopters. For example, Hoang (2013) conducted a literature review of aircraft disturbance on shorebirds and seabirds. Of seven studies presented in the literature review which investigated effects on shorebirds, the minimum distance at which disturbance was found to be caused by fixed-wing aircraft was 300 m above ground level, with lower-level flights having relatively limited or no disturbance effects. Komenda-Zehnder *et al* (2003) performed 326 experimental flights over lakes in Switzerland to observe for behavioural responses by non-breeding waterbirds. They found that birds returned to a ‘relaxed’ behaviour (including preening, resting and feeding) within five minutes of the over-flights. Similar to the review of studies carried out by Hoang (2013), Komenda-Zehnder *et al* (2013) also found that planes flying at heights of 300 m above ground level did not result in any significant change in the behaviour of birds. In a study carried out

in the Dutch Wadden Sea, the numbers and behaviours of knot *Calidris canutus* were found to be affected by over-flights of military jets, with fewer birds present on days with flights and the birds that were present being more restless and less approachable by humans (Koolhaas *et al*, 1993). They also observed that 'light tourist airplanes' caused a more severe response in the birds than the military jets.

Although the above studies do not reference noise levels, it is intuitive that aircraft passing overhead at heights of around 300 m above ground level would generate a large amount of noise, relative to construction or decommissioning activities.

A study of nesting herring gulls beside an airport (Burger, 1981) found that normal colony noise was 77 dB(A), and (in this case, where birds were habituated to normal jet aircraft) behavioural reactions (taking flight) only occurred when Concorde passed by, generating noise exceeding 101 dB(A). This is rather an extreme example, however, involving birds that were habituated to noise from nearby passenger jets at levels which were liable to have caused hearing damage, but is useful as a further demonstration that birds may tolerate high levels of constant or frequently-occurring noise.

An Australian study of nesting terns (Brown, 1990) is particularly useful because it simulated aircraft noise using speakers placed beside a colony which was not accustomed to aircraft, thus visual disturbance stimuli were eliminated and there was no prior habituation. It found that playback of aircraft noise at 65dB(A) had a minimal reaction, causing the majority of terns to 'scan' (cocking the head or turning it horizontally). At 70dB(A), about half the terns engaged in 'alert' behaviour (extending the neck, making minor whole-body movements or wing tensing). 'Startle' (preparation to fly) and 'escape' (flying off) behaviours only affected a small proportion of the terns and were largely restricted to sound levels above 85dB(A). An observation study of harlequin ducks *Histrionicus histrionicus* (Goudie and Jones, 2004) similarly found that behavioural changes increased substantially when sound from passing aircraft exceeded 80dB(A). However, this and other studies (e.g., Buxton *et al*, 2017) noted that whilst disturbance may not cause birds to take flight, less obvious stress-related behavioural changes can occur such as reduced courtship behaviour and increased time engaged in agonistic, disturbance or predator evasion behaviour, which may adversely affect survival if, for example, young are more exposed to predators or receive less food.

The study by Buxton *et al* (2017) is one of the few studies that investigated noise alone. The Brandt's cormorants *Phalacrocorax penicillatus* observed in this study were found to engage in stress-related behaviour (wing fluttering) approximately 35% of the time when human visitor noise exceeded 62dB(A), but no flights were caused at this level of noise. Note that the visitors were inside buildings and not visible to the birds in this study, hence noise was the only factor.

A substantial review of literature associated with the disturbance of waterbirds was produced for the Humber Industry Nature Conservation Association (INCA) by the University of Hull (Cutts *et al*, 2009). This report recommended (with respect to waterfowl on mudflats) that construction noise levels should be restricted to below 70 dB because birds would habituate to regular noise below that level, but that sudden irregular noise above 50 dB should be avoided. The University of Hull subsequently produced refined guidance in the *Waterbird Disturbance Mitigation Toolkit* (Cutts *et al*, 2013). It concluded that:

- high level disturbance effects are likely with continuous noise above 72dB or sudden noise above 60dB;
- moderate level disturbance effects are likely with regular noise of 60 – 72dB or sudden noise of 55 – 60dB; and,
- there is unlikely to be any response by waterbirds to any noises below 55dB[8].

As analogies to put these sound levels in context, normal conversational speech between two people is in the region of 55-60dB(A), and a domestic electric lawnmower at close range is in the region of 80dB(A) (Berger *et al*, 2016; HSE 2005).

On the basis of the above, Cutts *et al* (2013) provide definitions for 'High', 'Moderate' and 'Low' noise level effects on waterbirds, as set out in **Table 7**. The noise levels stated in the table are at the bird, rather than at the source of the noise.

[8] Although these figures (and others provided by Cutts *et al* (2013)) are given in dB, as stated above, bird hearing in birds is generally worse than in humans. Therefore, although noise modelling for the Designated Development was carried out in dB(A) and is not exactly the same as these figures, by using dB(A), a precautionary approach to the assessment of noise disturbance of birds has been taken.

Table 7. Noise level effects on birds (adapted from Cutts *et al* (2013))

Noise level effect	Definition
High	Noise disturbance is typified by regular responses to stimuli, with birds moving away from the works to areas which are less disturbed (within noise tolerances). Most birds will show a degree of response to noise stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (e.g., cold weather) then this may impact upon the survival of individual birds or their ability to breed. For auditory disturbance to qualify as High level, it must constitute a sudden noise event of over 60dB (at the bird, not the source) or a more prolonged noise of over 72dB.
Moderate	Moderate noise disturbance is typified as a High level noise which has occurred over long periods so that birds become habituated to it or lower level noise which causes some disturbance to birds. This encompasses occasional noise events above 55dB, regular noise 60-72dB, and long-term regular noise above 72dB, where birds have become habituated. There is cross-over in Moderate and High level noise thresholds, although the lower band can be assumed unless the species is particularly sensitive.
Low	Low level noise is classed as that which is unlikely to cause response in birds using a fronting intertidal area. As such, noises of less than 55dB at the bird are included in this category. These effects are likely to be masked by background inputs in all but the least disturbed area and thus would not disturb the birds close by. Noise between 55-72dB in some highly disturbed areas (e.g., industrial or urban areas, and adjacent to roads) may feature a Low level of disturbance provided the noise level was regular as birds will often habituate to a constant noise level.

Construction and decommissioning phases

Noise modelling was initially carried out assuming a worst-case scenario or plant and machinery working with no mitigation at the edge of the boundary of the Designated Development (i.e., as close as possible to the River Shannon and River Fergus Estuaries SPA). In addition, heavy construction vehicles movements between the public access road and the plant area have been modelled and included in the noise level predictions. A total of 186 Heavy Good Vehicles have been modelled over a 24-hour period based on construction traffic estimates provided by the project team. Assuming these parameters, predicted noise levels exceeded 55 dB L_{Aeq}[9] for at least some activities to be carried out during the construction / decommissioning phase at ecological noise modelling receptor locations G, J, K, M and N (i.e., at five of the fifteen modelling points) (see Figure 4).

The noise modelling was therefore revised taking into account the mitigation measures set out in Section 4 of this NIS, and in particular considering the use of an acoustic barrier (as shown on Figure 12). The predicted noise levels for various construction / decommissioning phase activities are provided in **Table 8**. Full details of the noise modelling exercise are provided in **Appendix E**. As the exact method of piling is not currently known, noise modelling was carried out for vibration piling and for impact piling as one of these two piling methods will be used. For the latter, the noise generated is ‘sudden’, rather than continuous, and thus the maximum sound level which could be generated (dB L_{Amax}) is the appropriate measure of sound for this activity.

[9] L_{Aeq} noise source data represent ‘equivalent continuous sound levels’ from multiple plant in operation at 100% power over any duration. The L_{Aeq} may be considered akin to an ‘average’ noise level over the phase duration.

Table 8. Noise levels at ecological noise modelling locations during construction / decommissioning phase

Modelling point	Approximate distance from site of Designated Development (m)	Site clearance (dB L_{Aeq})	Groundworks (dB L_{Aeq})	Vibration piling (dB L_{Aeq})	Impact piling (L_{Amax})	Construction (dB L_{Aeq})
A	210	48	41	50	58	44
B	445	45	43	46	56	44
C	540	38	32	40	48	34
D	770	41	36	40	52	38
E	1,075	33	29	36	48	30
F	525	41	35	43	55	37
G	175	49	43	50	62	45
H	980	34	29	37	49	30
I	1,300	31	26	35	47	27
J	22	54	49	64	75	51
K	200	48	42	53	64	44
L	1,000	34	29	37	49	31
M	50	53	48	58	69	50
N	295	46	40	47	59	42
O	450	41	35	44	52	37

It can be seen from **Table 8** that the majority of construction / decommissioning works will generate noise levels below 55dB L_{Aeq}. As set out above, according to guidance published by Cutts *et al* (2013) this is below the threshold at which any disturbance of waterbirds is considered likely to occur. At modelling locations J and M, noise levels generated by vibration piling activities could exceed 55dB L_{Aeq}. However, at both of these points, noise levels are still predicted to fall within the range of 55-72dB L_{Aeq} (with the loudest of these points being J at 64dB L_{Aeq}). According to Cutts *et al* (2013), waterbirds can be expected to habituate to regular noise between 55-72dB L_{Aeq}. At point J, which is within the creek immediately south of the Designated Development, the noise generated by vibration piling is predicted to be 64dB L_{Aeq} , however, it can be seen that at point M, also in the creek but further from the Designated Development, noise levels are predicted to drop to 58dB L_{Aeq}. Noise levels would continue to decrease across the creek with increasing distance from the Designated Development.

For impact piling, the maximum sound level which could be generated exceeds 55dB L_{Amax} at the same points as for vibration piling, plus points A, B, F, G, K and N. However, the only noise modelling location where levels are predicted to exceed 72dB L_{Amax} is point J. At all other locations, the predicted noise levels are within the range of 55-72dB L_{Amax}, and generally towards the lower end of those figures. Although the sound produced by impact piling is sudden, once operating, the noise and activity produced by this type of piling is likely to be predictable to birds, and it is expected that a degree of habituation to such works would occur.

It is therefore considered that disturbance of birds around the Designated Development is unlikely to be significant at all but the very closest locations to piling works. Although noise levels will be elevated during piling works in habitats within River Shannon and River Fergus Estuaries SPA, they will quickly be within the range at which waterbirds are expected to become habituated. Should disturbance of waterbirds occur, displacement is therefore only likely from a very small area immediately around the Designated Development. This has no potential to prevent the Conservation Objectives for the SPA being met, namely there will be no material change to distribution of SCI species, nor any impact on the population trends of these species.

It is thus concluded that there will be **no significant effect of noise disturbance on SCI birds during the construction or decommissioning phases of the Designated Development**.

Operational phase

Noise levels during the operational phase will be generally lower than during construction and decommissioning. Modelling carried out for the operational OCGT units predicts maximum noise levels of around 55dB at the closest point of River Shannon and River Fergus Estuaries SPA. As set out above, at these noise levels, disturbance of waterbirds is considered very unlikely. This is especially the case as the noise generated by the operational Designated Development will be continuous (when in use) and it is highly likely that birds will become habituated to it (as is the case with the existing power station facility).

It is thus concluded that there will be no significant effect from noise disturbance of SCI birds during the operational phase of the Designated Development.

5.1.6.2 Visual disturbance – presence of site personnel and plant

The visual disturbance of SCI bird species could be caused by the presence and activities of personnel, plant and machinery during the construction, operational or decommissioning phases.

In addition to noise disturbance, the *Waterbird Disturbance Mitigation Toolkit* (Cutts *et al*, 2013) also considers visual disturbance effects on waterbirds. It states that, in most instances, a visual stimulus (e.g., a construction worker) will create a disturbance effect before any associated noise starts to have an effect. For example, the *Toolkit* suggests that a flight response may be expected in many waterbird species if approached to within circa 100-150m across a mudflat, whereas for such an effect to occur through noise alone this would require a noise level of around 120-130 dB to be generated at the source (this being the threshold of pain). Similarly to noise, above, Cutts *et al* (2013) provide definitions for 'High', 'Moderate' and 'Low' disturbance level effects on waterbirds, as set out in **Table 9**.

Table 9. Disturbance level effects on birds (adapted from Cutts *et al* (2013))

Noise level effect	Definition
High	This is typified by regular reactions to visual stimuli, with birds moving away from the works to areas which are less disturbed. Most birds will show a degree of response to stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (e.g., cold weather) the this may impact upon the survival of individual birds or their ability to breed. Visual stimuli reaches High levels of disturbance extremely easily with workers operating outside of equipment, fast movement, large plant, and close proximity to the birds (especially encroachment on mudflats) contributing to this level of disturbance.
Moderate	Typified as either High level disturbance which has occurred over long periods so that birds become habituated to it or less sensitive to it, or less intrusive works which will still cause a degree of disturbance. This describes visual stimuli such as works or third parties on the flood bank. Habituation occurs less with workers on the flood bank or foreshore working outside machinery. If a worker leaves plant, it usually increases the disturbance level to High. There is cross-over in the Moderate and High level thresholds, although unless a species is particularly sensitive, or it is a new activity, then the lower band can be assumed.
Low	This is stimuli that is unlikely to cause a response in birds using an adjacent wetland. Most works would not qualify as Low level impact unless they were out of sight of the birds and any disturbance then would be considered noise-related disturbance (although there remain over-flight issues for some species whereby flights to and from inland feeding and roosting sites can mean that behind bank works still have a visual disturbance effect). Long-term works, including plant on a flood bank, are also considered to be low impact. This type of work would initially qualify as Moderate disturbance but with the absence of workers on the flood bank, birds would quickly become habituated. If workers were to appear alongside plant, this would immediately increase the disturbance to Moderate.

NatureScot has published guidance on the disturbance distances of selected bird species, including many of the SCI species of the River Shannon and River Fergus Estuaries SPA (Goodship and Furness, 2022). The guidance presents an extensive review of literature on disturbance of bird species and using information collected by that exercise makes recommendations for buffer distances to be applied to avoid or reduce the risk of disturbance being caused (for example by the presence or activities of people, vehicles, etc.). The recommended buffer zones for the non-breeding SCI species of the River Shannon and River Fergus Estuaries SPA which are included in Goodship and Furness (2022) are presented in **Table 10**.

Table 10. Buffer zones recommended by NatureScot in Goodship and Furness (2022) for selected SCI species of River Shannon and River Fergus Estuaries SPA

SCI species	Likely sensitivity to disturbance	Quantitative information	Recommended buffer zone
Whooper swan	Medium	Medium agreement and limited evidence	200-600 m
Light-belled brent goose	-	-	50-200 m*
Shelduck	High	Medium agreement and medium evidence	100-400 m
Wigeon	High	Low agreement and medium evidence	200-500 m
Pintail	Medium	Low agreement and limited evidence	100-200 m
Shoveler	Medium	Medium agreement and limited evidence	100-200 m
Scaup	High	Medium agreement and limited evidence	150-450 m
Ringed plover	High	Medium agreement and medium evidence	100-300 m
Golden plover	Medium	Medium agreement and medium evidence	150-300 m
Grey plover	Medium	Medium agreement and medium evidence	200-500 m
Knot	Medium	Medium agreement and medium evidence	100-300 m
Dunlin	Medium	Medium agreement and medium evidence	150-300 m
Black-tailed godwit	Medium	Medium agreement and medium evidence	100-200 m
Bar-tailed godwit	Medium	Medium agreement and medium evidence	200-300 m
Curlew	High	Medium agreement and robust evidence	200-650 m
Redshank	Medium	Medium agreement and robust evidence	200-300 m
Greenshank	Medium / High	High agreement and robust evidence	300-500 m

* Light-bellied brent goose is not specifically included as a selected species in the NatureScot guidance. However, research on brent geese is used as a surrogate for barnacle geese *Branta leucopsis*, thus the buffer zone for the latter species is taken to be appropriate for light-bellied brent goose.

For the SCI bird species not assessed in Goodship and Furness (2022), a precautionary approach has been taken whereby they are assumed to be highly sensitive to disturbance.

Construction and decommissioning phases

The Conservation Objectives Supporting Document for River Shannon and River Fergus Estuaries SPA provides the results of non-breeding waterbird surveys carried out between October 2010 and February 2011. These are summarised in Section 3.2 of this NIS, in relation to the area of the SPA around the Designated Development. Furthermore, the non-breeding waterbird surveys carried out for the Designated Development recorded a range of SCI species using habitats surrounding the Designated Development for foraging and roosting (see Section 3.3.2 and Figures 6, 7, 8, 9, 10 and 11).

According to Cutts *et al* (2013), visual disturbance of non-breeding waterbirds typically extends up to a distance of 300 m. However, for individual species accounts given both in Cutts *et al* (2013) and Goodship and Furness (2022), disturbance of particularly sensitive species is reported to occur at greater distances. According to the buffer zones recommended in the latter reference, published by NatureScot and shown in **Table 10**, above, disturbance of the SCI species of River Shannon and River Fergus Estuaries SPA could occur up to a distance of 500 m, or as far as 600 m for whooper swan and 650 m for curlew.

The areas around the Designated Development within which SCI birds have been recorded are within at most 400 m of the Designated Development, and thus within the distance at which disturbance could be caused by construction or decommissioning works.

However, the largest area of suitable habitat – the intertidal area to the south-east, and within which far larger numbers of waterbirds were recorded both in 2010/11 and November / December 2022 and January 2023 – is screened from the Designated Development by existing topography, vegetation and buildings and the location already has an operational power station present. This area is also more than 300 m from works areas. Vehicles

accessing the Site will do so along an existing public road, to which birds can be expected to be habituated. It is therefore considered unlikely that any visual disturbance of birds using this area would occur.

All other areas of habitat around the Designated Development could be subject to visual disturbance caused by the presence of personnel, plant and machinery. To mitigate this, an acoustic barrier, which will provide visual screening, will be erected for the duration of the construction / decommissioning phases around the southern, western and northern perimeters of the Designated Development to ensure that all works areas are completely screened from the adjacent SPA habitat (see Figure 12). In doing so, the presence of a visual stimulus to cause disturbance of SCI birds will be largely or entirely removed. The exception to this could be if or when SCI birds fly over the Site and are dissuaded from using habitat adjacent to it having seen on-going works. However, this occurrence is expected to be rare, particularly given the presence of the existing power station, and the presence of the screening barrier is also expected to serve a mitigating effect which would encourage birds to land and use adjacent habitats.

Considering specifically whooper swan, this species forages in agricultural grassland of the type present to the south of the Designated Development. While these are within 600m, they are on the opposite side of the creek and screened by woodland and other vegetation. It is therefore very unlikely that the Designated Development could cause any visual disturbance of foraging whooper swans.

On the basis of the above, and with the installation of a visual screening barrier around the southern and western perimeters of the Designated Development, there is **not expected to be significant disturbance of any SCI species of the River Shannon and River Fergus Estuaries SPA during the construction or decommissioning phases**.

Operational phase

During the operational phase, the presence of personnel and vehicles will be much reduced when compared to construction / decommissioning. There will also not be the same movements of heavy plant or machinery, with only an infrequent requirement for these for maintenance works. The movement of personnel and vehicles into and out of the Designated Development is likely to be largely or entirely screened by the presence of the new buildings which form the new power station.

There are existing fence lines along the top of the shore, between the Designated Development and the SPA. Although vehicles and personnel may be present on the road which runs alongside the SPA here, no personnel will be permitted to go over the fence and onto the shore.

Due to screening which will be afforded by the buildings which form the new power station, the relatively low numbers of operational staff and associated vehicles, and the fact that staff will not be able to access the shore within the SPA, there is **no expectation of significant disturbance of SCI birds during the operational phase**.

5.1.6.3 Visual Disturbance – Lighting

A study carried out in central Scotland found that the increased artificial lighting of an estuary caused by adjacent industrial facilities benefitted redshank (which is an SCI species of River Shannon and River Fergus Estuaries SPA) by facilitating night-time foraging (Dwyer *et al*, 2012). However, a literature review carried out by Adams *et al* (2021) identifies numerous studies showing adverse impacts on bird species, including changes to bird perception of habitat quality, resulting in selection or avoidance of illuminated areas.

Consequently due to some uncertainty about the potential effects of artificial illumination, which may vary between SCI species, a precautionary approach is adopted in this NIS, and it is considered that any illumination of habitats used by SCI species as a result of lighting used for the Designated Development could have adverse effects on one or more SCI species.

Construction and decommissioning phases

As set out in Section 4, the following mitigation will be implemented during the construction and decommissioning phases to avoid illumination of habitats with the SPA, as well as other areas of land which could be functionally-linked to the European site:

- works within 20m of the Shannon Estuary and the creek immediately south of the Designated Development (which is encompassed by the River Shannon and River Fergus Estuaries SPA) will not be permitted to take place during hours of darkness; and,

- elsewhere within the Site of the Designated Development, any lighting required during the construction and decommissioning phases will be directional and will be prevented from spilling light onto watercourses or other habitats through the use of cowling.

The Ecological Clerk of Works will be responsible for monitoring compliance with this mitigation and will require that the contractor(s) take corrective action if it is deemed that lighting used for the Designated Development is illuminating the SPA or other habitats which could be used by SCI birds.

With the implementation of this mitigation, there is **not expected to be any adverse effect on SCI bird species from lighting used during construction or decommissioning of the Designated Development**.

Operational phase

Adopting the same precautionary approach, whereby artificial illumination of habitats used by SCI species is assumed to have the potential to cause disturbance / displacement, permanent lighting required for the safe operation of the Designated Development will be designed to avoid lightspill onto such areas. Using appropriate design software, permanent lighting will be designed so as any increase in illumination of habitats within the River Shannon and River Fergus Estuaries SPA does not increase by more than 0.2lux. This is the approximate brightness of a full moon, so can be expected to have no significant effect on SCI species.

With the implementation of this mitigation, there is **not expected to be any adverse effect on SCI bird species from lighting used during the operational phase of the Designated Development**.

5.1.6.4 Combined Noise and Visual Disturbance

Construction and decommissioning phases

It is important to note that visual stimuli tend to have greater disturbance effects on birds than noise stimuli alone (as stated in Cutts *et al* (2009)).

Generic waterbird responses to disturbance from a range of activities including construction work have been collated and summarised by IECS over time. **Image 2** below is taken from the *Waterbird Disturbance Mitigation Toolkit* (Cutts *et al*, 2013) and is based on the collation of these studies, together with author observations of construction studies on the Humber Estuary. It sets out the level of disturbance that can be expected from various types of construction works due to the noise and visual stimuli they generate.

Image 2. Disturbance levels expected on non-breeding waterbirds from various construction activities (taken from Cutts *et al* (2013))

Personnel and plant on mudflat:	High (and should be restricted at all times)
Third party on mudflat:	High (but difficult to restrict)
Personnel and plant on seaward toe and face:	High to Moderate
Intermittent plant and personnel on crest:	High to Moderate
Third party on bank:	High to Moderate
Irregular piling noise (above 70db):	High to Moderate
Long-term plant and personnel on crest:	Moderate
Regular piling noise (above 70db):	Moderate
Irregular noise (50db - 70db):	Moderate
Regular noise (50db - 70db):	Moderate to Low
Occasional movement of crane:	Moderate to Low
Noise below 50db:	Low
Long-term plant only on crest:	Low
Activity behind flood bank (inland):	Low

It can be seen from the above that disturbance is likely to be highest when personnel are visible to birds, and when there are irregular loud noises (above 70dB). To minimise this risk, and as described in the preceding sections, a range of mitigation measures will be implemented during the construction and decommissioning phases, specifically:

- BPM techniques will be adopted during piling works, including use of a soft-start to works;
- piling will not take place until at least one hour after sunrise and will not take place after the time of one hour before sunset;

- the loudest activities, in particular piling, will not take place during extended periods of severe weather; and,
- an acoustic barrier will be erected around the southern, western and northern perimeters of the Designated Development to reduce noise levels and to screen the Site from birds using the SPA. This will largely or entirely remove the visual disturbance stimulus, and will help to reduce noise levels.

The probability of 'High' level disturbance being caused is therefore considered to be low. Furthermore, the use of soft-start piling techniques and other measures to minimise noise disturbance described in Section 4, means that disturbance of SCI birds is unlikely to occur at all, or would be minor.

Even if infrequent disturbance were to occur (although as stated, this is considered to be unlikely), the largest area of habitat which appears most suitable to SCI bird species is more than 300m to the south-east of the Designated Development, and screened by topography, vegetation and buildings. There is not expected to be any disturbance impacts on birds using this area for these reasons. Therefore, even in the event that birds were disturbed from other smaller areas of habitat closer to the Designated Development (e.g., the creek immediately to the south), there is abundant alternative habitat very nearby. Within the wider SPA, this becomes increasingly the case.

In summary, significant disturbance of SCI birds is not predicted based on the results of noise modelling and following implementation of mitigation to minimise or remove noise and visual disturbance stimuli. Even in the unlikely event that disturbance was to be caused, there is abundant alternative habitat within the SPA both very nearby and across the wider area covered by this very large European site. It is therefore concluded that there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of disturbance caused by the construction or decommissioning of the Designated Development.**

Operational phase

As already described above, noise and visual disturbance during the operational phase is considerably less likely than at the construction or decommissioning phases. Therefore, given the conclusion in relation to these phases, it is also concluded that there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA as a result of disturbance during the operational phase of the Designated Development.**

5.1.7 Spread of invasive non-native species during the Construction and Decommissioning Phases

Invasive non-native species can have detrimental effects on native flora and fauna, including potentially QI habitats or habitats that support QI or SCI species. There is no realistic possibility of the Designated Development facilitating the spread of non-native animals. However, butterfly-bush and winter heliotrope were recorded on Site during the habitat survey, and construction and/or decommissioning works have the potential to cause the spread of these non-native plants. There is also the potential for these species and other non-native invasive species to be present within the Designated Development on parts of the Site that were not previously surveyed. These species can outcompete native plants, reducing biodiversity and leading to other impacts such as increased susceptibility to erosion. There can be indirect consequences if the spread of invasive non-native species results in the loss of plants upon which animal species rely for food.

Biosecurity management measures will ensure that there will be no spread of invasive non-native species during works. In particular, the following measures may be required (depending on the presence of invasive non-native plants within the Site of the Designated Development):

- as far as possible, any stands of invasive non-native plants present within the Site of the Designated Development will be demarcated and entirely avoided;
- where this cannot be achieved, the species will be subject to appropriate treatment and/or management. This may include herbicide application, coupled with on-site burial or off-site disposal to a suitably licensed landfill; and,
- the following good practice biosecurity measures will also be adopted: the provision of washdown facilities for any personnel, plant or other equipment involved in works within an area potentially infested by an invasive non-native species.

The implementation of measures will be monitored by the Ecological Clerk of Works.

With the adoption of such measures, it is concluded that the Designated Development will not facilitate the spread of invasive non-native species and there will be **no adverse effect on the integrity of River Shannon and River Fergus Estuaries SPA during the construction or decommissioning phases.**

5.1.8 In-combination Assessment

Seven planning applications have been identified as having the potential to act in-combination with the Designated Development to result in adverse effects on European site integrity and are detailed in **Appendix C** with their planning status at the time of search being undertaken (January 2023). As tabled in **Appendix C**, four of the seven planning applications have been granted planning consent/permission while the others are not yet determined. No plans have been identified which could give rise to in-combination effects with the possible impacts from the Designated Development. The existing Tarbert Power Station, Shannon Liquefied Natural Gas (LNG) project and Moneypoint Power Station were assessed for cumulative air quality impacts as seen in **Table 4** and **Table 5**.

With the exception of the Shannon LNG, which is located approximately 4.2km from the Designated Development, none of the projects with planning consent will have emissions to air during their operation. Of the existing power stations assessed; Tarbert Power Station is located within the same facility as the Designated Development, and Moneypoint Power Station is located approximately 3km from the Designated Development. The Process Contribution of the Designated Development for NO_x, SO_2 and nitrogen deposition at all modelled locations was well below 1% of the relevant critical levels / loads. Therefore, with such a small contribution the impact of the Designated Development on the cumulative PEC for nitrogen deposition and NO_x is negligible. Therefore, the Designated Development in-combination with the existing Tarbert Power Station, Moneypoint Power Station and Shannon LNG will not have adverse effects on vegetation or habitats.

With the exception of Shannon LNG, all of the projects detailed in Appendix C are located in a single area, a little over 1.5km from the Designated Development. The habitats at this location appear from aerial images to be agricultural grasslands, meaning that habitats which may be lost to their construction are different to those that will be directly impacted by the Designated Development. The projects are themselves relatively small. Therefore, because the habitats involved are different, and the total areas associated with these projects and the Designated Development are small, there is no possibility of a significant effect on SCI birds arising due to a loss of functionally-linked habitat.

It is possible that construction of these projects could cause disturbance of SCI birds both within the SPA and in surrounding functionally-linked habitat. However, as six of the seven projects are located in very close proximity to one another, the geographic extent over which disturbance could be caused is largely minimised. In addition, it is highly unlikely that all of these projects, plus Shannon LNG and the Designated Development will be under construction at the same time. Moreover, the Designated Development and Shannon LNG have sought to minimise as far as possible the disturbance impacts on SCI birds. It is therefore considered to be unlikely that there will be significant in-combination disturbance effects between the Designated Development and these other projects.

Other issues such as waterborne pollution and the spread of invasive non-native species must be managed as a requirement of other relevant legislation by these projects. It can therefore be reliably concluded that these possible impacts will not give rise to significant adverse effects on European sites in-combination with the Designated Development.

It is thus concluded that there will be **no adverse effects on the integrity of River Shannon and River Fergus Estuaries SPA from the Designated Development acting in-combination with any existing power stations or other plans or projects.**

5.2 Lower River Shannon SAC

5.2.1 Overview

This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head / Kerry Head, a distance of some 120km. The SAC thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments, and the marine area between Loop Head and Kerry Head.

As set out in **Table 3**, the site is designated for a wide variety of aquatic, intertidal and terrestrial habitats, as well as several fish species, freshwater pearl mussel, bottlenose dolphin and otter.

5.2.2 Waterborne Pollution During the Construction, Operational and Decommissioning Phases

Waterborne pollution caused by run-off of fuels, oils or chemicals, if they were to reach the Shannon Estuary, could degrade habitats or, if sufficiently severe, cause direct harm to QI species including fish, bottlenose dolphin and otter.

However, as described under the River Shannon and River Fergus Estuaries SPA (which largely overlaps the Lower River Shannon SAC in this area), a range of proven pollution prevention measures will be adopted at all phases of the Designated Development. Therefore, for the reasons described in more detail in the appraisal for the aforementioned SPA, it is concluded that there will be **no adverse effect on the integrity of Lower River Shannon SAC as a result of waterborne pollution during the construction or decommissioning phases of the Designated Development.**

5.2.3 Airborne Pollution During the Construction, Operational and Decommissioning Phases

The section on air quality concepts provided in the assessment for River Shannon and River Fergus Estuaries SPA should be read when considering the similar appraisal for Lower River Shannon SAC.

Construction and decommissioning phases

As described under River Shannon and River Fergus Estuaries SPA, during the construction and decommissioning phases there is expected to be a maximum of 200 staff on site each day. Staff are expected to travel to the Site via a combination of carsharing and single occupancy vehicles, resulting in a maximum of 50 LGVs movements per day (100 two-way movements). It is predicted that the construction and decommissioning phases of the Designated Development will lead to an increase of 186 two-way HDVs movements per day. This is below the threshold number of vehicle movements that would trigger a requirement for air quality modelling under the TII construction screening criteria (TII, 2022). Therefore, no adverse effect on any QI habitats or habitats which support QI species is likely from construction (or decommissioning) traffic. For dust emissions, guidance published by IAQM indicates that significant dust deposition arising from earthworks, construction / demolition and vehicles tracking out of the Site is not likely to extend more than 50m from these activities, and adjacent to roads used by construction vehicles up to 500m from the works (Holman *et al*, 2016). The QI habitats, or habitats which support QI species, within this distance of works are estuaries and mudflats, and the Shannon Estuary itself (with associated subtidal habitats), none of which are particularly sensitive to dust deposition (for example because they are regularly inundated and 'washed' by the tide. However, where required (e.g., during periods of dry weather, or during demolition works), dust suppression will be implemented as standard good practice. This will be achieved by wetting access tracks used by vehicles, and by using machinery which has dust suppression capabilities during demolition activities.

It is therefore concluded that airborne pollution will not result in adverse effects on the integrity of Lower River Shannon SAC during the construction or decommissioning phases.

Operational phase

With regard to operational traffic emissions, the numbers of vehicles associated with the operational phase of the Designated Development will be well below relevant screening criteria referred to in the section above on construction and decommissioning, thus an assessment is not required. There is no expectation of dust emissions during operation.

As set out above, airborne pollution is primarily a concern for habitats, and potentially individuals of flora or fauna if very high levels of airborne pollution reaching toxic concentrations are predicted. However, the only terrestrial QI species is otter and, given that air pollution levels from the Designated Development are predicted to be below human health risk levels, there is no possibility of direct harm on this (or other QI) species.

Several of the QI habitats of Lower River Shannon SAC are not sensitive to atmospheric nitrogen deposition or have no critical load for nitrogen deposition, these being:

- sandbanks which are slightly covered by sea water all the time [1110];
- mudflats and sandflats not covered by seawater at low tide [1140];
- reefs [1170];

- vegetated sea cliffs of the Atlantic and Baltic coasts [1230];
- watercourses of the plain to montane levels [3260]; and,
- alluvial forests with alder and ash [91E0].

These habitats are therefore not considered to be vulnerable to airborne pollution from the Designated Development and were therefore not included in the air quality modelling exercise.

For the remaining QI habitats, the critical load for nitrogen deposition was based on information provided by APIS. As set out under River Shannon and River Fergus Estuaries SPA, where a range is given by APIS, the critical load used for air quality modelling and this Appropriate Assessment was the lowest end of this range (i.e. taking a precautionary approach, the critical load was taken to be the lowest level of deposition which could possibly have adverse effects on the habitats). The critical load for nitrogen deposition for the QI habitats of Lower River Shannon SAC which may be sensitive to this impact used in this assessment are given in **Table 11**.

Table 11. Critical load for nitrogen deposition for QI habitats of the Lower River Shannon SAC

QI habitat [and code]	Critical load for nitrogen deposition used in air quality modelling and this Appropriate Assessment
Estuaries [1130]	20kgNha^{-1}yr^{-1}
Coastal lagoons [1150]	20kgNha^{-1}yr^{-1}
Large shallow inlets and bays [1160]	20kgNha^{-1}yr^{-1}
Perennial vegetation of stony banks [1220]	8kgNha^{-1}yr^{-1}
Salicornia and other annuals colonising mud and sand [1310]	20kgNha^{-1}yr^{-1}
Atlantic salt meadows [1330]	20kgNha^{-1}yr^{-1}
Mediterranean salt meadows [1410]	20kgNha^{-1}yr^{-1}
Molinia meadows on calcareous, peaty or clayey-silt-laden soils [6410]	15kgNha^{-1}yr^{-1}

The results of dispersion modelling are shown in **Table 4, Table 5** and **Table 6**. It can be seen that the Process Contribution from the Designated Development for NO_x and SO_2 are extremely small and consequently that predicted nitrogen deposition rates at all modelled locations within Lower River Shannon SAC are well below 1% of the relevant critical loads for the corresponding QI habitats.

The results of air quality modelling of operational emissions therefore suggests that there will be no effect on the QI habitats, meaning that the Conservation Objectives of the site will not be compromised. It is therefore concluded that there will be **no adverse effect on the integrity of Lower River Shannon SAC as a result of airborne pollution during the operational phase of the Designated Development.**

5.2.4 Changes to Groundwater Flows or Volume during the Construction Phase

The only QI habitats of the Lower River Shannon SAC which are potentially groundwater-dependent are *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils [6410] and alluvial forests [91E0]. According to the information given in the Conservation Objectives Supporting Document for the site, published by NPWS, neither of these habitats are located in proximity to the Designated Development, and certainly the nearest areas of such habitat are well beyond 250m distant. According to SEPA (2017), beyond 250m, impacts on groundwater caused by excavations is very unlikely to affect GWDTE.

Consequently, as there are no ground-water dependent habitats which are QI of the Designated Development within 250m of works areas, it is concluded that there will be **no adverse effect on the integrity of Lower River Shannon SAC as a result of changes to groundwater during the construction phase of the Designated Development.**

5.2.5 Disturbance of Qualifying Species During the Construction, Operational and Decommissioning Phases

5.2.5.1 Noise and vibration disturbance

The QI animals of the Lower River Shannon SAC which could be subject to disturbance are: Atlantic salmon, sea lamprey, brook lamprey, river lamprey, bottlenose dolphin and otter. Freshwater pearl mussel are not directly susceptible to disturbance by noise or visual stimuli. However, any effects of disturbance on Atlantic salmon could have indirect effects on this species because freshwater pearl mussels rely on salmonid fish for part of their lifecycle.

The aquatic QI species (fish and bottlenose dolphin) are not considered to be vulnerable to noise which passes through air. This is because sound does not transmit very well between air and water, with one source suggesting that the sound source needs to be 15 degrees or less relative to the surface of the water to pass through the air / water boundary (in other words, more-or-less directly above the water), otherwise the sound is reflected off the surface of the water (https://dosits.org/science/movement/how-does-sound-propagate-from-air-into-water/). Hawkins and Johnstone (1978) also concluded that Atlantic salmon are unlikely to detect sounds originating in air, but that they are sensitive to substrate-borne sounds.

Fish species

There have been multiple studies assessing the impacts of noise and vibration from piling on fish where the construction is in-stream, however very little has been investigated in relation to piling sound and vibration impacts from ground source into water (as will be the case for the Designated Development).

Hastings and Popper (2005) determined that the degree of damage to fish is not related directly to the distance of the fish from the pile, but to the received level and duration of the sound exposure. It is evident that sound affects different species to a differing degree. For example, Atlantic salmon hearing compared to carp and cod *Gadus* sp. is poor due to a narrow frequency span meaning its power to discriminate signals is poor with low sensitivity. This is likely due to a lack of secondary hearing modifications linking the swim bladder to the auditory system. Atlantic salmon are known to detect low frequency acoustic stimuli below 380Hz (Hawkins and Johnstone, 1978), coinciding with the dominant frequencies produced during impact piling operations in the range of 100Hz to 2kHz (Bailey *et al*, 2010). Studies have found no clear evidence of a startle response from Atlantic salmon in relation to playback of individual hammer strikes (Harding *et al*, 2016). In a closely related species, the brown trout *Salmo trutta*, no observable changes in behaviour were recorded from exposure to a real piling event (average noise level 134 re 1 µPa, peak) (Nedwell *et al*, 2003).

There is very little information available for lamprey of any species with respect to hearing, and no audiograms are understood to exist that would provide an indication as to their sensitivity to noise, or indeed a confirmation as to whether they are able to detect sound at all (Popper, 2005). In common with cephalopods (squids and octopuses), lamprey have statolith organs, and so it is thought that they may also have a sensitivity to low frequency sound (Lenhardt and Sismour, 1995) or particle velocity, rather than sound pressure. Therefore, behavioural or physiological effects on lamprey are usually considered likely to occur only when the organism is very close to a powerful noise source (Popper 2005). However, this assumption is based on the use of very limited morphological data.

There is a high degree of variability in predictions relating to the behavioural impact threshold distances in fish species. As a result of the uncertainty surrounding the way in which fish will react to sound, Popper *et al* (2014) do not provide criteria for behavioural responses. No studies have been found to provide data on how sound and pressure waves would dissipate through the ground before reaching the water, and how effectively these waves would then be transmitted to the water.

Bottlenose dolphin

The area of the Shannon Estuary immediately adjacent to the Designated Development is identified in the Conservation Objectives Supporting Document as one of two areas of ‘critical habitat’ for bottlenose dolphin with the SAC. Sound from anthropogenic activities can negatively impact marine mammals such as bottlenose dolphin as it influences their ability to echolocate, communicate and it can cause physical harm (Southall *et al*, 2007). Sound can cause certain cetacean species to change their behaviour and can result in increased alertness, modification of vocalisations, interruption or cessation of feeding or social interactions, alteration of movement or diving behaviour, and temporary or permanent habitat abandonment.

There are no widely agreed quantitative thresholds for behavioural disturbance of marine mammals, reflecting both a lack of empirical evidence and a high level of variability in behavioural responses which are often unrelated to the sound level received (e.g., Gomez *et al*, 2016). There have however been some attempts to describe behavioural responses in terms of a severity scale Southall *et al* (2021). For example, where there is a strong motivation to remain in an area, or there is a high level of habituation to man-made underwater sound, such as close to shipping lanes, animals may not demonstrate observable avoidance behaviour. Also, depending on the choice of numerical models to estimate sound source and propagation one can end up with predictions for disturbance ranges that are several orders of magnitude apart.

Currently established estimates of zones of influence from the JNCC (JNCC, 2020), based on empirical evidence rather than modelling distances, can be used to determine the areas subject to disturbance during construction activities. These distances, known as ‘effective deterrence ranges’ (EDR), can be used to estimate the number of individuals that could be disturbed during operations. Whilst the guidance is proposed for the waters of England, Wales and Northern Ireland, the EDRs are also considered appropriate for disturbance ranges in Irish waters. An EDR is only available for harbour porpoise *Phocoena phocoena* but, as this species is very sensitive to underwater sound (JNCC, 2020), these effect zones represent a worst-case scenario for bottlenose dolphin.

Otter

Guidance published by Transport Infrastructure Ireland (TII, formerly the National Roads Authority (NRA)) recommends that a buffer of 150 m should be applied around piling works and otter breeding holts (NRA, 2008). It is therefore taken that this is the maximum distance at which the noisiest works associate with the Designated Development could cause disturbance of this species.

Construction and decommissioning phases

Fish species

Disturbance of QI fish species as a result of the transfer of noise from air into water is not considered to be likely for the reasons set above. The primary concern is therefore ground-borne noise / vibration. However, no studies have been undertaken to provide data on how sound and pressure waves dissipate through the ground before reaching water, and how effectively these waves would then be transmitted to the water. Furthermore, the underlying substrate at the site, which will have a substantial influence on how noise / vibration travels, is also currently unknown.

The only works associated with the Designated Development which could theoretically generate sufficient noise or vibration levels to transfer through the ground into the Shannon Estuary (or the creek to the south of the Designated Development) is piling. No other works are expected to generate substantial noise or vibration in the ground, although they could generate noise through air.

As the potential impacts of piling on underwater noise and vibration remain unknown, a precautionary approach to this assessment is necessary. It is therefore assumed that some level of disturbance could be caused. However, this is considered likely to be low as the transfer of sound / vibration to the river is not expected to be effective, and noise / vibration levels are consequently not expected to be substantial within the watercourses. Furthermore, the following measures will be implemented to minimise as far as possible the noise or vibration which could be generated:

- adoption of BPM methods for piling;
- soft-start techniques will be employed during piling: and,
- piling will not start early in the day or late in the day (i.e., they will not start until at least one hour after sunrise and will cease not later than one hour prior to sunset). Lamprey species typically migrate in darkness, so this restriction will benefit them particularly.

In addition to the above, to further minimise the potential for disturbance to be caused, piling within 20 m of the Shannon Estuary and the creek to the south of the Designated Development will not be permitted during the migratory seasons for Atlantic salmon and lamprey species, these being:

- Atlantic salmon – March to August;
- brook lamprey – April to June (according to NatureScot (https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey));
- river lamprey – October to December and July to September (Maitland, 2003); and,
- sea lamprey – April to May (Maitland, 2003).

On the basis of the above, piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will only be permitted in September, January or February.

The 20m buffer distance will be measured from the edge of the water, which may change with tidal state, meaning that some locations may be piled within the migratory seasons, but only at certain times within the tidal cycle (i.e., when water levels drop to be more than 20m away from relevant piling location).

With the implementation of the above measures, the risk of disturbance being caused is considered to be very low. However, one final consideration which must be accounted for is the width of the Shannon Estuary at the Designated Development, which is between approximately 1.8 and 2.5km. Even though the transfer of noise / vibration to the watercourse is considered to be unlikely, and the key migration period for QI fish species will be avoided for the closest piling locations, there would be a large area of watercourse within which fish could swim which is well beyond the immediate vicinity of the Designated Development.

It is therefore concluded that there will be no adverse effect on the integrity of Lower River Shannon SAC as a result of the disturbance of QI fish species during the construction or decommissioning phases.

Bottlenose dolphin

As described above in relation to QI fish species, there is not expected to be a substantial transfer of noise or vibration from the ground into the Shannon Estuary. Noise / vibration levels are therefore not expected to be sufficient to cause significant disturbance of the QI bottlenose dolphin population.

The EDR recommended by JNCC (2020) for geophysical survey is 5km. These works will generate substantially more noise levels in the water than will be caused by piling works on the land for the Designated Development. The actual distance over which any impact could occur will therefore be much smaller than this. As stated above, the Shannon Estuary in the vicinity of the Designated Development is between approximately 1.8 km wide at its narrowest point, to around 2.5km. As noise / vibration levels will be minimal, there is therefore very likely to be a large area of the river that would be undisturbed and available to bottlenose dolphins.

Furthermore, all of the mitigation measures described above in relation to QI fish species will also act to minimise noise / vibration levels with mitigation benefits for bottlenose dolphin.

It is therefore concluded that there will be no adverse effect on the integrity of Lower River Shannon SAC as a result of the disturbance of QI bottlenose dolphin during the construction or decommissioning phases.

Otter

Otter are very unlikely to be as sensitive to underwater noise as fish or dolphin because their hearing is air-adapted and not specialised for detecting underwater sounds (Ghoul and Reichmuth, 2016). There is consequently no expectation that otters foraging or commuting within the Shannon Estuary or the creek to the south of the Designated Development will be disturbed by noise or vibration.

No resting sites were found by targeted field survey within 150m of the Designated Development and there is very limited potential for otters to shelter anywhere within this area. It is therefore extremely unlikely that disturbance will be caused to any otter while using a resting site. Although the habitats within 150m of the Designated Development are suitable for foraging and commuting by otter, the majority of works will take place outside of the hours of darkness, when otter are generally active. Moreover, there is a massive area of alternative suitable habitat in the surrounding area, beyond the distance at which any disturbance could be caused by works, in particular the Shannon Estuary. Therefore, the likelihood of disturbance being caused is low, and even if it were to occur, the consequences to otter would be very minor.

It is therefore concluded that there will be no adverse effect on the integrity of Lower River Shannon SAC as a result of the disturbance of QI otter during the construction or decommissioning phases.

Operational phase

Noise and vibration generated by the Designated Development during the operational phase will be minimal and not sufficient to cause disturbance to aquatic QI species (fish and bottlenose dolphin).

Furthermore, the level of noise generated during operation will be lower than that generated during the construction / decommissioning phase. Therefore, for the reasons set out above in relation to those phases – namely that no otter resting sites are present within 150m of the Designated Development, and that there is abundant foraging and commuting habitat in the wider area beyond 150m – there is no possibility of significant effects on this species.

It is therefore concluded that there will be no adverse effect on the integrity of Lower River Shannon SAC as a result of the disturbance of QI otter during the operational phase.

5.2.5.2 Lighting Disturbance

Artificial light can interfere with the physiological function and behaviour of fish and can disrupt the spawning of migratory species (Brüning, 2016). Newman (2015) found in laboratory experiments that artificial light at night affected the activity levels of Atlantic salmon fry, disrupting the amount and timing of refuge behaviour, with individuals seeking refuge 28% more than those not subject to artificial lighting. The same experiment found that this response was induced at a light intensity of only 1 lux and that even dim artificial lighting has the potential to cause effects. It was therefore concluded that reducing lamp brightness has little potential as a successful mitigation measure to reduce the impact of artificial lighting on freshwater ecosystems.

Dolphins and otters, which are both predatory animals and may therefore receive some benefit from increased illumination, are not considered to be particularly sensitive to artificial illumination of watercourses or (in the case of otter) riparian habitat.

Construction and decommissioning phases

As set out in Section 4, and under the assessment of lighting effects on the River Shannon and River Fergus Estuaries SPA, the following mitigation will be implemented during the construction and decommissioning phases to avoid illumination of habitats within the Lower River Shannon SAC:

- works within 20m of the Shannon Estuary and the creek immediately south of the Designated Development (which may be accessible to fish species from the Shannon Estuary) will not be permitted to take place during hours of darkness; and,
- elsewhere within the Site of the Designated Development, any lighting required during the construction and decommissioning phases will be directional and will be prevented from spilling light onto watercourses or other habitats through the use of cowling.

The Ecological Clerk of Works will be responsible for monitoring compliance with this mitigation and will require that the contractor(s) take corrective action if it is deemed that lighting used for the Designated Development is illuminating the SAC or other habitats which could be used by QI animals (particularly the creek to the south of the Designated Development).

There are no otter resting sites within 150m of the Designated Development, and thus very limited potential for disturbance of otter while using a place of shelter to occur. Furthermore, with the implementation of mitigation, it is predicted that there will be no adverse effect on QI animal species from lighting used during the construction or decommissioning phases of the Designated Development.

Operational phase

As also described in Section 4 and under the assessment of lighting effects on the River Shannon and River Fergus Estuaries SPA, any permanent lighting required for the safe operation of the Designated Development will be designed to avoid lightspill onto such areas. Using appropriate design software, permanent lighting will be designed so as any increase in illumination of habitats within the Lower River Shannon SAC does not increase by more than 1 lux.

With the implementation of this mitigation, it is predicted that there will be no adverse effect on QI animal species from lighting used during the operational phase of the Designated Development.

5.2.6 Prevention of migratory movements of QI species during the Construction and Decommissioning Phases

There will be no in-stream works associated with the Designated Development and therefore no physical barriers to the movement of any aquatic QI species. There will similarly be no new barriers created which prevent the movement of otter (although not a migratory species).

Consequently, the only way in which the normal migratory movements of QI animals could be caused is through non-physical disturbance / displacement, as described in the section in relation to noise / vibration and lighting. The assessment presented for those impacts is therefore applicable when considering the prevention of migratory movements and, as such, the mitigation put forward is applicable. With the implementation of such mitigation, which will prevent noise, vibration and light levels within the watercourses adjacent to the Designated Development being sufficient to cause disturbance, it is concluded that, as for disturbance, there will be **no adverse effect on the integrity of River Shannon SAC from the prevention of migratory movements of QI species at any stage of the Designated Development.**

5.2.7 Injury or mortality of QI species during the Construction and Decommissioning Phases

Injury or mortality of QI species of Lower River Shannon SAC could be caused through several of the impacts described above, including:

- if noise / vibration levels were sufficiently high that they injured aquatic species, particularly fish and bottlenose dolphins;

- if artificial illumination of watercourses made these species more vulnerable to predation (particularly relevant to fish species);
- as a result of waterborne pollution directly harming these species (again, primarily this would impact fish and bottlenose dolphin); and,
- collision with vehicles or plant (relevant to otter, only).

However, the mitigation described in the assessment above, and set out in Section 4, will help to avoid or minimise the risk of these impacts occurring. It is therefore considered that the risk of injury or mortality of any QI animals is extremely low, and there is concluded to be **no adverse effect on the integrity of Lower River Shannon SAC during the construction or decommissioning phases.**

5.2.8 Spread of invasive non-native species during the Construction and Decommissioning Phases

As described as part of the assessment for River Shannon and River Fergus Estuaries SPA, the spread of invasive non-native plant species could have multiple adverse effects on the QI habitats and species of the Lower River Shannon SAC.

However, as also set out above, with the implementation of appropriate biosecurity measures, there will be **no adverse effect on the integrity of Lower River Shannon SAC due to the spread of invasive non-native species during the construction or decommissioning phases.**

5.2.9 In-Combination Assessment

As previously discussed, seven planning applications have been identified as having the potential to act in-combination with the Designated Development to result in adverse effects on European site integrity, and are detailed in **Appendix C** with their planning status at the time of undertaking the search (January 2023). As tabled in **Appendix C**, four of the seven planning applications have been granted consent while the others are not yet determined. No plans have been identified which could give rise to in-combination effects with the possible impacts from the Designated Development. The existing Tarbert Power Station, Shannon LNG project and Moneypoint Power Station were assessed for cumulative air quality impacts as seen in **Table 4** and **Table 5**.

With the exception of the Shannon LNG, which is located approximately 4.2km from the Designated Development, none of the projects identified within the planning search will have emissions to air during their operation. Of the existing power stations assessed; Tarbert Power Station is located within the same facility as the Designated Development, and Moneypoint Power Station is located approximately 3km from the Designated Development. The Process Contribution of the Designated Development for NO_x, SO_2 and nitrogen deposition at all modelled locations was well below 1% of the relevant critical levels / loads. Therefore, with such a small contribution the impact of the Designated Development on the cumulative PEC for nitrogen deposition and NO_x is negligible. Therefore, the Designated Development in-combination with the existing Tarbert power station, Moneypoint Power Station and Shannon LNG will not have adverse effects on vegetation or habitats.

With the exception of Shannon LNG, all of the projects with planning applications are located in a single area, a little over 1.5km from the Designated Development. These projects are all relatively small and relate to battery storage or synchronous compensators. It is unlikely that any piling will be required to construct these developments, and the potential for disturbance of QI fish species or bottlenose dolphin is considered to be extremely small. Moreover, these projects are located in what appears from aerial images to be agricultural grassland which is very unlikely to be of importance to otter. The potential for significant disturbance of this species is therefore also very low.

The Shannon LNG project will involve substantial piling works within the River Shannon. A range of mitigation measures are proposed for this project to avoid significant effects on QI fish species and bottlenose dolphin (and also to minimise noise to air, caused by works on land). With the implementation of these measures, the NIS for the Shannon LNG project concluded that there would be no adverse effect on the integrity of the Lower River Shannon SAC (or any other European sites) from that project alone or in-combination with other plans or projects. Considering this, and the mitigation proposed in this NIS for the Designated Development at Tarbert, there is no expectation of significant disturbance being caused during construction, operation or decommissioning as a result of the in-combination impacts of multiple projects.

Other issues such as waterborne pollution and the spread of invasive non-native species must be managed as a requirement of other relevant legislation by these projects. It can therefore be reliably concluded that these

possible impacts will not give rise to significant adverse effects on European sites in-combination with the Designated Development.

It is thus concluded that there will be no adverse effects on the integrity of Lower River Shannon SAC from the Designated Development acting in-combination with any other plans or projects.

5.3 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA

5.3.1 Overview

The Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is a very large site centred on the borders between the counties of Cork, Kerry and Limerick. The site consists of a variety of upland habitats, though almost half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. A substantial part (28%) of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (*Juncus* spp.) and some areas subject to scrub encroachment.

This SPA is a stronghold for hen harrier and supports the largest concentration of the species in Ireland. A survey in 2005 recorded 45 pairs, which represents over 20% of the all-Ireland total. Breeding hen harrier is therefore the sole SCI species of the SPA.

The mix of forestry and open areas provides optimum habitat conditions for this species. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather *Calluna vulgaris* of unplanted bogs and heath. Hen harriers forage over open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests.

5.3.2 Airborne pollution during the Operational Phase

As described in more detail elsewhere in this NIS, the primary concern in relation to operational phase emissions of gaseous pollutants is the impacts that this can have on vegetation. Emissions from the Designated Development will not be sufficient, especially at the distance to the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, to have direct harmful effects on hen harriers.

Therefore, the potential for adverse effects on hen harriers arises should emissions lead to changes in the vegetation structure of habitats which they use for nesting and/or foraging.

APIS does not provide a critical load for nitrogen deposition onto conifer forests of the type used by hen harriers with Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA. However, bogs and heaths, which are used for both nesting and foraging by breeding hen harriers, are very sensitive to inputs of nitrogen from the atmosphere (e.g., https://www.apis.ac.uk/node/964). A critical load for nitrogen deposition of 5-10kgNha^{-1}yr^{-1} is therefore advised for bogs, or 10-20kgNha^{-1}yr^{-1} for heaths.

Taking a precautionary approach, therefore, a critical load of 5kgNha^{-1}yr^{-1} was adopted when assessing potential contributions from the operation of the Designated Development. The results of the dispersion modelling are shown in **Table 5**. It can be seen that at the modelled location within Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Process Contribution from the Designated Development for nitrogen deposition is predicted to be less than 0.01kgNha^{-1}yr^{-1}, which is well below 1% of the critical load of 5kgNha^{-1}yr^{-1}.

With the contribution from the Designated Development being well below the critical load for nitrogen deposition for even the most sensitive habitat which could be used by hen harriers within the Site, it is therefore concluded that there will be **no adverse effect on Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA from airborne pollution during the operational phase of the Designated Development.**

5.3.3 In-Combination Assessment

The existing Tarbert power station, Shannon LNG project and Moneypoint power station were assessed for cumulative air quality impacts as seen in **Table 4** and **Table 5**.

With the exception of the Shannon LNG, which is located approximately 4.2km from the Designated Development, none of the projects with planning applications will have emissions to air during their operation. Of

the existing power stations assessed; Tarbert power station is located within the same facility as the Designated Development, and Moneypoint power station is located approximately 3km from the Designated Development. The Process Contribution of the Designated Development for NO_x, SO_2 and nitrogen deposition at all modelled locations was well below 1% of the relevant critical levels / loads. Therefore, with such a small contribution the impact of the Designated Development on the cumulative PEC for nitrogen deposition and NO_x is negligible. Therefore, the Designated Development in-combination with the existing Tarbert power station, Moneypoint power station and Shannon LNG will not have adverse effects on vegetation or habitats.

It is therefore concluded that there will be **no adverse effects on the integrity of Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA from the Designated Development acting in-combination with any other plans or projects.**

5.4 Moanveanlagh Bog SAC

5.4.1 Overview

Moanveanlagh Bog is situated in Co. Kerry approximately 6km east of Listowel. The site comprises a raised bog that includes both areas of high bog and cutover bog. This is a relatively flat site with some marginal areas that slope relatively steeply towards the cutover. There are a few large hummocks but over much of the site the micro-topography is very uniform. A flush area extends along the north and northeast of the site. In the south-west a bog burst has occurred and concentrically arranged tear pools can be seen, some of which are up to 12m long. A swallow hole occurs near the middle of the site. Cutover bog occurs around the south-west, south and south-eastern margins of the high bog

5.4.2 Airborne Pollution During the Operational Phase

As described under the assessment for Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, bog habitats, which are the QI for Moanveanlagh Bog SAC, are sensitive to nitrogen deposition. They are consequently considered to have a critical load for nitrogen deposition of 5kgNha^{-1}yr$^{-1.}$

It can be seen in **Table 5** that at the modelled location within Moanveanlagh Bog SAC, the Process Contribution from the Designated Development for nitrogen deposition is predicted to be less than 0.01 kgNha^{-1}yr^{-1}, which is well below 1% of the critical load of 5kgNha^{-1}yr^{-1}.

It is therefore concluded that there will be no adverse effect on Moanveanlagh Bog SAC from airborne pollution during the operational phase of the Designated Development.

5.4.3 In-Combination Assessment

The existing Tarbert power station, Shannon LNG project and Moneypoint power station were assessed for cumulative air quality impacts as seen in **Table 4** and **Table 5**.

With the exception of the Shannon LNG, which is located approximately 4.2km from the Designated Development, none of the projects with planning applications will have emissions to air during their operation. Of the existing power stations assessed; Tarbert power station is located within the same facility as the Designated Development, and Moneypoint power station is located approximately 3km from the Designated Development. The Process Contribution of the Designated Development for NO_x, SO_2 and nitrogen deposition at all modelled locations was well below 1% of the relevant critical levels / loads. Therefore, with such a small contribution the impact of the Designated Development on the cumulative PEC for nitrogen deposition and NO_x is negligible. Therefore, the Designated Development in-combination with the existing Tarbert power station, Moneypoint power station and Shannon LNG will not have adverse effects on vegetation or habitats.

It is therefore concluded that there will be **no adverse effects on the integrity of Moanveanlagh Bog SAC from the Designated Development acting in-combination with any other plans or projects.**

6. Conclusion

The AA Screening for the Designated Development (AECOM, 2023) could not exclude the possibility of likely significant effects on four European sites:

- River Shannon and River Fergus Estuaries SPA;
- Lower River Shannon SAC;
- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA; and,
- Moanveanlagh Bog SAC.

The relevant potential construction, operational and/or decommissioning phase impacts which could give rise to significant effects on these sites was therefore assessed in detail in this NIS.

A range of mitigation measures are proposed in Section 4 of this NIS. With the implementation of these measures, and on the basis of the assessment described in this document, including the results of air pollution dispersion modelling and noise modelling, no significant effects on any European site are predicted, including from in-combination impacts arising from other plans or projects.

It is therefore concluded, in view of best scientific knowledge and on the basis of objective information, that the Designated Development will have no adverse effect on the integrity of any European site, either alone or in-combination with other plans or projects.

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8. Figures

Figure 1 – Site location

Figure 2 – European sites within the ZoI

Figure 3 – Air quality assessment of ecological receptors within 15km of the Designated Development

Figure 4 – Noise modelling assessment of potential ecological receptors within proximity to the Designated Development

Figure 5 – Habitat walkover survey

Figure 6 – Non-breeding bird low tide survey results: November 2022

Figure 7 – Non-breeding bird high tide survey results: November 2022

Figure 8 – Non-breeding bird low tide survey results: December 2022

Figure 9 – Non-breeding bird high tide survey results: December 2022

Figure 10 – Non-breeding bird low tide survey results: 24th January 2023

Figure 11 – Non-breeding bird low tide survey results: 25th January 2023

Figure 12 – Acoustic Barrier Fencing (Construction Phase)

Appendix A Information on European sites within the ZoI of the Designated Development

Below are details on the European sites which were established to be within the potential zone of influence of the construction, operation and / or decommissioning of the Designated Development. The sites are described in geographic order, with those closest to the Designated Development given first.

River Shannon and River Fergus Estuaries SPA

Site code: 0004077

Date of designation: January 1997

Local planning authority: Clare County Council, Kerry County Council and Limerick County Council

Total area: 322 km^2

Special Conservation Interests:

- Cormorant Phalacrocorax carbo [A017]
- Whooper swan [A038]
- Light-bellied brent goose *Branta bernicla hrota* [A046]
- Shelduck *Tadorna tadorna* [A048]
- Wigeon Anas penelope [A050]
- Teal *Anas crecca* [A052]
- Pintail *Anas acuta* [A054]
- Shoveler *Anas clypeata* [A056]
- Scaup *Aythya marila* [A062]
- Ringed plover Charadrius hiaticula [A137]
- Golden plover *Pluvialis apricaria* [A140]
- Grey plover Pluvialis squatarola [A141]
- Lapwing Vanellus vanellus [A142]
- Knot Calidris canutus [A143]
- Dunlin Calidris alpina [A149]
- Black-tailed godwit *Limosa limosa* [A156]
- Bar-tailed godwit *Limosa lapponica* [A157]
- Curlew Numenius arquata [A160]
- Redshank *Tringa totanus* [A162]
- Greenshank *Tringa nebularia* [A164]
- Black-headed gull Chroicocephalus ridibundus [A179]
- Wetland and waterbirds [A999]

Conservation objectives:

- To maintain the favourable conservation condition of cormorant which is defined by the following list of attributes and targets:
  - Breeding population abundance of apparently occupied nests: Target of no significant decline in numbers.
  - Productivity rate: Target of no significant decline in mean numbers.
  - Distribution of breeding colonies: Target of no significant decline of number, location or area (hectares).
  - Prey biomass available: Target of no significant decline in kilograms.
  - Barriers to connectivity: Target of no significant increase in number, location, chape, area (hectares).
  - Disturbance at the breeding site: Target that human activities should occur at levels that do not adversely affect the breeding cormorant population. Measurable by the level of impact.
  - Population trend: Long term population trend stable or increasing. Measurable by percentage change.
  - Distribution: There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation. Measurable by range, timing and intensity of use.
- To maintain the favourable conservation condition of whooper swan, light-bellied brent goose, shelduck, wigeon, teal, pintail, shoveler, scaup, ringed plover, golden plover, grey plover, lapwing, knot, dunlin, black-tailed godwit, bar-tailed godwit, curlew, redshank, greenshank, black-headed gull are defined by the following list of attributes and targets:
  - Population trend: Long term population trend stable or increasing. Measurable by percentage change.
  - Distribution: There should be no significant decrease in the range, timing or intensity of use of areas by the SCI bird species other than that occurring from natural patterns of variation. Measurable by range, timing and intensity of use.
- To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.
  - Wetland habitat area: The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation. Measurable by hectares.

Existing threats, pressures, and activities with impacts on the site:

The main threats to the River Shannon and River Fergus Estuaries SPA are disturbances from recreational activities, with walking being the most widespread. After walking, the second largest pressure comes from shooting and aircraft flying.

Lower River Shannon SAC

Site code: 002165

Date of designation: January 2002

Local planning authority: Clare County Council, Kerry County Council and Limerick County Council

Total area: 683 km^2

Qualifying Interests:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Reefs [1170]
- Perennial vegetation of stony banks [1220]
- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
- *Salicornia* and other annuals colonising mud and sand [1310]
- Atlantic salt meadows [1330]
- Mediterranean salt meadows [1410]
- Watercourses of plain to montane levels [3260]
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils [6410]
- Alluvial forests with alder *Alnus glutinosa* and ash *Fraxinus excelsior* [91E0]
- Freshwater pearl mussel *Margaritifera margaritifera* [1029]
- Sea lamprey *Petromyzon marinus* [1095]
- Brook lamprey *Lampetra planeri* [1096]
- River lamprey *Lampetra fluviatilis* [1099]
- Atlantic salmon *Salmo salar* [1106]
- Common bottlenose dolphin *Tursiops truncatus* [1349]
- Otter *Lutra lutra* [1355]

Conservation objectives:

- To restore the favourable conservation condition of freshwater pearl mussel which is defined by the following list of attributes and targets:
  - Distribution: Maintain at 7 km.
  - Population size: Restore to 10, 000 adult mussels.
  - Population structure (recruitment): No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution.
  - Population structure (mortality): No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution.
  - Habitat extent: Restore suitable habitat in more than 3.3km and any additional stretches necessary for salmonid spawning.
  - Water quality (macrovertebrate and phytobenthos (diatoms)): Restore substratum quality – filamentous algae: absent or trace (<5%).
  - Substratum quality (sediment): Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment.
  - Substratum quality (oxygen availability): Restore to no more than 20% decline from water column to 5 cm depth in substrate.
  - Hydrological flow regime (flow variability): Restore appropriate hydrological regimes.
  - Host fish: Maintain sufficient juvenile salmonids to host glochidial larvae
- To restore the favourable conservation condition of sea lamprey which is defined by the following list of attributes and targets:
  - Distribution (extent of anadromy): Greater than 75% of main stem length of rivers accessible from estuary.
  - Population structure of juveniles: At least three age/size groups present.
  - Juvenile density in fine sediment: Juvenile density at least 1/m^2.
  - Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.
  - Availability of juvenile habitat: More than 50% of sample sites positive.
- To maintain the favourable conservation condition of brook lamprey and river lamprey which are defined by the following list of attributes and targets:
  - Distribution: Access to all water courses down to first order streams.
  - Population structure of juveniles: At least three age/size groups of brook/river lamprey present.
  - Juvenile density in fine sediment: Mean catchment juvenile density of brook/river lamprey at least 2/m^2.
  - Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.
  - Availability of juvenile habitat: More than 50% of sample sites positive.
- To restore the favourable conservation condition of salmon which is defined by the following list of attributes and targets:
  - Distribution (extent of anadromy): 100% of river channels down to second order accessible from estuary.
  - Adult spawning fish: Conservation Limit (CL) for each system consistently exceeded.
  - Salmon fry abundance: Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling.
  - Out-migrating smolt abundance: No significant decline in number.
  - Number and distribution of redds: No decline in number and distribution of spawning redds due to anthropogenic

Lower River Shannon SAC

causes.
  - Water quality: At least Q4 at all sites sampled by EPA.
- To maintain the favourable conservation condition of sandbanks which is defined by the following list of attributes and targets:
  - Habitat distribution: The distribution of sandbanks is stable, subject to natural processes.
  - Habitat area: The permanent habitat area is stable or increasing, subject to natural processes.
  - Community distribution: Conserve the following community type in a natural condition; Subtidal sand to mixed sediment with *Nephyts* spp. community complex.
- To maintain the favourable conservation condition of estuaries which is defined by the following list of attributes and targets:
  - Habitat area: The permanent habitat area is stable or increasing, subject to natural processes.
  - Community distribution: Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community.
- To maintain the favourable conservation condition of mudflats and sandflats which is defined by the following list of attributes and targets:
  - Habitat area: The permanent habitat area is stable or increasing subject to natural processes.
  - Community distribution: Conserve the following community types in a natural condition; intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
- To restore the favourable conservation condition of coastal lagoons which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha
  - Habitat distribution: No decline, subject to natural processes.
  - Salinity regime: Median annual salinity and temporal variation within natural ranges.
  - Hydrological regime: Annual water level fluctuations and minima within natural ranges.
  - Barrier (connectivity between lagoon and sea): Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management.
  - Water quality (chlorophyll a): Annual median chlorophyll a within natural ranges and less than 5µg/L.
  - Water quality (Dissolved Inorganic Nitrogen (DIN)): Annual median DIN within natural ranges and less than 0.15mg/L.
  - Depth of macrophyte colonisation: Macrophyte colonisation to maximum depth of lagoons.
  - Typical plant species: Maintain number and extent of listed lagoonal specialists, subject to natural variation.
  - Typical animal species: Maintain listed lagoon specialists, subject to natural variation.
  - Negative indicator species: Negative indicator species absent or under control.
- To maintain the favourable conservation condition of large shallow inlets and bays which is defined by the following list of attributes and targets:
  - Habitat area: The permanent habitat area is stable or increasing, subject to natural processes.
  - Community distribution: Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex.
- To maintain the favourable conservation condition of reefs which is defined by the following list of attributes and targets:
  - Habitat distribution: The distribution of reefs is stable, subject to natural processes.
  - Habitat area: The permanent habitat area is stable, subject to natural processes.
  - Community distribution: Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex.
- To maintain the favourable conservation condition of perennial vegetation of stony banks which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing subject to natural processes, including erosion and succession.
  - Habitat distribution: No decline, or change in habitat distribution, subject to natural processes.
  - Physical structure (functionality and sediment supply): Maintain the natural circulation of sediment and organic matter, without any physical obstructions.
  - Vegetation structure (zonation): Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
  - Vegetation composition (negative indicator species): Negative indicator species (including non-natives) to represent less than 5% cover.
- To maintain the favourable conservation condition of vegetated sea cliffs which is defined by the following list of attributes and targets:
  - Habitat length: Area stable or increasing, subject to natural processes, including erosion. For sub- sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km;

Lower River Shannon SAC

Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km.

- Habitat distribution: No decline, subject to natural processes.
- Physical structure (functionality and hydrological regime): No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures.
- Vegetation structure (zonation): Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession.
- Vegetation structure (vegetation height): Maintain structural variation within sward.
- Vegetation composition (typical species and sub-communities): Maintain range of sub-communities with typical species listed in the Irish Sea cliff survey.
- Vegetation composition (negative indicator species): Negative indicator species (including non-natives) to represent less than 5% cover.
- Vegetation composition (bracken and woody species): Cover of bracken (Pteridium aquilinum) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%.

- To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha.
  - Habitat distribution: No decline, or change in habitat distribution, subject to natural processes.
  - Physical structure (sediment supply): Maintain natural circulation of sediments and organic matter, without any physical obstructions.
  - Physical structure (creeks and pans): Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.
  - Physical structure (flooding regime): Maintain natural tidal regime.
  - Vegetation structure (zonation): Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
  - Vegetation structure (vegetation height): Maintain structural variation within sward.
  - Vegetation structure (vegetation cover): Maintain more than 90% of area outside creeks vegetated.
  - Vegetation composition (typical species and sub-communities): Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009).
  - Vegetation structure (negative indicator species- *Spartina anglica*): No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%.
- To restore the favourable conservation condition of Atlantic salt meadows which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha.
  - Habitat distribution: No decline or change in habitat distribution, subject to natural processes.
  - Physical structure (sediment supply): Maintain natural circulation of sediments and organic matter, without any physical obstructions.
  - Physical structure (creeks and pans): Maintain creek and pan structure, subject to natural processes, including erosion and succession.
  - Physical structure (flooding regime): Maintain natural tidal regime.
  - Vegetation structure (zonation): Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
  - Vegetation structure (vegetation height): Maintain structural variation within sward.
  - Vegetation structure (vegetation cover): Maintain more than 90% of the saltmarsh area vegetated.
  - Vegetation composition (typical species and sub-communities): Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009).
  - Vegetation structure (negative indicator species – *Spartina anglica*): No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%.
- To maintain the favourable conservation condition of bottlenose dolphin which is defined by the following list of attributes and targets:
  - Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use.
  - Habitat use (critical areas): Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.
  - Disturbance: Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site.
- To restore the favourable conservation condition of otter which is defined by the following list of attributes and targets:
  - Distribution: No significant decline.
  - Extent of terrestrial habitat: No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds.
  - Extent of marine habitat: No significant decline. Area mapped and calculated as 4,461.6ha.
  - Extent of freshwater (river) habitat: No significant decline. Length mapped and calculated as 500.1km.
  - Extent of freshwater (lake/lagoon) habitat: No significant decline. Area mapped and calculated as 125.6ha.

Lower River Shannon SAC

  - Couching sites and holts: No significant decline.
  - Fish biomass available: No significant decline.
  - Barriers to connectivity: No significant increase.
- To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha.
  - Habitat distribution: No decline or change in habitat distribution, subject to natural processes.
  - Physical structure (sediment supply): Maintain natural circulation of sediments and organic matter, without any physical obstructions.
  - Physical structure (creeks and pans): Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.
  - Physical structure (flooding regime): Maintain natural tidal regime.
  - Vegetation structure (zonation): Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
  - Vegetation structure (vegetation height): Maintain structural variation within sward.
  - Vegetation structure (vegetation cover): Maintain more than 90% of area outside creeks vegetated.
  - Vegetation composition (typical species and sub-communities): Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009).
  - Vegetation structure (negative indicator species – *Spartina anglica*): No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%.
- To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes.
  - Habitat distribution: No decline, subject to natural processes.
  - Hydrological regime (river flow): Maintain appropriate hydrological regimes.
  - Hydrological regime (tidal influence): Maintain natural tidal regime.
  - Hydrological regime (freshwater seepages): Maintain appropriate freshwater seepage regimes.
  - Substratum composition (particle size range): The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles).
  - Water quality (nutrients): The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition.
  - Vegetation composition (typical species): Typical species of the relevant habitat sub-type should be present and in good condition.
  - Floodplain connectivity: The area of active floodplain at and upstream of the habitat should be maintained.
  - Riparian habitat: The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained.
- To maintain the favourable conservation condition of Molinia meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes.
  - Habitat distribution: No decline, subject to natural processes.
  - Vegetation structure (broadleaf herb grass ratio): Broadleaf herb component of vegetation between 40 and 90%.
  - Vegetation structure (sward height): 30-70% of sward between 10 and 80cm high.
  - Vegetation composition (typical species): At least 7 positive indicator species present, including 1 "high quality" species.
  - Vegetation composition (notable species): No decline, subject to natural processes.
  - Vegetation composition (negative indicator species): Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control.
  - Vegetation composition (negative indicator moss species): Bog mosses (*Sphagnum* spp.) not more than 10% cover; hair mosses (*Polytrichum* spp.) not more than 25% cover.
  - Vegetation structure (woody species and bracken (*Pteridium aquilinum*)): Cover of woody species and bracken not more than 5% cover.
  - Physical structure (bare ground): Not more than 10% bare ground.
- To restore the favourable conservation condition of Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) which is defined by the following list of attributes and targets:
  - Habitat area: Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed.
  - Habitat distribution: No decline.
  - Woodland size: Area stable or increasing. Where topographically possible, 'large' woods at least 25ha in size and 'small' woods at least 3ha in size.
  - Woodland structure (cover and height): Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi- mature trees and shrubs; and well-developed herb layer.
  - Woodland structure (community diversity and extent): Maintain diversity and extent of community types.
  - Woodland structure (natural regeneration): Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy.
  - Hydrological regime (flooding depth/height of water table): Appropriate hydrological regime necessary for maintenance of alluvial vegetation.

Lower River Shannon SAC

- Woodland structure (dead wood): At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder).
- Woodland structure (veteran trees): No decline.
- Woodland structure (indicators of local distinctiveness): No decline.
- Vegetation composition (native tree cover): No decline. Native tree cover not less than 95%.
- Vegetation composition (typical species): A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*).
- Vegetation composition (negative indicator species): Negative indicator species, particularly non-native invasive species, absent or under control.

Existing threats, pressures, and activities with impacts on the site:

There are a wide number of threats and impacts to the site. Of the land use activities in the area, grazing by cattle is the most common. Over-grazing and poaching have damaged some areas within the site. A large amount of the lands adjacent to the river have been reclaimed and further reclamation still poses an active threat to the land. Planted cord-grass *Spartina* sp. risks out-competing other species of grass and could reduce mudflats available to foraging birds. While the water quality is generally satisfactory, further industrial development along the river is recognised as a potential threat. Local recreational activities in the area also pose a threat to birds and dolphins.

Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA

Site code: 004161

Date of designation: March 2007

Local planning authority: Kerry County Council, Cork County Council and Limerick County Council

Total area: 566 km^2

Special Conservation Interests:

- Hen harrier *Circus cyaneus* [A082]

Conservation objectives:

- To restore the favourable conservation condition of hen harrier which is defined by the following list of attributes and targets:
  - Population size: Restore the numbers of confirmed breeding pairs to at least 38–39 confirmed breeding pairs.
  - Productivity rate: Maintain at least 1.0–1.4 fledged young per confirmed pair.
  - Spatial utilisation by breeding pairs: Restore the spatial utilisation of the SPA by breeding pairs to at least 97–98 %.
  - Extent and condition of heath and bog and associated habitats: Restore the extent and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation.
  - Extent and condition of low intensity managed grasslands and associated habitats: Restore the extent and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation.
  - Extent and condition of hedgerows: Maintain at least the length and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation.
  - Age structure of forest estate: Achieve an even and consistent distribution of age-classes across the forest estate.
  - Disturbance to breeding sites: Disturbance occurs at levels that does not significantly impact upon breeding hen harrier.

Existing threats, pressures, and activities with impacts on the site:

Threats and pressures not listed on NPWS website or European Environment Agency.

Moanveanlagh Bog SAC

Site code: 002351

Date of designation: April 2003

Local planning authority: Kerry County Council

Total area: 2 km^2

Qualifying features [and latest assessed condition]:

- Active raised bogs [7110]
- Degraded raised bogs still capable of natural regeneration [7120]
- Depressions on peat substrates of the *Rhynchosporion* [7150]

Conservation objectives:

- To restore the favourable conservation condition of active raised bogs which is defined by the following list of attributes and targets:
  - Habitat area: Restore area of active raised bog to 12.8ha, subject to natural processes.
  - Habitat distribution: Restore the distribution and variability of active raised bog across the SAC.
  - High bog area: No decline in extent of high bog necessary to support the development and maintenance of active raised bog.
  - Hydrological regime (water levels): Restore appropriate water levels throughout the site.
  - Hydrological regime (flow patterns): Restore, where possible, appropriate high bog topography, flow directions and slopes.
  - Transitional areas between high bog and adjacent mineral soils (including cutover areas): Restore adequate transitional areas to support/protect active raised bog and the services it provides.
  - Vegetation quality (central ecotope, active flush, soaks, bog woodland): Restore 6.4ha of central ecotope/active flush/soaks/bog woodland as appropriate.
  - Vegetation quality (microtopographical features): Restore adequate cover of high quality microtopographical features.
  - Vegetation quality (bog moss (*Sphagnum*) species): Restore adequate cover of bog moss (*Sphagnum*) species to ensure peatforming capacity.
  - Typical ARB species (flora): Restore, where appropriate, typical active raised bog flora.
  - Typical ARB species (fauna): Restore, where appropriate, typical active raised bog fauna.
  - Elements of local distinctiveness: Maintain features of local distinctiveness, subject to natural processes.
  - Negative physical indicators: Negative physical features absent or insignificant.
  - Vegetation composition (native negative indicator species): Native negative indicator species at insignificant levels.
  - Vegetation composition (nonnative invasive species): Non-native invasive species at insignificant levels and not more than 1% cover.
  - Air quality (nitrogen deposition): Air quality surrounding bog close to natural reference conditions. The total N deposition should not exceed 5kg N/ha/yr.
  - Water quality: Water quality on the high bog and in transitional areas close to natural reference conditions.
- The long-term aim for Degraded raised bogs still capable of natural regeneration is that its peat-forming capability is re-established; therefore, the conservation objective for this habitat is inherently linked to that of Active raised bogs (7110) and a separate conservation objective has not been set in Moanveanlagh Bog SAC.
- Depressions on peat substrates of the *Rhynchosporion* is an integral part of good quality Active raised bogs (7110) and thus a separate conservation objective has not been set for the habitat in Moanveanlagh Bog SAC.

Existing threats, pressures, and activities with impacts on the site:

Land uses such as peat cutting and cattle grazing pose threats to the bog. These are compounded by additional pressures such as fires and dumping, which have resulted in habitat loss. Invasive species are also a plight to the site, with Rhododendron *Rhododendron ponticum* and the carnivorous pitcher plant *Sarracenia purpurea* having established there.

Appendix B Framework Construction Environmental Management Plan

Temporary Emergency Generation Project

Tarbert Power Station

Appendix B
Framework Construction Environmental Management Plan (CEMP)

Project Number: 60697004

February 2023

Delivering a better world

Prepared for:

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Table of Contents

Executive Summary 1
1. Introduction 1
1.1 Overview 1
1.2 The Applicant 1
1.3 The Designated Development 1
1.4 The Designated Development Site 3
1.5 The Purpose and Structure of this Document 3
2. Construction Phase Arrangements 5
2.1 Indicative Programme 5
2.2 Working Hours 5
2.3 Environmental Training 6
2.3.1 Site Induction 6
2.3.2 Daily Pre-Work Briefings, Toolbox Talks and Training 6
2.4 Complaints 7
2.5 Communication 8
2.6 Site Housekeeping 8
2.7 Traffic Management 8
2.8 Parking Provisions 10
2.9 Wheel Cleaning Facility 10
2.10 Road Sweeper 10
2.11 Site Lighting 10
2.12 Recycling and Disposal of Waste 11
2.13 Best Practice Measures 11
2.14 Soil Management 11
3. Impact Avoidance and Mitigation Measures Implementation Plan 13
3.1 Overview 13
3.2 Implementation and Operation 51
3.2.1 Roles and Responsibilities 51
3.3 Checking and Corrective Action 53
3.3.1 Monitoring 53
3.3.2 Auditing 53
3.3.3 Consents and Licences 54
3.3.4 Records 54
3.4 Management Review 54
4. References 55
Appendix A Framework Resource and Waste Management Plan (RWMP) 56
A.1 Introduction 56
A.2 Waste Management Legislation and Policy Context 56
A.3 Waste and Recycling Targets 58
A.4 Indicative Roles and Responsibilities 59
A.5 Approach to Waste Management 60
A.6 Waste Identification, Classification, Quantification and Handling 64
A.7 Segregation and Storage 65
A.8 Documentation of Waste 66
A.9 Audit Monitoring and Review 67
A.10 Conclusion and Summary 67

Tables

Table 2-1: Indicative Construction and Commissioning Programme 5
Table 2-2: Summary of Training Requirements 7
Table 3-1: Air Quality 14
Table 3-2: Noise and Vibration 17
Table 3-3: Biodiversity 22
Table 3-4: Population and Human Health 30
Table 3-5: Land and Soils 31
Table 3-6: Water 34
Table 3-7: Climate 40
Table 3-8: Cultural Heritage 41
Table 3-9: Material Assets 42
Table 3-10: Landscape and Visual 43
Table 3-11: Traffic Management 44
Table 3-12: Waste Management 49
Table 3-13: Key Contractor Team Roles and Responsibilities (indicative) 52
Table A-1: Standard, Good and Best Practice Recovery Rates by Material 59
Table A-2: Roles and Responsibilities 59
Table A-3: Waste Types and Management 61

Executive Summary

This document has been prepared on behalf of SSE Generation Ireland Limited (the Applicant) to provide a framework for a Construction Environmental Management Plan (CEMP). The final/Contractor's CEMP will be produced by the contractor appointed by the Applicant to undertake the construction of the Designated Development. By implementing the measures set out in the following sections, the final CEMP will help to manage environmental issues appropriately during construction. These measures should therefore be considered as agreed embedded mitigation that will be applied to control the environmental effects of construction of the Designated Development.

Section 1 provides an overview of the Designated Development, the Applicant, and a description of the Designated Development Site.

Section 2 details the indicative construction programme, including construction facilities, delivery routes for construction materials, construction lighting and recycling and disposal measures for construction waste.

Section 3 gives an indication of the additional information which will be included under each sub-section within the final CEMP. This includes a table summarising the potential impacts for each environmental topic (Air Quality, Traffic, Noise and Vibration, Biodiversity, Landscape and Visual, Land and Soils, Water, Materials Assets, Cultural Heritage, Waste, Population and Human Health and Climate) reported in the Environmental Report (ER) (AECOM, 2023). Mitigation and enhancement measures described in the ER to address construction impacts are also presented. Monitoring requirements for mitigation measures are described where these have been proposed in the ER and the responsibilities for implementation are to be confirmed in the Final CEMP. Submission and approval of the Final CEMP prior to commencement of construction is proposed to be secured by a condition.

Appendix A presents a Framework Resource Waste Management Plan (RWMP). This outlines the waste management strategy for the construction phase by considering likely waste arisings from construction activities and provides recommended management measures, considering the principles of the waste hierarchy. A final RWMP would be developed by the appointed construction contractor.

1. Introduction

1.1 Overview

This Framework Construction Environmental Management Plan (CEMP) has been prepared by AECOM on behalf of SSE Generation Ireland Limited (the 'Applicant').

The Applicant is seeking approval for a Temporary Emergency Generation (TEG) project ('the Designated Development') within the boundary of Tarbert Power Station, Tarbert, Listowel, Co. Kerry. The Designated Development will involve construction works, installation and operation and eventual decommissioning of three Open Cycle Gas Turbines (OCGT) with a total operational output capacity of 150Mwe on 13.55ha of land ('the Site') within the existing operational Tarbert Power Station Site boundary.

The Designated Development is described in Section 2 'Description of the Designated Development' of the *Temporary Emergency Generation Power Plant Tarbert Power Station Environmental Report (ER)*[1] and Section 1.3 of this CEMP.

1.2 The Applicant

The Applicant, SSE Generation Ireland Limited, part of the FTSE-listed SSE plc, is a leading developer, owner and operator of flexible generation, energy-from-waste, and energy storage assets, with over 600 direct employees across the UK and Ireland. SSE's vision is to become the leading provider of flexible thermal energy in a net-zero world. SSE Generation Ireland Ltd. currently operates the existing Tarbert Power Station.

In accordance with the provisions of the *Development (Emergency Electricity Generation) Act 2022*, SSE will apply to the Minister for approval under Section 7 of the Act to carry out the Designated Development.

SSE has entered into an agreement with EirGrid to progress certain time-sensitive works which includes the preparation of application documents to seek approval from the Minister for the Designated Development under the new legislation.

EirGrid identified the need for the Designated Development and identified the technology and the location *i.e.,* Tarbert Power Station, to provide temporary emergency electricity generation.

1.3 The Designated Development

The Designated Development consists of the installation of three OCGT units which will collectively have the capacity to generate 150MWe of temporary emergency electricity, site development and associated ancillary works required for the operation of the plant. The plant will operate as an emergency plant, with a maximum running time of 500 hours per annum, spending the majority of time on standby, and will be run to meet emergency security of supply needs while complementing renewable power generation sources.

The objective of the project is to facilitate and ensure security of supply and provide support to the electricity network during periods when there is a gap between the renewable power generation and power demand.

The three LM6000 units have been selected for development as they are able to respond to changes in electricity demand by starting up quickly and achieving full output within a short period of time.

With regard to the operational phase, it is envisaged that the Designated Development will have to be temporarily operational at the Site for approximately five years. At the end of the temporary period, the Designated

[1] AECOM (2023)

Development will be decommissioned, dismantled, and removed from this Site. Decommissioning would therefore be expected to commence at some point during 2027 and 2028.

The Designated Development will comprise the following main components:

- 3 No. 50 MW Gas Turbine generators;
- 3 No. Exhaust stacks – 30m tall;
- 3 No. Fin fan Coolers with several control modules;
- 6 No. Fuel oil tanks (80m^3) (containerised);
- 6 No. Containerised switchgear and control modules;
- 1 No. Fuel oil drain tank for filter change over;
- 3 No. Fuel oil storage tanks (1000m^3);
- 2 No. Demineralisation treatment units;
- 1 No. Demineralisation water storage tanks (1320m^3;.
- 1 No. Raw and Fire water storage tank (2500m^3);
- 2 No. Distillate fuel unloading and forwarding;
- 2 No. Pre Filters;
- 1 No. Coalescer Filter;
- 3 No. Fuel oil heaters;
- Instrument air compressors;
- 3 No. Generator circuit breakers;
- 2 No. Generator step-up transformers;
- 1 No. Administration building;
- 1 No. 220kV substation, and
- Circa. 560m underground cable to connect to an existing onsite 220kV substation

The construction phase of the Designated Development will comprise:

- temporary construction and laydown areas comprising hardstanding, laydown, and open storage areas;
- temporary facilities and stores;
- materials and plant storage;
- contractor compound and construction staff office and welfare facilities;
- temporary vehicle parking facilities; and
- signage.

In connection with and in addition to the above, the following infrastructure will be included:

- internal roads;

- external lighting, including lighting columns;
- security fencing and gates; and
- utilities, pipes, cables and connection to surface water drainage systems, oil-water separators, including channelling, culverting, crossings and works to existing drainage systems.

Further information on the Designated Development is provided within Section 2 'Description of the Designated Development' of the TEG Tarbert Power Station ER.[2]

1.4 The Designated Development Site

The Designated Development is located in Tarbert, Co. Kerry, Ireland within the existing Tarbert Power Station. The existing Tarbert Power Station occupies an area of approximately 42ha. The site on which the main elements of the Designated Development will be located is located on the western side of the existing Tarbert Power Station Site, immediately west of four existing fuel tanks which are associated with the existing operating power station. The Site for the Designated Development works is (hereafter referred to as 'the Site') 13.55ha.

The Site is off the N67 (a National Secondary road), situated on a brownfield site, and is surrounded by electricity generating, transmission and fuel storage infrastructure and will utilise an area of existing made ground, which is relatively flat in nature.

The area where the main components of the Designated Development will be located is bound to the north by fuel storage tanks which supply Tarbert Power Station and the Shannon Estuary; to the east by the Power Station, EirGrid 110kV and 220kV electrical transmission substations and an access road from the N67 National Secondary; to the south by a lagoon draining the Shannon Estuary and agricultural lands further south on the mainland; and to the west/northwest by Tarbert Jetty and the Shannon Estuary.

The Site will be accessed via the N67 from the southern or eastern entrances, which also serve the existing Power Station and the Tarbert-Killimer Ferry Terminal. The N67 connects the Designated Development Site to the N69 Tralee / Limerick Road, located approximately 1.8km to the south of the Site.

The Site is located adjacent to the Lower River Shannon Special Area of Conservation (SAC) and the River Shannon and River Fergus Estuaries Special Protect Area (SPA). Tarbert Bay is also a proposed Natural Heritage Area (pNHA).

1.5 The Purpose and Structure of this Document

This Framework CEMP sets out a series of proposed measures that would be applied by the Contractor to provide effective planning, management, and control during construction to control potential impacts upon people, businesses, and the natural and historic environment.

This Framework CEMP has been produced in conjunction with the ER with the aim of ensuring that design and impact avoidance measures reported in the ER are implemented and are effective, together with any additional mitigation measures proposed to reduce significant adverse effects. Site-specific controls, which will be included within the final CEMP, would be developed based on the measures set out in this Framework CEMP. The final CEMP will be developed by applying the commitments set out in this Framework, the ER, Natura Impact Statement (NIS) (AECOM, 2023) produced for the Designated Development and any conditions (should approval be granted).

It is expected that the Contractor will comply, as a minimum, with applicable environmental legislation at the time of construction, together with any additional environmental controls imposed by An Bord Pleanála (hereafter referred to as the Bord). The Final CEMP will, therefore, be designed with the objective of compliance with relevant

[2] AECOM (2023)

environmental legislation, the mitigation measures set out within the ER, the NIS produced for the Designated Development, this Framework CEMP, and any conditions (should approval be granted). Any additional construction licences, permits or approvals that are required would be listed in the Final CEMP, including any environmental information submitted in respect of them.

Further guidance on specific areas, such as soil handling and dust management, are taken from industry best practice guidance documents, as set out in each discipline section of this Framework CEMP. The references to guidance documents are not intended to be exhaustive.

The Final / Contractor's CEMP will broadly reflect the structure of this Framework CEMP, which is as follows:

- **Section 2** provides an indication of the construction arrangements that have been assessed in the ER;
- **Section 3** presents additional information that might be included under each sub-section within the Final CEMP, which includes:
  - environmental impacts;
  - impact avoidance or reduction of measures to be applied, including any measures identified during the detailed design or construction phase;
  - any other additional mitigation measures;
  - additional surveys or monitoring considered necessary pre-construction or during construction in order to confirm the status of receptors, and the effectiveness of impact avoidance/mitigation measures;
  - corrective action procedure to be applied, where necessary; and
  - links to other complementary plans and procedures.
- **Appendix A** comprises a Framework Resource and Waste Management Plan (RWMP)'

In summary, the final CEMP will identify how commitments made during the assessment (and reported in the ER) will be translated into actions on-site.

The Contractor will be responsible for working in accordance with the environmental controls documented in the Final CEMP, which will allocate responsibilities for environmental performance. The overall responsibility for implementation of the Final CEMP will lie with the Applicant.

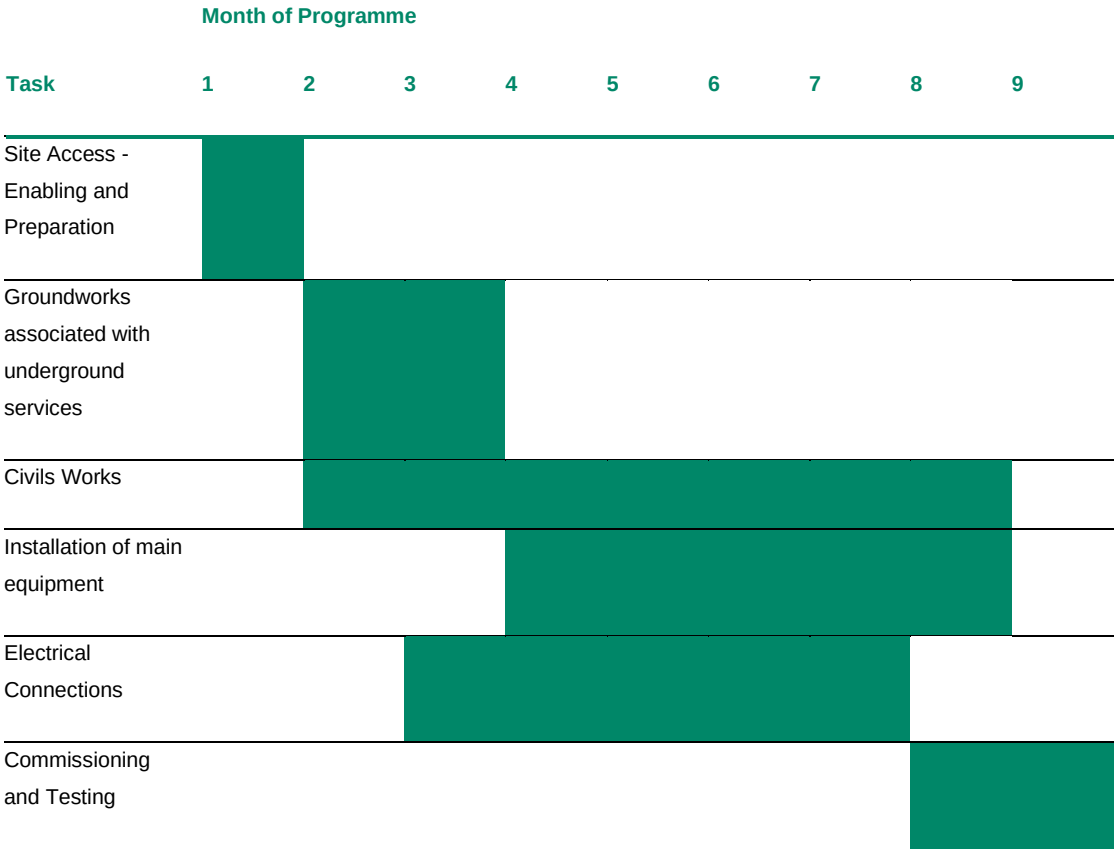
2. Construction Phase Arrangements

2.1 Indicative Programme

At this stage, a detailed construction programme is not available, as this is normally determined by the Engineering, Procurement and Construction (EPC) contractor for the construction of the Designated Development.

Construction activities will progress from site set up and preparation, to construction and modular assembly works of the various components, followed by commissioning and testing of the Designated Development. Construction of the Designated Development could (subject to the necessary approvals being granted) potentially start in March 2023. Construction works would commence with initial site access and set up, pre-construction works, ground works, piling and construction of plant equipment. The construction programme and commissioning are expected to be completed within approximately nine months, see Table 2.1 for an indicative programme.

Table 2-1: Indicative Construction and Commissioning Programme



The appointed Contractor will confirm the duration of construction phase works in the Final / Contractor's CEMP.

2.2 Working Hours

To address the urgent need to install the temporary emergency generation power plant, construction phase works will take place over a minimum of two eight hour shifts and on occasions, three eight hour shifts per day, seven days a week, during construction and commissioning phases, acting in full compliance with Irish labour and Health and Safety laws.

2.3 Environmental Training

2.3.1 Site Induction

All personnel working on the Designated Development shall attend a site induction. Personnel attending such an induction shall complete a site induction record acknowledging attendance and confirming that they understand and agree to comply with the requirements of the Designated Development Site. Copies of all certificates of competency, licences and other qualifications as deemed necessary by the Contractor shall be copied and documented. The environmental induction shall run concurrently with safety awareness training.

Induction shall include:

- overview of the goals and objectives of the environmental policy and CEMP;
- awareness in relation to the environmental risk associated with the Designated Development and methods of avoiding environmental risks as identified within the CEMP, the planning conditions, and any other relevant plans, documents, or reports;
- awareness of roles and individual responsibilities and environmental constraints to specific jobs;
- location of any sensitive receptors on or adjacent to the Site;
- location of habitats and species to be protected during construction, how activities may affect them and methods necessary to avoid impacts, controls to minimise noise and the importance of pollution prevention measures to protect nearby watercourses and sensitive receptors including residential properties;
- information on the environmental emergency response procedure to be followed onsite, should an environmental emergency occur, including contact details for key site personnel to contact in an emergency; and
- information on the storage locations of spill kits across site and on the correct use of spill kits.

2.3.2 Daily Pre-Work Briefings, Toolbox Talks and Training

All supervisors are required to carry out daily briefings at the commencement of each shift to ensure environmental issues specific to the work being performed are being understood, evaluated, and addressed. All personnel involved with site works must be briefed and sign onto the daily briefing form prior to commencing activities.

Toolbox Talks may be conducted prior to the start of specific work elements where there is a substantial environmental risk or when required to reinforce ongoing environmental issues and shall be repeated as necessary over the duration of the relevant works. Any toolbox talk training conducted shall ensure that relevant information is communicated to the workforce and that feedback can be provided on issues of interest or concern.

Personnel and sub-contractors working on environmentally sensitive sites shall be provided with environmental training to achieve a level of awareness and competence appropriate to their assigned activities. Targeted environmental awareness training may be provided to individuals or groups of workers with a specific authority or responsibility for environmental management or those undertaking an activity with a high risk of environmental impact. Environmental training will be recorded, and the records will be available for inspection upon request.

All personnel and staff involved in the construction, operation and decommissioning of the Designated Development shall be briefed on the ecological risks present and ecological sensitivities of the Designated Development Site and its environs through ‘Toolbox Talks’ and provision of clear information about protected species and restricted areas and activities and will be made aware of the presence of ecological features (including the QI / SCI features of European sites) in the vicinity of the Designated Development and the mitigation measures

and working procedures which must be adopted. Toolbox Talks shall also cover legal requirements and working arrangements necessary to comply with legislation. All staff (including sub-contractors) will receive regular updated talks and briefings.

Clear instruction on hazardous wastes and the particular dangers of each hazardous waste will be incorporated into training. Table 2-2: summarises the indicative environmental training that will likely be required to be undertaken as a minimum as part of the Designated Development.

Table 2-2: Summary of Training Requirements

Training	Target	Frequency	Record
Site Induction	All site personnel	Prior to working onsite	Induction Record Form
Daily Pre-working Briefings	All site personnel	Prior to commencing daily works	Briefing Record Form
Toolbox Talk	Personnel relevant to the topic	As required	Toolbox Record Form
Project Management Meeting	Project Managers, Engineers, and Site Supervisor	Monthly	Meeting Minutes Record
Environmental Training	Personnel relevant to the activity	Quarterly or more frequently as required	Training Attendance Form
Environmental Bulletin	All company and Project personnel	As required	Environmental Bulletin Form

2.4 Complaints

A Complaints Register for internal communication and for receiving, documenting, and responding to environmental complaints from external parties shall be established and will be maintained.

When a complaint is received (telephone calls and letters of complaint etc.), the following information must be taken as a minimum:

- Date and time of the complaint are recorded;
- Name of complainant (if provided); and
- Nature of the complaint.

A mechanism for managing stakeholders' questions, concerns, and grievances from local residents and stakeholders' shall be implemented, appropriate conflict resolution processes will be implemented to ensure any issues are heard by the developer. All complaints received from external sources and incidents must be reported to the CEMPC and the appropriate site personnel. Measures shall include but will not be limited to:

- complying with the requirements of the Data Protection Act, and other relevant legislation, the Contractor will record all Complaints, Comments and Queries (correspondence) received during construction. Stored data will be secured against theft, intrusion, or modification by malicious third parties in-line with current best practice;
- the Contractor will record any actions, including further correspondence, taken in respect of any Complaint, Comment or Query;
- the following timescales will apply in the Contractor's management of correspondence following submission:
    - within 8 working hours from receiving the complaint, an acknowledgement will be sent to the correspondent; and

  - within 72 hours, the Contractor will issue a response to any correspondence detailing further actions to be undertaken.

- the Contractor will aim to have completed and implemented their actions within seven working days of receiving correspondence.
- the Contractor will have a means by which to explore the Complaints, Comments and Queries interface within the reception area of the site offices, to allow access to the records during normal working hours.

2.5 Communication

The Contractor will:

- develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person(s) accountable for complaints and/or queries on the site boundary; and
- display the head or regional office contact information.

2.6 Site Housekeeping

Good housekeeping is an important part of good environmental practice and helps to maintain a more efficient and safer site. The Site will be tidy, secure, and have clear access routes that are well signposted. The appearance of a tidy, well-managed site can reduce the likelihood of theft, vandalism, complaints and/or specific hazards that could affect the safe operation of the other businesses in the area, such as bird hazards and wind-blown litter.

As outlined in the fourth edition of CIRIA's 'Environmental good practice on site guide' (C741), when considering good housekeeping, the Contractor will implement the following steps:

- adequately plan the site with designated areas of materials and waste storage;
- segregate and label different types of waste as it is produced and arrange frequent removal;
- keep the site tidy and clean;
- ensure that no wind-blown litter or debris leaves the site, use covered skips to prevent wind-blown litter;
- keep hoarding tidy – repair and repaint when necessary, removing any fly posting or graffiti;
- frequently brush-clean wheel washing facilities and keep haul routes clean from site derived materials;
- keep roads free from mud by using a road sweeper; and
- ensure the site is secure.

2.7 Traffic Management

A Framework Construction Traffic Management Plan (CTMP) has been produced for the Designated Development and provides a framework document for ensuring work activities in, near or having impact upon the public highway, are undertaken safely and with minimal impact on traffic movement and existing infrastructure throughout the works programme.

During construction, the appointed contractor will ensure that the impacts from construction traffic on the local community (including local residents and businesses and users of the surrounding transport network) are minimised, where reasonably practicable, by implementing the measures set out in the Framework Construction Traffic Management Plan (CTMP).

The Contractor will be required to always accommodate and make provision for access and egress to local residential premises, paying particular attention to the provision of pedestrian/disabled/cyclist safe access and egress. Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and will be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons

Access to the Designated Development Site during construction for both construction workers and HGV traffic will be via the two existing accesses off the N67 to the southeast and east. The N67 serves the existing Power Station and the Tarbert-Killimer Ferry Terminal. The N67 connects the Site to the N69 Tralee / Limerick Road, located approximately 1.8km to the south. Traffic control will be used to and from the Designated Development Site as required, managed by an allocated member of the construction team.

The majority of construction traffic is expected to be generated between month one and month seven of the Construction Programme of the project. Based on development of a similar nature, it is estimated that there will be up to 15 HGVs arrivals per day (30 two-way movements).

In addition to these trips, there are also expected to be a maximum of 80 HGV arrivals (160 two-way trips) associated with cut and fill movements. These trips will occur during months two and four.

The number of construction workers required during the construction phase is expected to peak at approximately 200 persons. Staff are expected to travel to the Designated Development Site via a combination of carsharing and private passenger vehicles with approximately 50 staff vehicles movements during the peak construction staffing periods.

It is estimated that a number of abnormal load deliveries will be required during the construction phase of the project. The emergency generation plant and equipment will be shipped to Ireland, possibly to Foynes Port in County Limerick, which is to the approximately 28km east of the Designated Development Site and then transported by road via the N69 and N67. This would reduce road traffic where possible. The expected abnormal loads are:

- 3 x gas turbine units;
- 7 x control modules;
- 3 x generator circuit breakers;
- 3 x generators;
- 3 x 30m turbine stacks;
- 2 x Generator Step-up Transformers;
- 1 x raw and fire water storage tank;
- 1 x demineralisation water storage tanks; and
- 3 x liquid fuel storage tanks.

More details on Abnormal Loads are provided in the Framework CTMP, prepared for the Designated Development. A mobile crane is likely to be required on Site for part of the construction works.

The CTMP will consider where deliveries will be made to/from, what roads will be used and will include the scheduling of deliveries to and from the Site. Material deliveries and collections from Site will be planned, scheduled, and staggered to avoid unnecessary build-up of construction works related traffic. HGV trips are anticipated to arrive and depart the Site at a uniform rate throughout the day to avoid pressure on the morning and evening peak hour periods.

The Contractor must distribute the HGV routing plan to all HGV drivers during their induction. It will be a condition of contract between the Applicant and the Contractor to require that all construction HGV deliveries must use the designated routes to access and egress the construction site. Sanctions will be put in place to deal with non-compliance.

The Contractor will erect temporary signage to appropriately direct all HGV traffic relating to the Designated Development (both accessing and egressing the Site). The Contractor will be required to maintain all the HGV route signage.

A full CTMP will be developed by the Contractor prior to the commencement of work on-site. No works shall commence until such time that the full CTMP has been prepared.

2.8 Parking Provisions

Parking demand will vary throughout the construction phase and parking areas will be set aside within the Site to accommodate parking for construction workers. There will be specific on-site parking locations for staff vehicles, separate from construction vehicles and laydown areas. No extraneous parking will take place.

2.9 Wheel Cleaning Facility

In the interests of highway safety, wheel cleaning facilities will be installed at the Site from the start of the construction phase. All HGVs will be required to use the wheel wash prior to exiting the Site.

2.10 Road Sweeper

If required as identified by routine visual inspections, a mechanical road sweeper will be employed to clean the public roads adjacent to the Site of any residual debris that may be deposited on the public roads leading away from the construction works.

2.11 Site Lighting

Construction works outside daylight hours will be undertaken using adequate site lighting to ensure safe working conditions. Site lighting during construction will be designed to avoid light spill and will be pointed down at a 45-degree angle away from sensitive receptors.

Where temporary construction lighting is required, it will consist of the lowest lumen lighting possible while also maintaining a safe working environment. Lighting will be designed so as not to cause a nuisance outside of the Site in relation to views from residential receptors or light disturbance to ecological receptors.

During the construction phase, any artificial lighting which is required (e.g., for construction works and security purposes) will be directed on to required areas and light spill will be minimised by the use of beam deflectors/ cowls/hoods (or similar). When not required, all temporary lighting will be switched off. Light spill onto any notable ecological features which include the watercourses, treelines, hedgerows, and woodlands will be avoided or minimised by the use of cowling.

Lighting will be designed so as not to cause a nuisance outside of the Site in relation to views from residential receptors or light disturbance to ecological receptors. Lighting will be turned off when not in use except to meet the minimum requirements for security and Health and Safety.

Illumination of the Shannon Estuary, the creek to the immediate south of the Designated Development (which is encompassed by the River Shannon and River Fergus Estuaries SPA), and surrounding semi-natural habitats will be avoided during the construction and decommissioning phases in the following ways:

- works within 20m of the Shannon Estuary and the tidal lagoon immediately south of the Designated Development (which may be accessible to fish species from the Shannon Estuary) will not be permitted to take place during hours of darkness;
- elsewhere within the Site, any lighting required during the construction and decommissioning phases will be directional and will be prevented from spilling light onto watercourses or other habitats through the use of cowling.
- any permanent lighting required during the operational phase will be restricted to the absolute minimum required for security and safety purposes. It will be designed using appropriate design software (such as Lighting Reality PRO) so that light levels at the Shannon Estuary and the creek to the immediate south of the Designated Development do not increase from the current baseline by more than 0.2 lux (this being the approximate brightness of a full moon). No direct illumination of the Shannon Estuary or creek to the south of the Designated Development will be permitted.
- the ECoW will be responsible for monitoring compliance with this mitigation and will require that the contractor(s) take corrective action if it is deemed that lighting used for the Designated Development is illuminating the SAC or other habitats which could be used by QI animals (particularly the creek to the south of the Designated Development).

A Lighting Management Plan (LMP) will accompany the Final CEMP which sets out the approach for use of lighting during the construction phase.

2.12 Recycling and Disposal of Waste

To control the waste generated during the site preparation and construction phase, the contractor will minimise the creation of waste, maximise the use of recycled materials and assist the collection, separation, sorting, recycling, and recovery of waste arisings, as far as reasonably practicable. The waste hierarchy outlines that waste prevention and minimisation are the priority in managing wastes, followed by waste reuse and recycling, with disposal being considered as a last resort.

A site-specific Resource and Waste Management Plan (RWMP) will be prepared by the Contractor in line with best practice guidelines such as the EPA '*Best Practice Guidelines for the preparation of resource & waste management plans for construction and demolition projects'* 2021. The RWMP will be developed to control construction activities to minimise, as far as reasonably practicable, impacts on the environment and will specify the waste streams to be estimated and monitored and will set goals with regards to the waste produced. A Framework RWMP is included in **Appendix A** of this Framework CEMP.

2.13 Best Practice Measures

The Contractor would be encouraged to be a member of the 'Considerate Constructors Scheme' which is an initiative open to all contractors undertaking building work.

Construction industry guidance (e.g., from the Construction Industry Research and Information Association (CIRIA)) will be adopted as far as reasonably practicable to assist in reducing the potential for pollution and nuisance. This will be achieved by employing best practice measures.

2.14 Soil Management

Impacts relating to the handling, movement, and temporary storage of soils, will be controlled through the Final CEMP. Measures within the Final /Contractor's CEMP will include:

- a method statement for the works to include soil handling and storage proposals;

- a restoration specification (where applicable); and
- a post-works survey to confirm condition (where applicable).

Soils will be managed in accordance with the DEFRA *Construction Code of Practice for the Sustainable Use of Soil on Development Sites* (DEFRA, 2009) to minimise impacts on soil structure and quality.

The Contractor will develop a Soil Resource Plan (Soil/Sediment Control Plan) in accordance with relevant legislation and guidance. The plan will include information / details on such topics as:

- soil handling procedures, legislation and guidance used;
- good practice and general principles of soil handling;
- methods of stripping, stockpiling and stockpile maintenance, respreading and include an outline of the machinery to be used;
- haul routes to be used;
- the location and content of each soil stockpile;
- schedule of volumes of each material;
- expected after use / disposal of material (in line with all relevant legislation);
- roles and responsibilities including a list of responsible personnel for soil management supervision;
- biosecurity measure to be implemented (if required);
- seasonal working constraints;
- testing of soil conditions;
- importing soil to site;
- transport of soil to and from site.

3. Impact Avoidance and Mitigation Measures Implementation Plan

3.1 Overview

This section sets out the embedded impact avoidance and additional mitigation, enhancement, and management measures to be included as a minimum in the Final CEMP. It also illustrates where additional surveys will be required, either pre-construction or during construction. It describes how the monitoring strategy would be implemented in order to assess the effectiveness of mitigation measures, monitor the impact of construction works and take other actions necessary to enable compliance.

In the Final CEMP, this section will identify the responsible party for each mitigation, enhancement measure or monitoring requirement. As a contractor has not yet been appointed, responsibilities cannot be assigned at this stage.

Table 3-1: Air Quality

Potential Impact	Mitigation/Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
There is very little likelihood of significant air quality effects during construction based on the distances to receptors, the activities proposed, and the use of industry standard control measures. In terms of N deposition, the site has no perceptible impacts (<1%) at any SAC or SPA designated habitat.	The Contractor will be required to implement measures to minimise the amount of dust and emissions (including odour) produced during the construction of the Designated Development, including the production of a Dust Management Plan as part of the Final CEMP. Standard industry best practice mitigation measures shall be applied to the Site, for example that described in: – 'Control of dust from construction and demolition activities' (Kukadia, V., Upton S., & Hall, D. (2003); – 'Best Practice Guidance: The control of dust and emissions from demolition and construction' (Greater London Authority (GLA) (2006); – 'Guidance on the assessment of dust from demolition and construction', Institute of Air Quality Management (IAQM. (2014); and – 'Guidelines for the Treatment of Air Quality during Planning and Construction of National Roads' (TII. (2011). Mitigation measures will be undertaken so that construction works are carried out in such a manner that emissions of dust and other pollutants are limited, and that best practicable means are employed to minimise disruption, risks to human health, and to avoid unnecessary impacts on ecological habitats. Air Quality mitigation measures include: **Communications:** – A Dust Management Plan (DMP) will be prepared, which may include measures to control other emissions. The level of detail will depend on the risk, and should include, as a minimum, the measures in this document. **Site Management:** – Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. – Make the complaints log available to the Applicant when asked. – Record any exceptional incidents that cause dust and / or air emissions, either on or off site and the action taken to resolve the situation in the logbook **Preparing and maintaining the Site** – Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible. – Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site. – Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period, where possible. – Keep site fencing, barriers and scaffolding clean using wet methods. – Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on-site.	Dust monitoring or recording will be undertaken by the Contractor to an approach agreed with the Applicant. In the event that significant or unacceptable dust effects on receptors arise from an activity – due to dry weather and high winds for example – activities may need to be ceased and additional mitigation measures applied. Monitoring shall include: • undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log available to the local authority when asked; • carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked • increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and • if required, agree dust deposition, dust flux or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks, and construction.	**To be confirmed in Final CEMP.**

Potential Impact	Mitigation/Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	– Cover, seed, or fence stockpiles to prevent wind whipping **Operating vehicle / machinery and sustainable travel:** – Ensure all vehicles switch off engines when stationary – no idling vehicles. – Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. – Impose and signpost a maximum speed limit of 20km/h on surfaced and 15km/h on unsurfaced haul roads and work area. – Implement a Travel Plan that supports and encourages sustainable travel (car-sharing etc.,). **Construction Operations:** – Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays. – Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation. – Use enclosed chutes and conveyors and covered skips. – Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. – Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods. **Waste Management:** – Avoid bonfires and burning of waste materials. No fires will be permitted onsite. **Demolition:** – Soft strip inside any buildings before demolition (retaining walls and windows in the building where possible, to provide a screen against dust). – Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground. – Avoid explosive blasting, using appropriate manual or mechanical alternatives. – Bag and remove any biological debris or damp down such material before demolition **Earthworks:** – Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. – Use Hessian, mulches or trackifers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. – Only remove the cover in small areas during work and not all at once. **Construction** – Avoid scabbling (roughening of concrete surfaces) if possible. – Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.		

Potential Impact	Mitigation/Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	Track-out – Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. – Avoid dry sweeping of large areas. – Ensure bulk material transporting vehicles entering and leaving sites are covered to prevent escape of materials during transport. – Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. – Record all inspections of haul routes and any subsequent action in a site logbook. – Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site when reasonably practicable).		

Table 3-2: Noise and Vibration

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
During the construction phase, noise levels are expected to vary depending on the work being carried out. Noise levels will likely be highest during the initial enabling period whilst louder activities such as earthworks and piling take place. As the construction phase develops, noise levels are expected to reduce as less noisy works (plant installation, internal works within structures) take over. Potential noise and vibration sources during the construction phase comprise mobile plant and construction processes such as earthworks which can give rise to elevated sound and vibration levels. No significant effects are predicted based on the application of appropriate control measures.	Noise will be minimised through the adoption of best practicable means (BPM) as standard working practices across the Designated Development to ensure that noise is reduced whenever practicable. The following provision, although not exhaustive, will be adhered to where practicable throughout the construction programme: • Good community relations to be established and maintained throughout the construction process. This shall include informing residents on progress and ensuring measures are put in place to minimise noise and vibration impacts. • Fixed and semi-fixed ancillary plant such as generators, compressors, and pumps to be located away from sensitive receptors wherever possible. • All plant used onsite to be regularly maintained, paying attention to the integrity of silencers and acoustic enclosures. • All noise generating construction plant to be shut down when not in use. • The loading and unloading of materials to take place away from residential properties, ideally in locations which are acoustically screened. • Materials to be handled with care and placed rather than dropped where possible. Drop heights of materials from lorries and other plant shall be kept to a minimum. • Modern plant to be selected which complies with the latest European Commission noise emission requirements[3]. Electrical plant items (as opposed to diesel powered plant items) to be used wherever practicable. All major compressors to be low noise models fitted with properly lined and sealed acoustic covers. All ancillary pneumatic percussive tools to be fitted with mufflers or silencers of the type recommended by the manufacturers. • Site operations and vehicle routes to be organised to minimise the need for reversing movements, and to take advantage of any natural acoustic screening present in the surrounding topography. • No employees, subcontractors and persons employed on the site to cause unnecessary noise from their activities e.g., excessive 'revving' of vehicle engines, music from radios, shouting and general behaviour etc. All staff inductions at the site to include information on minimising noise and reminding them to be considerate of the nearby residents. • As far as practicable, noisier activities to be planned to take place during periods of the day which are generally considered to be less noise sensitive *i.e.,* not particularly early, or late in the day. • Measures to be put in place to ensure that employees know that minimisation of noise will be important at the site; and	To be confirmed in the Final CEMP. Undertake daily on-site inspections, record inspection results and make the log available to the Applicant when asked. The Final CEMP will set out a scheme for the provision of information to the relevant planning authority and local residents to advise of potential noisy works that are due to take place and for monitoring of noise complaints and reporting to the Applicant for immediate investigation and action. Increase the frequency of site inspections by the person accountable for noise issues on site when activities with high noise levels are being carried out. When activities with high noise levels are anticipated, construction noise level monitoring will be undertaken to check compliance.	**To be confirmed in final CEMP.**

[3] Noise emission by outdoor equipment (europa.eu)

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility

- It will be ensured that construction traffic from this and other concurrent developments will be coordinated to minimise traffic and site noise impacts where possible

Any noise complaints received during the construction phase will be investigated thoroughly. The results of the investigation, including measured noise and vibration levels at the time of the complaint, on-site activities and any corrective action taken, will also be reported to relevant stakeholders.

General

- Contractors will be made aware of the following guidance:
  - BS 5228 Code of practice for noise and vibration control on construction and open sites: Part 1 Noise and Part 2 Vibration;
  - NR/L2/ENV/015 Environment and Social Minimum Requirements for Projects – Design and Construction; and
  - NR/L2/ENV/121 Managing environmental and social impact of noise and vibration.
- Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Designated Development Site to be conducted in such a manner as to minimise noise generation, as far as reasonably practicable.
- Appropriate routing of construction traffic on public roads and along access tracks, to reduce construction traffic noise, as far as reasonably practicable.
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works.
- Construction activities taking place during night-time hours will need to be planned, managed, and controlled appropriately so they do not give rise to elevated noise and vibration levels off-site.
- The selected Contractor will be encouraged to be a member of the 'Considerate Constructors Scheme'.

Vehicles, Mechanical Plant and Machinery

- modern plant shall be selected which complies with the latest European Commission noise emission requirements. Electrical plant items (as opposed to diesel powered plant items) shall be used wherever practicable. All major compressors shall be low noise models fitted with properly lined and sealed acoustic covers. All ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;
- vehicles, plant, and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, and all parts of such vehicles, plant or machinery shall be maintained in good and efficient working order and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements and is used and maintained in accordance with manufacturer's recommendations;
- machines in intermittent use will be shut down or throttled down to a minimum when not in use. Vehicles shall not remain stationary on the Designated Development Site with engines running;

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	• pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers; • all compressors and generators shall be “sound reduced” models fitted with properly lined and sealed acoustic covers or enclosures, which shall remain closed whenever the machines are in use; • hydraulic techniques for breaking / equipment which breaks concrete, brickwork, or masonry by bending, bursting, or “nibbling” will be used in preference to percussive tools. Where possible, the use of impact tools will be avoided close to sensitive receptors; • wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity; • vehicles associated with works shall not wait or queue on the public highway; • ensure that modern plant is used, complying with applicable best practice noise emission requirements, and selection of inherently quiet plant where possible; **Inductions and Toolbox Talks** • careful handling of tools/equipment, placement and handling of materials, and control of raised voices on site shall be covered in activity plans, briefings and ‘Toolbox Talks’ as appropriate; • site inductions and ‘Toolbox Talks’ shall be delivered to the site personnel to inform them of noise and vibration issues and the location of nearby receptors; • all site personnel will be instructed on Best Practicable Means (‘BPM’) measures to limit noise and vibration as part of their induction training and as required prior to specific work activities; **Monitoring and Inspections** • the contractor shall carry out regular site inspections, specialist BPM checks, random senior management tours and unannounced audits to assess whether noise levels are acceptable and take steps to reduce them and to ensure all BPM mitigation measures have been implemented as required; • any noncompliance will be documented and reported remediation actions taken immediately; • the implementation of noise and vibration monitoring and abiding by agreed construction noise limits at locations is to be agreed with the relevant planning authority; • the contractor shall ensure that processes are in place to minimise noise before works begin and ensuring that best practicable means (BPM) are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities; • off-site pre-fabrication for components of the Designated Development, where reasonably practicable; **Complaints** • a site representative and designated noise liaison responsible for matters relating to noise and vibration shall be appointed prior to construction onsite, the role shall include the provision of information to the		

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility

relevant planning authority and local residents especially occupiers of sensitive receptors regarding construction works and provide advance notice of potential noisy works that are due to take place ;

- the relevant planning authority and local residents especially occupiers of sensitive receptors shall be provided with contact details for the person to whom any questions or complaints should be directed;
- Any complaints will be logged, investigated immediately, and followed up in a prompt fashion and, where required, measures taken to ameliorate the source of the noise complaint. Noise complaints shall be reported to the Applicant;
- good community relations shall be established and maintained throughout the construction process. Regular communication with the local community throughout the construction period will take place to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed.

Piling

- mitigation measures to be implemented where piling occurs may include, but not limited to, use of a temporary acoustic barrier, use of a partial enclosure around hammer, and the use of a non-metallic dolly between the hammer and the driving helmet (for driven piling) to prevent metal on metal impact sound;
- use of lower noise piling (e.g., rotary bored or hydraulic jacking) rather than driven piling techniques, where reasonably practicable;
- a soft-start or slow ramp-up of piling hammer power will be employed at the commencement of any impact piling activity or after a break of more than 10 minutes;
- should piling take place at locations close to, the Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, vibration impacts on ecological receptors would be minimised by applying mitigation measures as outlined within the ER prepared for the Designated Development and by adhering to the Joint Nature Conservation Commission (JNCC) best-practice measures for piling including the implementation of a soft-start process and avoidance of night-time piling, thereby offering marine ecological receptors respite from any disturbance;
- piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will not be permitted during the migratory seasons for Atlantic salmon and lamprey species, these being:
  - Atlantic salmon – March to August;
  - brook lamprey – April to June (according to NatureScot (https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey));
  - river lamprey – October to December and July to September (Maitland, 2003); and,
  - sea lamprey – April to May (Maitland, 2003).
- On the basis of the above, piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will only be permitted in September, January, or February.

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	The 20m buffer distance will be measured from the edge of the water, which may change with tidal state, meaning that some locations may be piled within the migratory seasons, but only at certain times within the tidal cycle (i.e., when water levels drop to be more than 20m away from relevant piling location). Additional measures to minimise environmental impacts would include: • adoption of the Joint Nature Conservation Commission (JNCC) best-practice measures for piling including the implementation of a soft-start process; • avoidance of night-time piling; • use of silt curtains (to minimise impacts on water quality). Further mitigation measures in relation to piling to be adhered to onsite are detailed within the Biodiversity section of this CEMP. Regular communication with the local community throughout the piling process will also serve to publicise the works schedule, giving notification to residents regarding periods when perceptible levels of vibration may occur during specific operations, reassuring that these levels are significantly below the levels at which building damage may occur and providing lines of communication should complaints arise. Measures would therefore be put in place to control or restrict activities during evenings/ night-time so as not to exceed the relevant noise limit at locations to be agreed with the relevant planning authority.		

Table 3-3: Biodiversity

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
Potentially the most significant ecological constraint to the Designated Development is the Site's location immediately adjacent to the Shannon Estuary and namely the River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC designations. Whilst there will be no direct effects (loss or damage to designated habitats or features) upon the SPA or SAC (the Designated Development boundary is separated by an existing fence line which will be retained), indirect effects upon the designated features (habitats and species) could occur. River Shannon and River Fergus Estuaries SPA. Loss of functionally linked habitat (habitat which could support SPA SCI species) Indirect effects upon SAC designated habitats, due to air or waterborne pollution; changes in hydrological conditions (quantity and quality). Loss and disturbance to habitats within the Site. Disturbance effects upon SCI/protected/notable species from increased/changes to noise, lighting or changes in site conditions influencing species movements/dispersal/foraging.	Mitigation measures detailed in the CEMP, ER, and NIS will be implemented in full in order to address potential effects upon biodiversity including SPA and SAC qualifying species. **The Appointed Ecologist / Ecological Clerk of Works** An Appointed Ecologist / Ecological Clerk of Works (ECoW) will be employed on a full-time basis for the duration of the construction and decommissioning of the Designated Development. The ECoW will be responsible for monitoring and ensuring the implementation of all mitigation measures and compliance with legislative requirements in relation to ecological features. The ECoW will also carry out pre-works checks for protected species, as necessary; The Appointed Ecologist / ECoW will be responsible for: • advising the Applicant on ecological matters and requirements for compliance with relevant legislation and protected species licences, providing support as instructed, and monitoring compliance with the mitigation measures outlined within the NIS, ER, CEMP and any planning commitments; • reviewing the CEMP at appropriate intervals and revising management requirements as necessary for the duration of the CEMP implementation; • providing the Applicant with survey reports and other written evidence required in accordance with the agreed scope of work and contractual obligations. • supervising and managing the implementation of measures to mitigate impacts on ecological features, including protected species, prior to and during the construction phase. This will encompass both licensed and relevant unlicensed activities; • supervising vegetation clearance and construction excavations, supervising all relevant works to provide guidance on the measures required day-to-day to deliver legislative compliance; and • ensuring all site workers are briefed on the ecological risks present and ecological sensitivities of the Designated Development Site and its environs through 'Toolbox Talks' and provision of clear information about protected species and restricted areas and activities. Toolbox Talks shall also cover legal requirements and working arrangements necessary to comply with legislation. All staff (including sub-contractors) will receive regular updated talks and briefings. Toolbox Talks will be repeated as necessary over the duration of the relevant works. **The Applicant and/ or the Appointed Main Contractor** The Applicant and/ or appointed main contractor will be responsible for: • correct instruction of all parties contributing to delivery of the final approved CEMP; • compliance with the final approved CEMP, relevant legislation, and any relevant planning commitments; • keeping the appointed ecologist/ ECoW/ landscape architect/ arboriculturist informed of work activities that require support and supervision, so that it is clear when attendance on-site is required; • enacting/ enforcing recommendations made by the ecologist/ ECoW/ landscape architect/ arboriculturist, or otherwise agreeing an appropriate alternative course of action, if it is subsequently determined that previous advice is not practicable or is out of date; and • keeping a record of measures taken to deliver the requirements of the final CEMP, to provide an auditable record of compliance.	Any additional surveys will be instructed during the advance works, site clearance and construction phases as identified as necessary by the ecologist.	**Roles and responsibilities shall be confirmed in final CEMP.**

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
No significant effects are predicted based on the application of appropriate control measures.	**Mitigation Measures** • a Final CEMP will be prepared by the Contractor for approval by the relevant planning authority, prior to commencement of construction works associated with the Designated Development. The Contractor CEMP will include works specific method statements prepared in association with the Appointed Ecologist/Ecological Clerk of Works (ECoW). Works will not start without agreed method statements in place. The final CEMP will set out the measures to be implemented to ensure there is no pollution of watercourses, waterbodies, or terrestrial habitats, in accordance with guidelines such as Construction Industry Research and Information Association's (CIRIA) Control of water pollution from construction sites (CIRIA, 2001) and Environmental good practice on site guide (CIRIA, 2015), and the EPA's Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects (EPA, 2021); • updated ecological surveys would be completed prior to the start of construction, where necessary, to gain up to date information on relevant protected or notable species. This would be required to determine appropriate mitigation requirements inform and to protected species licence applications (where necessary); • the Contractor will consult and comply with the requirements of National Parks and Wildlife Service (NPWS) with respect to any sites or species protected by law, which are likely to be affected by the construction, establishment, and maintenance of the Designated Development; • there will be no works directly within the boundary of any European site; • the Contractor will be responsible for obtaining any relevant construction phase licences required for protected species; • the Contractor will comply with requirements of The Wildlife Acts of 1976 and 2012 as amended ("The Wildlife Act") and the Flora (Protection) Order, 2022 when undertaking any works which will affect protected species; • in accordance with the requirements of The Wildlife Act, no works will be undertaken to any habitat (including buildings) in which any birds may be nesting without prior surveys being undertaken; • during the works, the Contractor will provide a fence between the Designated Development Site including the temporary construction area, laydown areas and the adjacent areas. This will limit construction works within the confines of the Designated Development Site; • the temporary construction compound area has been sited on an area of existing hard-standing within the centre of the existing Tarbert Power Station facility. Existing roads and access routes will be used. This avoids the loss of semi-natural habitats and minimises potential for disturbance of QI / SCI species; • the majority of the components of the new power generation units are modular and will be delivered to the Designated Development Site pre-assembled. This minimises the length of time required for construction; • all watercourses will be protected. All refuelling and servicing of vehicles and plant will be carried out in a designated area which is bunded and has an impermeable base, situated at least 50m from any watercourse and the boundary of any European site; • appropriate measures will be used to limit silt mobilisation and potential for scour, if appropriate. **Demarcation of European sites** • there will be no works directly within the boundary of any European site. The River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC are separated from the Designated Development		

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
	by existing fence lines. The boundary of the River Shannon and River Fergus Estuaries SPA and the Lower River Shannon SAC will be clearly demarcated during the construction, operational and decommissioning phases of the Designated Development by the presence of these existing fence lines. These fences will be retained during construction, operation and decommissioning, and signage will be erected on the fencing to notify all staff that no access beyond the fence is permitted; • all personnel involved in the construction, operation and/or decommissioning of the Designated Development will be made aware of the presence of these sites. This will prevent any encroachment into the European sites which could cause damage to QI habitats and/or habitats which support QI / SCI species; **Pollution Prevention** The following pollution prevention measures will be implemented: • controls and contingency measures to manage run-off from works areas and to manage sediment, including the use of sediment fencing, sediment traps and other drainage measures; • all oils, lubricants, or other chemicals to be stored in an appropriate secure container in a suitable storage area within one of the construction compounds in the Site, with spill kits provided at the storage location and at suitable places across the Designated Development Site; • in order to avoid potential pollution impacts to soils, vegetation and watercourses / waterbodies, all refuelling and servicing of vehicles and plant will be carried out in a designated area which is bunded and has an impermeable base, situated at least 50m from any watercourse and the boundary of any European site. This will also apply at the operational phase, when deliveries of liquid fuel will be carried out in a specific location, which is impermeable and bunded, and located at least 50m from any watercourse and the boundary of any European site. The bund will be sufficient to contain at least 110% of the total volume of a delivery lorry; • any spillages of distillate fuel during delivery / transfer will be managed. This includes the provision for a licensed contractor to respond to any emergency and with capabilities to collect and safely dispose of any spilled fuel; • dust suppression techniques will be adopted during construction and decommissioning works to prevent emissions of dust from the movement of vehicles / plant, or from other construction / demolition activities. This could involve spraying access tracks and other areas of hard-standing (as required) with clean water (also see Air Quality mitigation measures); • concrete will be delivered to the Designated Development Site ready-mixed in trucks but there will also be on-site batching. On-site batching will be undertaken on an impermeable base at least 30 m from the Shannon Estuary and pollution control measures will be implemented. Concrete pours will take place outside periods when heavy rainfall is forecast. Where washout of concrete transporting vehicles chutes occurs, this will occur in a designated carefully managed onsite wash out location prior to leaving the Designated Development Site. The wash-down location will be self-contained and will allow for concrete to be removed from the water, prior to disposal. Only the chutes of vehicles shall be rinsed on site; • wastewater from washing of concrete lorry chutes shall be directed into a concrete washout container, lined with an impermeable membrane. The container should be of good condition, should not overflow or leak and should be easily accessible to vehicles. The containers must be checked and emptied at a frequency equivalent to the volume of concrete being used and no runoff should leave the washout location. The area must be clearly marked and must be located away from storm drain inlets, open drainage		

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
	facilities, watercourses & ditches. Direct discharge of wash water to ground or surface waters shall be strictly prohibited; • all personnel and staff involved in the construction, operation and decommissioning of the Designated Development will be made aware of the presence of ecological features (including the QI / SCI features of European sites) in the vicinity of the Designated Development and the mitigation measures and working procedures which must be adopted. This will be achieved as part of the induction process through the delivery of a Toolbox Talk. In addition, as required, briefings will also be provided in advance of works which are considered to present an increased pollution risk and/or risk of impacting ecological features; • construction works will take place only within the red line boundary of the Designated Development Site; **Lighting** Illumination of the Shannon Estuary, the creek to the immediate south of the Designated Development (which is encompassed by the River Shannon and River Fergus Estuaries SPA), and surrounding semi-natural habitats will be avoided during the construction and decommissioning phases in the following ways: • works within 20 m of the Shannon Estuary and the creek immediately south of the Designated Development (which may be accessible to fish species from the Shannon Estuary) will not be permitted to take place during hours of darkness; • elsewhere within the Designated Development Site, any lighting required during the construction and decommissioning phases will be directional and will be prevented from spilling light onto watercourses or other habitats through the use of cowling; • Any permanent lighting required during the operational phase will be restricted to the absolute minimum required for security and safety purposes. It will be designed using appropriate design software (such as Lighting Reality PRO) so that light levels at the Shannon Estuary and the creek to the immediate south of the Designated Development do not increase from the current baseline by more than 0.2 lux (this being the approximate brightness of a full moon). No direct illumination of the Shannon Estuary or creek to the south of the Designated Development will be permitted; • The ECoW will be responsible for monitoring compliance with this mitigation and will require that the contractor(s) take corrective action if it is deemed that lighting used for the Designated Development is illuminating the SAC or other habitats which could be used by QI animals (particularly the creek to the south of the Designated Development); **Habitat Restoration/ Reinstatement** • any habitats disturbed during construction will be reinstated on a like-for-like basis at the same location following construction; **Breeding/Nesting Birds** The following approach would be taken to deliver legislative compliance in relation to nesting birds: • in accordance with the requirements of The Wildlife Act, no works will be undertaken to any structure which any birds may be nesting; • any necessary vegetation clearance, which has been identified as minimal following site visits, will, if possible, occur outside the bird-breeding/ nesting season (i.e., undertaken between September and February inclusive) and will be preceded by a check by an ornithologist, especially for the potential presence of early or late nesting species;		

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
	• if clearance cannot be undertaken outside of the breeding bird season, then the Designated Development Site will be checked for breeding birds by an ornithologist immediately before clearance and/or works commence. If active nests are discovered through this process, the ornithologist will advise on appropriate mitigation to ensure that these are not impacted by construction activities. All relevant works will be completed in accordance with this advice and under the supervision of the ornithologist. Any identified active nests will be left until the hatchlings have fledged; • for reference, the breeding bird season is generally taken as the 1st March until 31st August inclusive. However, it is also noted that birds can nest at any time of the year and are therefore protected when they do; • the Contractor's programme will clearly indicate any vegetation to be removed, site clearance, and their programmed schedule for removal; • where there would be a gap in activity between site clearance/ soil stripping and the start of construction, then all cleared ground would be maintained in a disturbed state (e.g., through regular harrowing) to minimise the risk of ground nesting birds establishing in the lead into construction; • all cleared material of bird nesting potential will be moved and stored off-site to ensure that birds do not use the cleared material for nesting during the bird breeding season. Similarly, stockpiles of earth (particularly sandy material) will be left without vertical faces during the spring and summer period; and • should bird species of qualifying Interest and/or Species of Conservation Interest be present at the time of construction (to be determined through pre-commencement surveys) the ECoW will advise on species-specific requirements to achieve legislative compliance. **Otters, Badger, Other Mammals and Animal Welfare during Construction** • a pre-works survey for otter will be carried out prior to the commencement of construction or decommissioning works, the pre-works survey shall include any potential laydown areas immediately adjacent to the River Shannon; • a badger survey will be completed in advance of construction works to identify the status and distribution of badgers. Mitigation requirements will be reviewed and confirmed based on this badger survey; • construction works will take place within a clearly demarcated area and a buffer zone to the River Shannon will be incorporated to ensure no encroachment into riparian habitat; • all excavations will be covered or fenced overnight, or where this is not practicable, a means of escape will be fitted e.g., battered soil slope or scaffold plank, to provide an escape route should any animals (e.g., reptiles, badger, otter, brown hare, hedgehog) that may stray into the construction site to vacate excavations, should they fall in; • excavations will be checked at the start of each working day to ensure no animals are trapped within them; • any pipes will be capped or otherwise blocked at the end of each working day, or if left for extended periods of time, to ensure no animals become trapped; • within the Designated Development Site, all vehicles will be restricted to a maximum speed of 20 km per hour. This will help to minimise the risk of collision with mammals, including otter; • mammal/ badger gates will be installed in boundary fences as appropriate to maintain access for nocturnal wildlife into and through the habitat;		

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
	• construction compounds will be fenced to prevent encroachment of personnel, machinery, and materials onto adjacent habitats. The temporary stockpiling of materials will be restricted to locations on the Site away from site boundaries, drainage infrastructure and watercourses. **Invasive Species Management Plan (ISMP)** An Invasive Non-Native Species (INNS) survey will be undertaken prior to construction to determine if INNS are present onsite. If determined as necessary through this survey and after consideration of other available INNS data, an ISMP will be prepared to accompany the final CEMP and would be agreed with relevant stakeholders. The ISMP will specify the measures and supervision necessary during construction to prevent the spread of plant and animal INNS to new locations. The ISMP will specify the control/ eradication (as reasonable and practicable), biosecurity measures and supervision necessary during construction to prevent the spread of plant and animal INNS to new locations. Biosecurity management measures will ensure that there will be no spread of INNS during the construction or decommissioning of the Designated Development. Biosecurity requirements will address all potential pathways for interaction with and dispersal of INNS, including movements of vehicles, machinery, and staff: • into the Designated Development Site from third party locations, e.g., during construction mobilisation; • between different parts within the Designated Development Site (also taking into consideration adjacent watercourses); and • from the Designated Development Site for redeployment elsewhere. The following measures may be required depending on the presence of INNS within the Designated Development Site: • as far as possible, any stands of invasive non-native plants present within the Designated Development Site will be demarcated and entirely avoided; • where this cannot be achieved, the species will be subject to appropriate treatment and/or management. This may include herbicide application, coupled with on-site burial or off-site disposal to a suitably licensed landfill; • the provision of washdown facilities shall be provided for any personnel, plant or other equipment involved in works within an area potentially infested by an INNS; • the implementation of measures will be monitored by the ECoW. **Tree Works** • where works in close proximity to retained trees cannot be practicably avoided, these works will be undertaken in accordance with current best practice, such as that defined in British Standard (BS) 5837: 2012 Trees in relation to design, demolition and construction – Recommendations (British Standards Institute, 2012), National Joint Utilities Group (NJUG) Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees (NJUG, 2007) and Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes; • all necessary protective fencing will be installed prior to the commencement of site clearance or construction works. Fencing will be erected at a sufficient distance from the tree so as to enclose the Root Protection Area (RPA) of the tree. The RPA will be defined based upon the recommendation of a qualified		

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility

arborist. The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils, and chemicals).

- Also see relevant mitigation measures set out above for Breeding/Nesting Birds.

Piling

A piling risk assessment shall be completed ahead of piling works. Piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will not be permitted during the migratory seasons for Atlantic salmon and lamprey species, these being:

- Atlantic salmon – March to August;
- brook lamprey – April to June (according to NatureScot (https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey));
- river lamprey – October to December and July to September (Maitland, 2003); and,
- sea lamprey – April to May (Maitland, 2003).

On the basis of the above, piling within 20m of the Shannon Estuary and the creek to the south of the Designated Development will only be permitted in September, January, or February.

The 20m buffer distance will be measured from the edge of the water, which may change with tidal state, meaning that some locations may be piled within the migratory seasons, but only at certain times within the tidal cycle (i.e., when water levels drop to be more than 20m away from relevant piling location).

The JNCC best-practice measures for piling will be adopted, including the implementation of a soft-start process and avoidance of night-time piling. In addition, a seasonal restriction will be adopted to minimise disturbance to sensitive fish species.

A range of other working practices and restrictions will be adopted to mitigate the potential for disturbance of QI / SCI species including:

- BPM techniques will be adopted including 'soft-start' techniques, these will be employed during construction / decommissioning works:
  - the required machines for each working day will be started gradually and not all at once, with starting of machines to be staggered over a period of 15-30 minutes, for example during daily safety briefings at the start of each working day;
  - machines will be brought to full throttle / speed gradually and not suddenly;
  - machines will be throttled down or switched off when not required.
- the loudest activities (e.g., piling) will not start early in the day or late in the day (i.e., they will not start until at least one hour after sunrise and will cease not later than one hour prior to sunset). Lamprey species typically migrate in darkness, so this restriction will benefit them particularly;
- during periods of particularly inclement weather, the loudest activities (in particular piling) will not be carried out. The approach to be taken will be based on the 'Scheme to reduce disturbance to waterfowl during severe winter weather' promoted by the UK Joint Nature Conservation Committee (JNCC), which specifically relates to the measures adopted during the shooting season for waterbirds (https://jncc.gov.uk/our-work/severe-weather-scheme/) but the principals of which are applicable;
- an on-site weather station will be used to monitor temperature during the autumn, winter, and spring periods (as a minimum). Should freezing conditions be recorded for a period of seven consecutive days, piling works will be suspended for a period of seven days, or longer if freezing conditions persist. Where

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
	one or two days of temperatures above freezing are recorded within the seven day period this would not have an effect on the process of triggering a suspension of noisy works. Only if three days of above-freezing temperatures are recorded within the seven day period will works be permitted to continue. The implementation of this process will be closely monitored by the contractor; • an acoustic barrier, of a minimum of 4m height, will be installed along the edge of the southern and western perimeters of the Site for the construction and decommissioning phases. This will be installed so as to ensure no gaps between joints or the ground and will be inspected and maintained throughout the periods that works are taking place. This barrier will reduce noise levels experienced by birds and other animals within the River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC; • the acoustic barrier installed around sections of the Designated Development Site will also serve a second purpose in providing visual screening of works during the construction and decommissioning phase. Being a minimum of 4m high, it will screen all personnel and all but the largest plant from birds and other animals in the adjacent European sites; • guidance published by Transport Infrastructure Ireland (TII, formerly the National Roads Authority (NRA)) recommends that a buffer of 150 m should be applied around piling works and otter breeding holts (NRA, 2008).		

Table 3-4: Population and Human Health

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Employment opportunities will be created as a result of the works. These will be temporary, but it is considered that there is sufficient accommodation capacity in the local area. The construction phase traffic will lead to an increase in the number of vehicles using the main junctions through the town of Tarbert onto the N67, however, the increase is not expected to lead to junctions in the area becoming over capacity, therefore congestion is not expected to become an issue, therefore a negligible impact is expected. The Designated Development has the potential to impact human health as a result of changes in local air quality, climate, and noise, during the construction phase. However, no significant impacts are predicted. No significant effects are predicted based on the application of appropriate control measures.	The Contractor will be responsible for the security of the Site and will be required to: – Install adequate Site hoarding to the Site boundary; – Maintain Site security staff at all times; – Ensure restricted access is maintained to the works; – Operate a Site induction process for all Site staff; – Ensure all Site staff shall have current 'safe pass' cards; and – Separate pedestrian access from construction at the main Site entrances provide a safe walkway for pedestrians along the site entrances. The Contractor will establish communications with local community representatives throughout the construction period.	To be confirmed in the Final CEMP.	**To be confirmed in the Final CEMP.**

Table 3-5: Land and Soils

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
The construction phase of the Designated Development has the potential to result in different types and durations of impact on soils and geological receptors. These are: • Temporary impacts on soil structure as a result of soil excavation, smearing and compaction; • Temporary impacts on soil chemistry as a result of spillages of oils, fuels, or other construction chemicals, or through the mobilisation of existing contamination following ground disturbance; • Impacts on surface and groundwater water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals/ wastewater, or through mobilisation of contamination following disturbance of contaminated ground, sediments, or groundwater, or through uncontrolled site run-off; • Potential increase in volume and rate of surface water runoff from new impervious areas during construction, leading to an impact on flood risk; • Increased risk of groundwater flooding or recharge as a result of any below ground excavations;	Mitigation measures within the Water section of this CEMP (see Table 3-6) are also relevant for the protection of land and soils during the construction phase activities and should be read in conjunction with the mitigation measures detailed. To minimise the potential for adverse impacts to soil structure and quality, the following is an outline of the general mitigation measures that will be in place: – Soil material will be stored temporarily within the Site in managed stockpiles that will not be allowed to dry out, to avoid generation of wind-blown dust; – Any stockpiled material will be managed in accordance with best practise guidelines (such as Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009)). When required, pre-earthwork drainage will be put in place to avoid sediment being washed off site and will be included in the CEMP; and – The Contractor will be required to prepare a Construction Traffic Management Plan (CTMP) to minimise site traffic and, if relevant, damage to soil structure from smearing and compaction. To minimise the potential for adverse impacts to soil chemistry and to water quality during construction, the following is an outline of the general mitigation measures that will be in place: – The construction of the Designated Development will be in accordance with good practice. – The E&C Contractor will be required to include measures in the Final CEMP for minimising erosion by reducing disturbance and stabilising exposed materials. The plan will also consider control measures to minimise the release of mobilised sediment. The Final CEMP will also include methods of handling and storing chemicals and fuels, followed by an Emergency Response Plan to be implemented in the event of a spill or leak. – Water quality monitoring will be undertaken pre and during-construction, details of which will be included in the Final CEMP. This will be based on a combination of visual observations, in situ testing using handheld water quality probes, and periodic sampling for laboratory analysis. – The E&C Contractor will be required to ensure the safe storage of any hazardous materials or chemicals required onsite. Storage areas for flammable/ toxic/ corrosive materials will be located in a separate, locked, impermeable bunded and fenced off area. Material data sheets will be available for all these materials and the COSHH (Control of Substances Hazardous to Health) assessments kept within the relevant Risk Assessment for the task, all subject to the Applicant's approval. Storage will not be within 30m of a watercourse and designated storage areas will be bunded to 110% of storage capacity to contain the effects of any spills. These areas will be cleared and re-instated following completion of the Site. – A Resource Waste Management Plan will be prepared, and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will primarily	Ground investigation will be undertaken before construction to inform the development of the preliminary and detailed design. The ground investigation will be designed to target the potentially contaminative sources identified. Where risks are deemed to be unacceptable, further detailed quantitative risk assessment and if required, detailed remediation strategies will be developed accordingly, pursuant to the process set out by the planning authorities. Additional measures to be confirmed in final CEMP. Water quality monitoring will be undertaken in line with the requirements if the IE Licence.	**To be confirmed in final CEMP.**

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Requirements	Survey	Responsibility
• Alteration in overland flow paths as a result of works associated with the Designated Development; and • Temporary impacts on off-site receptors through the inhalation of potentially contaminated dust and dermal contact with contaminated soil following ground disturbance. No significant effects are predicted based on the application of appropriate control measures.	take place off-site where noise and dust are more easily managed and less likely to impact on surrounding properties. – Should significant contamination occur as a result of construction stage activities, KCC and the EPA will be notified, and corrective actions will be agreed. – If water is encountered during below ground construction, suitable best practice de-watering methods will be used. No significant groundwater dewatering is anticipated but, if required, will be undertaken as outlined in Section 4.7. – Construction works will be carried out in such a way as to prevent, contain, or limit, as far as reasonably practicable, any adverse effects arising from the presence of contaminated land or materials (if encountered). Examples of these measures are as follows: – A contamination watching brief/environmental oversight to ensure that any significant contamination not identified during previous site investigations is recorded and dealt with appropriately; – Should ground with significant levels of unknown contamination be encountered during construction, working methods and procedures for handling and disposal of material will be employed to minimise risk in line with the EPA's "Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites". If required, the material will be disposed of at a suitably licensed waste facility; – 'Clean' and 'dirty' (contaminated) work areas will be divided by internal fencing if contamination is encountered; – Personal Protective Equipment (PPE) will be worn by ground workers and other staff; – Those potentially at risk will be made aware of potential site hazards via site safety induction and toolbox talk procedures. To minimise the potential for adverse impacts to off-site receptors and construction workers, the following is an outline of the general mitigation measures that will be in place: – The Contractor has a duty under the Safety, Health, and Welfare at Work Act 2005 and the Control of Substances Hazardous to Health (COSHH) Regulations 2002 to protect their employees against hazardous substances encountered at work. To that end and in accordance with *CIRIA guidance R132 A Guide for Safe Working on Contaminated Sites*[4], the Contractor will be required undertake a COSHH assessment before any work is carried out at the Site which is likely to expose staff to substances hazardous to health. Even if no hazardous substances are identified during the planned site investigation, it would be best practice for the Contractor to ensure that all employees (construction workers) are issued with PPE appropriate to the hazards identified. PPE could consist of hazard-specific gloves, eye protection and respiratory protective equipment (RPE).			

[4] CIRIA (1996).

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Requirements	Survey	Responsibility
	– The Contractor will implement measures to minimise the amount of dust produced during the construction phase, including the preparation of a Dust Management Plan (DMP). There will be a Duty of Care on the E&C Contractor to ensure that dust-raising activities are located away, and upwind where possible, from sensitive receptors as much as feasibly possible, the duration be kept to a minimum when in proximity to a receptor, and the spread of dust be controlled by judicious use of water, the most effective and efficient way being in the form of a fine spray. Comprehensive Site Investigations (SI) will be undertaken prior to constriction to better understand the existing ground conditions and will inform the siting and layout of the Designated Development. It should be noted that the Designated Development involves limited excavation and will be constructed in accordance with current engineering standards, including site investigation and understanding of ground conditions to inform construction works and design. Mitigation measures for construction works including soil handling are incorporated into the CEMP to be implemented by the E&C Contractor who will conduct the works. Should KCC consider independent supervision of these works to be required at the expense of the developer, the Applicant would be agreeable to this being implemented through an appropriately-worded planning condition.			

Table 3-6: Water

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Pollution of bedrock groundwater or impact on the superficial deposits aquifer flow regime Pollution of bedrock groundwater or impact on the bedrock aquifer flow regime Damage or loss of features of geomorphological features of interest Reduced groundwater level and flow alteration and/or potential groundwater flood risks Pollution of surface water and shallow groundwater No significant effects are predicted based on the application of appropriate control measures.	Mitigation measures as outlined within the Land and Soils section of this CEMP are also relevant for the protection of water during the construction phase activities and should be read in conjunction with the below. Run-off into excavations / earthworks cannot be prevented entirely and is largely a function of prevailing weather conditions. Care will be taken to ensure that exposed soil surfaces are stable to minimise erosion. All exposed soil surfaces will be within the main excavation site which limits the potential for any offsite impacts. All run-off will be prevented from directly entering into any water bodies as no construction will be undertaken directly adjacent to open water. During the construction phase water pollution may occur directly from spillages of polluting substances into waterbodies, or indirectly by being conveyed in runoff from hard standing, other sealed surfaces or from construction machinery. Fine sediment may also wash off working areas and hard standing (including approach roads) into waterbodies indirectly via existing drainage systems or overland flow. Due to the industrial activity of the Site, this sediment may potentially contain contamination that could be harmful to the aquatic environment. The amount of dewatering required during the construction phase of the Designated Development and possible result in the localised lowering of the water table is not known. As such, a Hydrogeological Risk Assessment (HRA) will be carried out prior to construction in order to determine, if any, the impact of dewatering at the site. There may also be localised pumping of surface run-off from the excavations during and after heavy rainfall events to ensure that the excavation is kept relatively dry. Measures to protect the water environment will be formulated in accordance with best practice guidance. The best practice guidelines are as follows: – IFI (2016). *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*. – *CIRIA C741 Environmental Good Practice on Site* (3rd edition) (C692). – *CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors*. – CIRIA guidance documentation C648 ‘Control of Water Pollution from Linear Construction Projects’ – C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice.	Water quality monitoring will be undertaken in line with the requirements if the IE Licence. Weekly checks will be carried out to ensure surface water drains are not blocked by silt, or other items, and that all storage is located at least 30m from water bodies. A regular log of inspections will be maintained, and any significant blockage or spill incidents will be recorded for root cause investigation purposes and updating procedures to ensure incidents do not reoccur. A programme of water monitoring and controlled discharges of water abstracted from open excavations should be implemented. Where necessary, it is proposed that groundwater monitoring of existing boreholes (using boreholes installed as part of the Ground Investigation (GI) should be undertaken around the site in order to ensure the monitoring process is effective. Automatic water level data loggers (or other suitable method) to facilitate continuous monitoring would be installed in selected monitoring boreholes at strategic locations.	**To be confirmed in final CEMP**

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	– British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works. British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites. – Sustainable Drainage Systems ("SuDS") constructed on the Site will be in accordance with The SuDS Manual (C753) (CIRIA, 2015) and the Site handbook for the construction of SuDS (C698) (CIRIA, 2007). **General Surface Water Management** – The existing surface water management system, such as drains, settlement ponds, outfalls, and interceptors / separators, will be inspected and confirmed to be in suitable working order prior to any Designated Development works commencing on the Site. – Additional new drainage installations will be installed in early stages of construction, alongside the remaining existing drainage facilities, can be used to treat runoff for silt and hydrocarbons early on in the programme. Daily weather forecasting will also be used to inform the works schedule, ensuring excavation works do not coincide with high intensity or extreme rainfall events. – The proposed surface water management system, including existing and proposed infrastructure, will be inspected, and confirmed to be of sufficient capacity to treat any additional water generated by the Designated Development, including runoff from dust suppression, prior to discharge. – Washout from power cleaning of drainage lines, oil interceptors or any other pipework which may contain pollutants will be collected and treated. No contaminated washout will be allowed enter any water body or be discharged to ground. – There will be regular monitoring and prompt maintenance of these the overall surface water management system throughout the Designated Development. This will ensure that the drainage system continues to function as designed. – There will be no direct discharge to any water body at any time during the demolition, construction, or phases. All surface water run-off within the Site will be directed to this drainage system. **Sedimentation (Suspended Solids)** During the construction phase, the mitigation measures will ensure that no sediment contamination, contaminated run-off, or untreated wastewater will enter water bodies on or near the Site. The following control measures will be implemented by the Contractor to manage silt-laden runoff into water bodies: – Excavations will only remain open for the shortest possible time to reduce groundwater ingress. Silt traps will be placed around the Site to reduce silt loss, and these will be inspected and cleaned or replaced regularly.		

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	– Run-off from spoil heaps will be prevented from entering water bodies by diverting it through settlement ponds and removing material off-site as soon as possible to designated storage areas. – Good construction practices will also be used during the construction phase, such as wheel washers and dust suppression on-site roads and at the Site access points. – Sediment barriers, such as silt fencing, will be used in areas where works are within 10m of water bodies. These barriers will be installed to directly treat surface water or direct surface water to the wider surface water management system. No existing riparian vegetation will be removed at any stage of the works. – The extent of exposed ground will be minimised where possible and stockpiles covered so to reduce sediment supply and prevent the creation of any contaminated runoff. The potential will be further minimised by using grit traps to drain stockpile and wheel-wash areas so silt from these activities can be diverted to the drainage network. Straw bales and Terram will also be used at appropriate locations deemed to be at risk from silt pollution during construction works. In addition to these mitigation measures, general methods of good practice to keep the site tidy will be employed to minimise surface water contamination. – Should short-term stockpiles be required these will be located at least 30m away from any water body. Slopes of these stockpiles will be made stable and regularly checked by the contractor or appointed staff member. Stockpiles shall be stored on impermeable surfaces and covered using tarpaulin. – Surface water run-off from working areas will not be allowed to discharge directly to the River Shannon. To achieve this, the drainage system will be constructed prior to the commencement of major site works. All design and construction will be carried out in accordance with *CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors*. – To control erosion, areas of exposed ground and stockpiles will only be created when the area of the Site is to be worked upon. Stockpiles will be located 20m away from drains and water body where there is no sloped gradient. Stockpiles will be stabilised as soon as they are completed (e.g., seeded or geotextile mats), and bunded by earth or silt fences at the toe of the stockpile to intercept silt-laden runoff during rainfall events. Stockpiles will not be located where there is a steep slope towards a drain. – Wash water with oils or chemicals will not enter any waterway by containing the wash water within a bunded and impermeable designated site and will be tankered off-site for authorised disposal.		
	Fuel and Chemical Handling		

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	It will be necessary to adopt the following mitigation measures at the Site in order to prevent spillages to ground and drains of fuels, and to prevent any consequent surface water impacts. – Designate a bunded storage area at the Contractor's compound(s) and at least 30m away from surface water gullies or drains for oils, solvents and paints used during construction. The fuel storage tanks shall be bunded to a volume of 110% of the capacity of the largest tank / container within the bunded area, away from any drains and / or water body. The Contractor will allow for regular checks and maintenance as required. – Drainage from the bunded area shall be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations within the Site, a suitably sized spill pallet will be used for containing any spillages during transit. – Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated impermeable refuelling areas isolated from surface water drains. Spill kit facilities shall be provided at the fuelling area in order to provide for any accidental releases or spillages in and around the area. Any used spill kit materials should be disposed of via a hazardous waste contractor. – Where mobile fuel bowsers are used on the Site in the event of a machine requiring refuelling outside of the designated area, fuel will be transported in a mobile double skinned tank. Any flexible pipe, tap or valve must be fitted with a safety lock where it leaves the container and locked shut when not in use. Each bowser should carry a spill kit and each bowser operator must have spill response training. No refuelling will be allowed within 30m of a surface water body. – Adequate stocks of hydrocarbon absorbent materials (e.g., spill-kits and / or booms) shall be held on-site in order to facilitate response to accidental spills. Spill response materials shall also be stored on all construction vehicles. It is important that the spill kits are regularly inspected and immediately replaced if used. – All equipment and machinery will be checked for leaks and other potential sources of contaminants before arriving on-site and on a daily basis. Any equipment or machinery likely to introduce to contaminants will not be brought on-site or will be removed from the Site immediately if any leak is discovered. Spill kits will be available to machine operators, and they will be trained in their use. – The storage of fuels and hazardous materials during the construction phase provides further potential for pollution incidents. Some removed topsoil and excavated material will be stored for reuse by the site, and it is important that these designated storage areas are strategically located in relation to the water bodies and any other drains, so that there is no risk of topsoil, or any other material being washed into the water bodies or drainage network. – The storage of hazardous substances will be necessary during construction and a number of considerations will need to be made to reduce the potential for pollution from these sources. Fuel will be required to be stored at least 30m from a water body and refuelling will only take place in designated areas, on hardstanding by appropriately trained personnel.		

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility

Accidental Spillage, Flooding or Other Emergencies

- The Contractor will implement in full the prescribed measures identified below:

– Leaking or empty oil drums will be removed from site immediately and disposed of via an appropriately licensed waste disposal contractor.

– Spill kits and oil absorbent material will be carried by mobile plant and located at vulnerable locations (e.g., near oil filled equipment). Booms will be held on-site for works near water body/ drains. Spill kits will contain a breakable tie to show use and indicates whether it needs to be replenished. The Site Manager and Environmental Site Representative (ESR) will be responsible for replenishing spill kits.

– An Emergency Response Plan will be prepared by the appointed Contractor and included in the Final CEMP and construction workers trained to respond to spillages.

– A copy of the Emergency Response Plan will be kept in the Site Emergency Information File (along with other safety emergency preparedness plans) together with the results of any test of the plan.

– Oil interceptors will be required for refuelling areas; runoff from washing areas that contains detergents which may prevent oil interceptors from working correctly will be prevented from entering oil separators by providing separate designated areas for washing and refuelling.

  – Discharge with oils and chemicals from vehicle washing areas will be considered as trade effluent and therefore will be disposed off-site.

  – The installation of protective bunds along all water body boundaries and drains during construction will filter contaminants and prevent adverse runoff.

  – Any plant, machinery or vehicles will be regularly inspected and maintained to ensure they are in good working order and clean for use.

  – Any site welfare facilities will be appropriately managed, and all foul waste disposed of by a licenced contractor to a suitably permitted facility.

  – During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly, and daily basis, and plan works accordingly. The Contractor will describe in the Emergency Response Plan the actions it will take in the event of a possible flood event. These actions will be hierarchal meaning that as the risk increases the Contractor will implement more stringent protection measures. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.

Concrete, cement, and grout

– No wash-down or wash-out of ready-mix concrete vehicles during the construction works will be carried out at the Site within 20m of an existing surface water drainage point. Wash-outs will only be allowed to take place in designated areas with an impervious surface.

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	– Concrete will be used to construct the Designated Development and will therefore need to be managed to reduce the potential for pollution. The Principal Contractor will be required to manage and mitigate concrete works ensuring that no concrete is laid during wet weather if achievable, so to reduce the risk of concrete being washed off the site and into the surface water drains or water bodies. – Concrete mixing will be undertaken in designated impermeable areas, at least 10m away from a water body or surface water drain to reduce the risk of runoff entering a water body, or the sub-surface, or groundwater environment.		

Table 3-7: Climate

Potential Impact	Mitigation / Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Greenhouse gas emissions. In-combination climate change impact. No significant effects are predicted based on the application of appropriate control measures.	The Framework CEMP will act as an overarching document that presents a number of considerations that will limit GHG emissions and ensure the Designated Development is in line with industry best practice standards. The following list outlines a number of measures that will be considered for integration into the construction and decommissioning phases of the Designated Development, to minimise GHG emissions. • When sourcing materials for the Designated Development first choice should be given to locally sourced materials. • Any existing materials already on the Site should be considered for reuse for the Designated Development, where feasible. – When possible, machinery, vehicles and energy should all use low and zero carbon energy e.g., electric vehicles and solar powered pitch lights. • Workers will be informed of the ways in which they can reduce their energy use and avoid unnecessary energy consumption onsite e.g., avoid leaving equipment running when not in use and turning off lighting when not in use. • Reduce potential emissions by minimising the waiting time for loading and unloading materials, and efficiently handling materials on site. • Undertaking regular maintenance of plant and machinery. The following is a number of measures that will be considered for integration into the construction and decommissioning phases of the Site, to help reduce the effects of climate change and extreme weather events on the Designated Development. • Preference will be given to construction materials that are more resilient to the identified impacts of climate change. • The Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. • Consideration will be given to suitable storage and bunding of any pollutants to protect from high rainfall events. • Omit any topographic low points and install drainage if required to mitigate the risk of surface water flooding. • Critical equipment to be raised above estimated peak flood level (e.g., electrical equipment). • Minimise maintenance during extreme weather events e.g., high wind events. Maintenance of the drainage system to be included within the general site management.	To be confirmed in the Final CEMP.	**To be confirmed in the Final CEMP.**

Table 3-8: Cultural Heritage

Potential Impact	Mitigation / Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Previous groundworks will have impacted any unrecorded heritage assets which may have existed. Groundworks associated with the Designated Development will introduce noise, dust, and vibration to the study area. This could impact the settings of heritage assets especially the Protected Structures. No significant effects are predicted based on the application of appropriate control measures.	The following impact avoidance/ mitigation measures will be followed: If unexpected archaeological remains or artefacts are discovered during construction work, work in that area will immediately cease and the area will be protected and made secure ensuring no access to plant or site staff until an Archaeological Contractor has inspected the suspected archaeological remains. The Archaeological Consultant and National Monuments Service (NMS) will be notified, and an unexpected find protocol will be implemented as outlined below: • all archaeological works (which will be agreed by the Archaeological Consultant and NMS) will be carried out in compliance with the National Monuments Acts 1930 – 2004 (and Policy and Guidelines on Archaeological Excavation (Department of Arts, Heritage Gaeltacht, and the Islands, 1999); • a suitably qualified and licensed Archaeological contractor will be appointed to carry out the archaeological fieldwork; • relevant licenses will be acquired from the NMS for all archaeological works, which will be carried out in accordance with an over-arching Method Statement for Archaeological Works prepared by the Archaeological Consultant and agreed with the NMS.	To be confirmed in Final CEMP.	**To be confirmed in final CEMP.**

Table 3-9: Material Assets

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
Risk to the environment from accidental pollution incidents. No significant effects are predicted based on the application of appropriate control measures.	The following measures will be implemented during the construction phase: • Construction works will be carried out in such a way as to prevent, contain, or limit, as far as reasonably practicable, any adverse effects arising from the presence of contaminated land or materials (if encountered). • 'Clean' and 'dirty' (contaminated) work areas will be divided by internal fencing where any contamination is encountered. • Appropriate Personal Protective Equipment (PPE) will be worn by ground workers and other staff. • Those potentially at risk will be made aware of potential hazards via site safety induction procedures. • Leaks and spills will be prevented, and control measures (outlined in Section 4.7 of the TEG ER (AECOM, 2023) used to prevent contaminants entering the sub-surface or groundwater environment. • Material removed as part of the construction will be re-used elsewhere in the project where practicable and possible. • Any soil / overburden encountered will be separated where removal is required and will be conserved and stored in a designated area and appropriately protected, ready for re-use as fill for the project. • Contaminated materials will be assessed as either: solids; liquids; gas; and leachate to allow for appropriate management. • The measures outlined in Table 3.6 will be implemented to prevent the contamination of ground and surface watercourses during the works. • Hazardous dust emissions will be prevented during excavation, or from stockpiles by implementing the measures outlined in Table 3.1. • The Contractor has a duty under the *Safety, Health, and Welfare at Work (Construction) Regulations 2013* to protect their employees against hazardous substances encountered at work. To that end and in accordance with CIRIA guidance (R132) *A guide for safe working on contaminated sites (1996)*, the Contractor will be required to undertake a risk assessment before any work is carried out at the site which is likely to expose staff to substances hazardous to health. Should hazards be identified during additional site investigation, the Contractor will be required to ensure that all employees (construction workers) are issued with personal protective equipment (PPE) appropriate to the hazards identified. PPE will, as required, consist of hazard specific gloves, eye protection and respiratory protective equipment (RPE).	To be confirmed in the Final CEMP.	**To be confirmed in final CEMP.**

Table 3-10: Landscape and Visual

Potential Impact	Mitigation / Enhancement Measure	Monitoring / Additional Survey Requirements	Responsibility
Visibility of new landscape features. Increased visibility of construction activities and vehicles. No significant effects are predicted based on the application of appropriate control measures.	The Contractor's CEMP will incorporate all the mitigation measures required to ensure the works is carried out in a way that minimises the potential for impacts to occur to the landscape, natural heritage, and visual environment. – With the primary objective to minimise the visual impact of the Designated Development so it is as unobtrusive as feasible against the existing environment backdrop. The stack will be finished in a light grey colour the stacks will be finished in a light grey colour (RAL7038), to blend in with the surrounding environment to help reduce attention away from industrial elements and help blend-in the various elements with the landscape in possible available views from local residences, the public road network, and in estuarine views across the River Shannon including designated views and prospects, scenic routes, and the Wile Atlantic Way. – There are elements of the existing facility that are screened by boundary vegetation from the sensitive receptors to the southeast of the Designated Development. It is essential that tree protection measures as described in BS 5837:2012 are applied in order to protect the existing trees within the Site during the construction phase. – A suite of mitigation measures have been provided by the ecology team setting out the measures to be implemented to ensure The Wildlife Acts of 1976 and 2012 as amended ("The Wildlife Act") and the Flora (Protection) Order, 2022 when undertaking any works which will affect protected species and there is no pollution of watercourses, waterbodies, or terrestrial habitats, in accordance with guidelines such as Construction Industry Research and Information Association's (CIRIA) Control of water pollution from construction sites (CIRIA, 2001). – It is proposed a perimeter fence (5 to 8m) will be erected prior to constructing to provide visual and acoustic screening. Mitigation and enhancement measures to be implemented include: – where existing vegetation is present along the Designated Development Site boundary, this will be retained, as far as reasonably practicable, and managed to ensure its continued presence to aid the screening of low level views into the Site; and – where possible, site compounds, plant and material stockpiles will be located in areas suitably screened from external views. **Lighting** – a Light Management Plan (LMP) will accompany the Final CEMP which sets out the approach for use of lighting during the construction phase; – lighting will be minimised in terms of number of lights and the power of the lights (lux level) during construction. Lighting required during the construction stage of the Designated Development will be designed to reduce unnecessary light spill/ glare outside of the Designated Development Site boundary. Directional lighting, facing and located away from the Designated Development Site's boundary, will be used. Lighting will be turned off when not in use except to meet the minimum requirements for Health and Safety.	To be confirmed in final CEMP	**To be confirmed in final CEMP.**

Table 3-11: Traffic Management

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Increased traffic flows, including HGV, on the roads leading to the Site.	The access points to the Designated Development Site are located off the N67. In order to minimise disruption to local traffic and maintain the safety of road users, the Contractor will be required to establish a traffic management system. This will account for: – planning and controlling the movement of vehicles, plant and non-motorised users that are present within the Designated Development Site, access to and egress from the Designated Development Site and on the adjacent road network; and – ensure that safety of construction operatives, motorised and non-motorised users are not compromised. This will be achieved by effective implementation of a Construction Traffic Management Plan (CTMP) to be prepared and initiated by the Contractor. The CTMP shall be included as part of the Contractor's CEMP. **Construction Traffic Management Plan (including HGV)** The objective of the CTMP will be to: – limit journeys to and from the Site by the workforce, sub-contractors, suppliers, and anyone else who is likely to visit the Site regularly; – provide protection from traffic hazards that may arise as a result of the construction activities and journeys to and from the Site; – installation of mirrors and construction traffic warning signs at site entrances; – manage potential adverse impacts on the public road network and ensure network performance is maintained at an acceptable level; – minimise adverse impacts on users (motorised and non-motorised) of the public road network and adjacent properties and community facilities; – plan deliveries to the Site; – ensure adequate signage is in place at the Site access points before use; and – ensure that the roads and footways at the site accesses are kept clear of debris, runoff, soil, and other material (complementing the Site wheel wash facilities). The Contractor will make local residents aware of the proposed works which will be undertaken. Therefore, the Contractor will be required to always accommodate and make provision for access and egress to these premises paying particular attention to the provision of pedestrian / disabled / cyclist safe access and egress. The CTMP will include alternative routes for pedestrians and vehicles in the event that public roads or right of ways are closed during works, although this is not expected to be required. The CTMP will include measures to limit the amount of queuing required by construction vehicles outside the Site boundaries.	The Contractor will undertake such monitoring as is necessary to assess the effectiveness of the measures included in the CTMP to control the routing and impact of construction traffic including HGV. This will include the maintenance of records of construction HGV entering and leaving the Site, which will be available to the relevant planning authority on request. Monitoring measures will provide a firm basis upon which to answer queries and complaints. Further details to be confirmed in the Final CEMP.	CTMP Co-ordinator to oversee management, monitoring, and implementation of the individual measures within the CTMP. **To be confirmed in Final CEMP.**

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Requirements	Additional	Survey	Responsibility
	Construction debris particularly site clearance, spoil removal and dirty water runoff, have the potential to cause a significant impact on footpaths and roads adjoining a construction site, if not adequately dealt with and these matters will be fully addressed in the contractors CTMP. **Traffic Management General Measures** – Warning signs / Advanced warning signs will be installed at appropriate locations in advance of the construction access locations. For example, warnings advise other road users of times of slow-moving vehicles during abnormal load deliveries; – Consideration will be given to reduce the volume of construction traffic accessing the site through reduce – reuse and recycle methods. Delivery control will also be adopted to reduce potential heavy vehicle convoys. – Temporary signage designating permissible HGV routes; – Material deliveries and collections from site will be planned, scheduled, and staggered to avoid unnecessary build-up of demolition/construction works related traffic; – HGV trips are anticipated to arrive and depart the site at a uniform rate throughout the day to avoid pressure on the morning and evening peak hour periods; – Appropriate vehicles will be used to minimise environmental impacts from transporting construction material, for example the use of dust covers on trucks carrying dust producing material; – Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the site; – Parking of site vehicles will be managed and will not be permitted on the public road, unless proposed within a designated area that is subject to traffic management measures; – A road sweeper will be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works; – On site wheel washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the site, to remove any potential debris on the local roads; – All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol, or diesel. Spill kits will be available on site. All scheduled maintenance carried out off-site will not be carried out on the public highway; – Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons; and – Using Garda escorts for abnormal loads where required. **Site Management measures:**				

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Requirements	Additional	Survey	Responsibility
	– complaint registers will be kept detailing all telephone calls and letters of complaint received in connection with construction activities, together with details of any remedial actions carried out; – equipment and vehicles used on site will be in good condition such that emissions from diesel engines etc. are not excessive; – pre-start checks will be carried out on equipment to ensure they are operating efficiently and that emission controls installed as part of the equipment are functional; – monitoring and control of demolition / construction traffic during construction works; and – the use of prefabricated elements to minimise on site fabrication and assembly thereby reducing the numbers of site operatives required. Dust deposition levels will be monitored on a regular basis in order to assess the impact that site activities may have on the local ambient air quality. The flowing procedures will be implemented: – The dust deposition rate will be measured by positioning Dust Deposit Gauges at strategic locations near the boundaries of the site for a period of 30 (+/- 2) days if required. Monitoring should be conducted as required during periods when the highest levels of dust are expected to be generated i.e., during site preparation works and soil stripping activities. – The exact locations will be determined after consideration of the requirements of Method VDI 2119 with respect to the location of the samplers relative to obstructions, height above ground and sample collection and analysis procedures. – After each 30 (+/- 2 days) exposure period, the gauges will be removed from the sampling location, sealed and the dust deposits in each gauge will be determined gravimetrically by an accredited laboratory and expressed as a dust deposition rate in mg/m2/day in accordance with the relevant standards. – Technical monitoring reports detailing all measurement results, methodologies and assessment of results shall be subsequently prepared and maintained by the Site Manager **Site Routes:** – Site access routes (particularly unpaved areas) can be a significant source of fugitive dust from construction sites if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25% to 80%. – A speed restriction of 20km/h on surfaced and 15km/h on unsurfaced haul roads and work area will be applied as an effective control measure for dust for on-site vehicles or delivery vehicles within the vicinity of the Site; – Bowsers will be available during periods of dry weather throughout the construction period. Research shown found that the effect of surface watering is to reduce dust emissions by 50%. The bowser will operate during dry periods to ensure that unpaved areas are kept				

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Requirements	Additional	Survey	Responsibility
	moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and – Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced areas shall be restricted to essential Site traffic only. **Site Traffic on Public Roads:** – Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures: – Vehicles delivering material with potential for dust emissions to an off-site location shall be enclosed or covered at all times to restrict the escape of dust; – Any hard surface site roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only; – A power washing facility or wheel cleaning facility will be installed near to the Site compound for use by vehicles exiting the site when appropriate, and – Road sweepers will be employed to clean the Site access route as required. **HGV and Abnormal Loads** – HGV arrivals, including deliveries, will be managed as far as reasonably practicable to avoid on-site congestion. Any noisy works outside the core working hours, if required, will be agreed with the Applicant on a case by case basis. – Traffic movements will be controlled during the Designated Development construction phase in order to minimise potential impacts on the surrounding road network. The contractor will be required to provide detail of any HGV routing in the full CTMP. This will consider where deliveries will be made to/from and what roads will be used. – Should any complaints be raised by members of the public with regards to construction HGV not using the dedicated HGV route to the Site, records along with CCTV footage where available would be used to identify the offending HGV involved and appropriate sanctions put in place with the aim of avoiding repeat events. – The Contractor must ensure that the designated HGV route is adhered to by HGV drivers and the contractor must ensure that the policy and routing plan is distributed to all HGV drivers. This policy will be reinforced during staff inductions, with sanctions put in place to deal with non-compliance with the aim of ensuring no repeat events. – To ensure compliance with the measures set out above, the contractor must enforce the disciplinary procedure, ‘yellow/ red card system’ or equivalent. – In the first event of non-compliance, a warning will be issued to the HGV driver (yellow card). In the event of any repeat of the contravention, that driver will be prohibited from making further HGV deliveries to the Site (red card). – As mentioned above the contractor must distribute the HGV routing plan to all HGV drivers during their induction. It will be a condition of contract between the Applicant and the				

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Requirements	Additional	Survey	Responsibility
	Contractor to aim to ensure that all construction HGV deliveries must use the designated route to access and egress the construction site. Sanctions will be put in place to deal with non-compliance in the interests of highway safety, wheel cleaning facilities will be installed at the Site from the start of the construction phase. All HGV would be required to wheel wash when exiting the Site. – A 24-hour contact name and number will be displayed on a notice board at the Site entrance and on the Applicant's website, for members of the public to contact should they have any issues regarding construction traffic. – Residents will be updated on the construction of the Designated Development via a regular update bulletin posted on the Applicant's website. This will include information on the general timing and routing of abnormal load deliveries and a 24-hour contact name and number for members of the public to contact should they have any issues regarding construction traffic. It is anticipated that the project liaison manager will act as the initial point of contact for members of the community to find out further information; – The contractor will erect signage at the main junctions to appropriately direct all HGV traffic relating to the Designated Development (both accessing and egressing the site). These will be in place for the duration of the construction phase and will be checked regularly to confirm they are visible throughout. – The Contractor will be required to maintain all the HGV route signage. A formal process of liaison between all relevant parties (for example Contractor and the relevant County Council) will: – make all parties aware of the results of monitoring of the final CTMP; – provide a route by which any complaints cand transport related issues can be communicated, identified, and dealt with. The Final CEMP will include vigilance and security systems to safely shutdown the plant in the event of any aircraft related incident. During the commissioning (and operational) phase, working with suppliers to ensure that all relevant materials (including chemicals) bought to the Site that are classified as hazardous are transported in compliance with applicable regulations and guidance.				

Table 3-12: Waste Management

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
Hazardous waste arisings are expected to comprise small quantities of oils, chemicals and similar materials typically used as part of construction activities. Procedures for the storage and management of these wastes will be further detailed in the appointed Contractor's RWMP. The waste management facilities to be utilised during construction are not yet known and suitability will be determined by the appointed Contractor. Since it is not possible to estimate the exact composition of construction waste at this time a total recovery rate in line with the national performance of 78% (reported for 2020) is anticipated and likely to be achievable for non-hazardous construction waste (excluding naturally occurring soil and stones (Waste Code 17 05 04)). Since this recovery rate is above 70% this is therefore not considered significant. The quantities of waste from excavation are unlikely to be more than 5% of national waste arisings and therefore not considered significant.	A site-specific Resource and Waste Management Plan (RWMP) will be prepared by the Contractor. The RWMP will be employed to ensure sustainable and effective waste management throughout the construction phase of the Designated Development. Adherence to the RWMP prepared for the construction works will ensure that the management of waste arising is dealt with in compliance with the provisions of the Waste Management Act 1996 (as amended)[5], associated Regulations, Litter Pollution Act of 1997 (as amended)6 and the Southern Region Waste Management Plan 2015-2021 and A Waste Action Plan For a Circular Economy and that it will achieve optimum levels of waste reduction, re-use and recycling. A range of good practice measures will include the following: – Select procurement routes to minimise unnecessary packaging, e.g., applying 'Just-in-Time' (JIT) delivery processes to minimise material spoilage. – Use of 'consolidation centres' to support JIT delivery - these are strategically-located storage and distribution facilities where materials can be stored prior to JIT delivery to sites. – Implement ordering procedures and supply chain systems that avoid waste, i.e., no over-ordering, use of take-back schemes for packaging, material surplus and offcuts. – Select procurement routes that minimise unnecessary packaging. – Plan the work sequence to reduce the potential for on-site residual resource generation. The following approaches will be implemented, where practicable, to further minimise the quantity of waste arising and requiring disposal: – Reuse of materials on-site wherever feasible, e.g., reuse of excavated soil for landscaping, recycling of demolition materials into aggregates. – Off-site prefabrication, where practical, including the use of prefabricated elements. – Segregation of waste at source, where practical, to facilitate a high proportion and high-quality recycling. – Off-site reuse, recycling and recovery of materials and waste where reuse on-site is not practical, e.g., through use of an off-site waste segregation or treatment facility or for direct reuse or reprocessing off-site. **Recycling** The aim is to reuse materials won on-site by recycling them into an alternative form that can be used for construction purposes (for example crushing concrete, brick, or other inert wastes to produce aggregate material). By recycling on-site, as far as practicable, the quantity of waste requiring off-site management is reduced and carbon emissions associated with transportation are eliminated. Recycling may also be achieved by utilising materials with a recycled content, such as recycled aggregates produced off-site.	To be confirmed in the Final CEMP	**To be confirmed in the Final CEMP.**

[5] GOI (1996). Waste Management Act 1996. Available at: https://www.irishstatutebook.ie/eli/1996/act/10/enacted/en/html.
[6] GOI (1997). Litter Pollution Act. Available at: https://www.irishstatutebook.ie/eli/1997/act/12/enacted/en/print.html

Potential Impact	Mitigation/ Enhancement Measure	Monitoring/ Additional Survey Requirements	Responsibility
	Recovery This generally aims to recover energy from waste which cannot otherwise be reused or recycled. This may include waste materials such as hazardous liquids or solids that can be sent to energy from waste facilities. Recovery may also include the beneficial use of materials on land for restoration (backfilling operations). **Disposal** The least preferred option in the Waste Hierarchy is a final disposal route such as landfill. Some waste streams will inevitably end up with such a solution. When placing waste disposal contracts, the Contractor will consider the implications of long-distance travel in terms of health and safety risk, commercial terms, and increased emissions from vehicles. **Waste Storage** The main waste storage area will be located within the Site compound. A dedicated and secure area containing bins, and / or skips and storage areas will be provided for waste materials generated by construction site activities. Waste materials generated will be segregated at waste collection and storage areas where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source. All waste receptacles leaving site will be covered or enclosed. The appointed waste Contractor will collect and transfer the wastes as receptacles are filled. The Site construction manager will ensure that all staff are informed of the requirements for segregation of waste materials by means of clear signage and verbal instruction. Site employees will be made responsible for ensuring good Site housekeeping. **Pest Management** A pest control operator will be appointed as required to manage pest on-site during the dismantling / demolition and construction phase. Organic and food wastes generated by Site staff will not be stored in open skips, but in closed waste receptacles. Any waste receptacles will be carefully managed to prevent leaks, odours, and pest problems.		

3.2 Implementation and Operation

3.2.1 Roles and Responsibilities

The Contractor shall employ a suitably experienced and qualified Construction Environmental Management Plan Co-ordinator (CEMPC) / Environmental Site Officer to undertake co-ordination of monitoring of the works' impacts and implementation of the Contractor's proposals, in respect of all environmental requirements.

A CEMPC / Environmental Site Officer shall be present onsite for the duration of the Designated Development. The CEMPC / Environmental Site Officer shall be the point of contact for dealing with environmental issues for the Contractor's employees, sub-contractors, relevant authorities/environmental bodies, and members of the public. The CEMPC / Environmental Site Officer shall also be responsible for controlling the construction impacts arising from the activities of the Contractor and sub-contractors in accordance with the CEMP.

The CEMPC / Environmental Site Officer shall prepare, implement, manage, review, and revise the CEMP with the sole purpose of ensuring that the environment is safeguarded at all times from anticipated or unexpected adverse impacts during construction.

Within the Contractor's team, the CEMPC / Environmental Site Officer shall have the authority to ensure that the CEMP is effectively implemented. The CEMPC / Environmental Site Officer must notify the Applicant of any transgressions in respect of the CEMP so that necessary sanctions can be imposed.

In general, the duties of the CEMPC / Environmental Site Officer shall include the following:

- Implementation of the CEMP procedures;
- Routine environmental monitoring, recording, and reporting;
- Maintaining and auditing the CEMP and documents that underpin it;
- Environmental training including daily Toolbox Talks to site staff and design staff;
- Liaison with statutory authorities as required;
- Assist in liaison with the relevant authorities/environmental bodies and local community; and
- Any other activities that may be necessary in order to protect wildlife and the environment during the works.

Indicative contractor team roles and responsibilities have been identified within **Table 3.12**. This is indicative only and the final CEMP will set out all roles, responsibilities and actions required in respect of implementation of the measures described in this Framework CEMP, including:

- an organogram showing team roles, names, and responsibilities;
- training requirements for relevant personnel on environmental topics;
- information on site briefings and Toolbox Talks that will be used to equip relevant staff with the necessary level of knowledge to follow environmental control procedures;
- measures to advise employees of changing circumstances as work progresses;
- communication methods (e.g., updates via the Applicant's website);
- document control; and
- environmental emergency procedures.

All construction works associated with the authorised development must be carried out in accordance with the approved CEMP unless otherwise agreed with the Applicant.

Table 3-13: Key Contractor Team Roles and Responsibilities (indicative)

Role	Responsibilities
Contractor's Project Director	▪ Assign specific environmental duties to competent members of the Contractor's Team. ▪ Identify the environmental training needs of personnel under their control and arrange appropriate training programmes and ensure records are being maintained. ▪ Ensure that significant environmental aspects identified for the Designated Development are managed. ▪ Promote the continual improvement of environmental performance.
CEMP Coordinator (CEMPC) / Environmental Site Officer	▪ Develop, maintain, and audit the CEMP (and supporting documents/plans) to ensure all aspects, impacts and statutory requirements etc. are reflected in the CEMP. ▪ Develop and implement a programme of regular environmental inspections, monitoring, recording, and reporting by the Environmental Site Representative(s) in accordance with procedures set out in the CEMP. ▪ Ensure that the works are constructed in line with the CEMP. ▪ Liaise with statutory authorities. ▪ Attend regular construction meetings to ensure environmental issues are discussed and addressed by the Contractor's Team. ▪ Liaise with relevant authorities/environmental bodies and the local community as required. ▪ Comply with duties under relevant legislation and company procedures in relation to environmental incident investigation and reporting. ▪ Provide support and training to the workforce with regard to understanding environmental aspects, impacts, regulatory requirements, best practice, constraints, and methods of working. ▪ Nominate the Environmental Site Representative(s). ▪ Appoint environmental specialists as required. ▪ Ensure identified environmental specialists are in attendance onsite as required by the CEMP. ▪ Review non-conformance reports provided by the Environmental Site Representative(s) and/or the Inland Fisheries Ireland (IFI) Environmental Advisors to identify any underlying issues or patterns to identify suitable ameliorative measures.
Contractor's Project Manager	▪ Ensure that the CEMP is produced, maintained, implemented, and distributed to all relevant parties. ▪ Provide an on-call 24hr resource as a first point of contact for environmental issues/incidents. ▪ Monitor the completion of corrective actions by the Site Manager and act as required to expedite completion. ▪ Provide regular reports to the Applicant on environmental performance, including details of any identified incidents or non-conformances and corrective actions. ▪ Ensure that all personnel for whom they are responsible are aware of the CEMP and implement the relevant requirements. ▪ Evaluate the competence of all subcontractors and suppliers and ensure that they are made aware of and comply with the CEMP and associated procedures. ▪ Establish a consultation and communication system, including employees, partners, sub-contractors, designers and third parties, etc., where relevant.
Site Manager	▪ Ensure that all personnel undergo suitable and sufficient environmental induction before starting work on the Designated Development, and periodic refresher environmental awareness training throughout the construction. ▪ Ensure staffs attend the appropriate environmental courses that are organised by the Environmental Manager (CEMPC). Ensure the Environmental Manager is maintaining records of training delivered to Site staff. ▪ Monitor the performance of personnel and activities under their control and ensure arrangements are in place so that all personnel can work in a manner which minimises risks to them and to the environment. ▪ Undertake a programme of regular environmental inspections in liaison with the Environmental Site Representative(s). ▪ Complete any corrective actions identified by the Environmental Site Representative(s) and provide status reports as required to CCC. ▪ Assist and support the Environmental Manager (CEMPC) and statutory bodies in the investigation of any incidents. ▪ Notify the Environmental Site Representative(s) of all environmental issues or incidents arising over the course of operations.
Environmental Specialists (i.e. Ecological Clerk of Works (ECoW) and Environmental	▪ Attend site as required to monitor the protection of asset in accordance with the requirements of relevant legislation, mitigation as outlined within the ER, NIS and any other reports produced for the Designated Development), mitigation measures as outlined within planning conditions, the construction contract, and the CEMP. ▪ Identify potential risks to wildlife and develop suitable control measures. ▪ Provide status reports and updates to the Environmental Site Representative(s) in the completion of their activities.

Role	Responsibilities
Clerk of Works (EnvCoW))	▪ Provide advice about ecological and environmental and issues during the construction of a development including advice on protected species, pollution, surface water management, material management, air quality and noise. ▪ ECoW and EnvCoW roles can be carried out by the same person once they are adequately qualified.

3.3 Checking and Corrective Action

3.3.1 Monitoring

Environmental focused monitoring and inspection activities shall be carried out throughout the lifetime of the Designated Development. The frequency of these monitoring and inspection activities will be agreed in advance of construction with the Applicant and will be in line with planning conditions. Additional monitoring and inspection will take place outside of the agreed frequency where an environmental incident occurs or where activities that can have a significant environmental impact are occurring.

As part of the monitoring process, the appointed contractor will allocate a designated CEMPC / Environmental Site Officer(s), who would be present on-site throughout the construction, including when new activities are commencing. The Environmental Site Officer will observe site activities and report any deviations from the final CEMP in a logbook, along with the action taken and general conditions at the time. The Applicant will be informed of any deviations from the final CEMP as soon as possible following identification of such issues. The CEMPC / Environmental Site Officer will also assist the Applicant with day-to-day contact with the relevant planning authority and regulatory agencies such as the EPA.

During construction, the CEMPC / Environmental Site Officer will conduct regular walkover surveys to ensure all requirements of the final CEMP are being met and to monitor compliance. It is anticipated that a daily visual check and a detailed weekly check shall be carried out and these records will be available upon request. Action from these surveys will be documented on an Environmental Action Schedule, discussed with the Site Foreman for programming requirements and issued weekly for actioning.

The CEMPC / Environmental Site Officer will arrange regular formal inspections to ensure the requirements of the final CEMP are being met. After completion of the works, the Environmental Site Officer will conduct a final review.

During the construction phase the following monitoring measures will be considered at a minimum:

- regular inspection of surface water run-off and sediments controls;
- soil sampling to confirm disposal and short-term storage options for excavated soils;
- regular inspection of construction/mitigation measures shall be undertaken e.g., concrete pouring, refuelling etc.;
- dust monitoring and monitoring of dust control measures;
- noise and vibration monitoring and monitoring of noise and vibration control measures;
- surface water monitoring (if required); and
- daily monitoring of general housekeeping onsite.

3.3.2 Auditing

Planned and documented audits (including waste and environmental audits) aimed at evaluating the conformance of the Designated Development will be carried out throughout the construction phase. The frequency of the audits will be agreed in advance with the Applicant. As a minimum this would include;

- weekly site walkover with results presented at the Contractors' regular meetings with the Applicant; and
- dedicated waste audits shall be carried out at a frequency agreed in advance with the relevant planning authority. All waste types and records would be available for review upon request.

The CEMP will be reviewed and audited every 6 months as a minimum and updated in line with current guidance and legislation.

3.3.3 Consents and Licences

All statutory consents and licences required to commence onsite construction activities shall be obtained ahead of works commencing, allowing for the appropriate notice period. It will be the responsibility of the Contractor to ensure all consents and licences required are in place prior to the start of construction.

These will include, but are not limited to:

- site notices;
- construction commencement notices;
- licence to connect to existing utilities (inc. water) and mains sewers, where required;
- abstraction and/or discharge licenses; and
- road opening/closure licences (if applicable).

3.3.4 Records

The CEMPC / Environmental Site Officer will retain records of environmental monitoring and implementation of the final CEMP. This will allow provision of evidence that the final CEMP is being implemented effectively. These records will include:

- an Environmental Action Schedule;
- records of licences, permits and approvals;
- results of inspections;
- other environmental surveys and investigations; and
- environmental equipment test records.

The final CEMP will be a live document and as such updated regularly, with a full review on at least a quarterly basis throughout construction.

3.4 Management Review

The final CEMP will be signed off on completion of the construction works. The operator of the Designated Development Site will then implement and maintain an Environment Management System (EMS).

4. References

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British Standards Institute (2014a*). BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.*

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CIRIA (2001). *C532: Control of water pollution from construction sites*. Available online: https://www.ciria.org/ProductExcerpts/C532.aspx

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Environment Agency (EA) (2001). *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention*.

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NetRegs website (2020). *Environmental Guidance for your Business in Northern Ireland and Scotland*.

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WRAP (2007). *Waste Recovery Quick Wins. Improving Recovery Rates without Increasing Costs. No longer available online.*

Appendix A Framework Resource and Waste Management Plan (RWMP)

A.1 Introduction

This Framework Resource and Waste Management Plan (Outline RWMP) has been prepared at a stage when exact quantities and volumes of waste material have not yet been determined. This document is considered to be live and is to be updated by the Contractor in accordance with the relevant guidance (Environmental Protection Agency (EPA) *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects, 2021*[7] (herein referred to as the 'RWMP Guidelines')).

This Framework RWMP will be updated by the Contractor into a Contractor's Resource and Waste Management Plan prior to commencement of works and will be part of the Contractor's CEMP. The construction stage RWMP will be produced by the Contractor and submission and approval of the final RWMP prior to commencement of construction is proposed to be secured by a condition.

This Framework RWMP has been developed to act as a guide for site staff on how to manage construction materials and waste, in accordance with both legal and best practice requirements.

This Framework RWMP does not replace the requirement for the completion of a construction phase RWMP. The Framework RWMP presents the approach that would be adopted as a minimum throughout construction and forms a framework for the approach of the construction stage RWMP.

RWMPs are used as a good practice measure on construction projects and to support planning and consenting applications. This outline RWMP has been developed to act as a guide for site staff on how to manage construction materials and waste, in accordance with both legal and best practice requirements. The Contractor will use this framework RWMP as a framework for producing the RWMP for use throughout the duration of the Designated Development construction phase.

It is anticipated that some of the required information will not be available until the detailed design phase, such as commitments, target setting, design approach and designing out waste strategies. It shall be the responsibility of the Contractor to update the RWMP once this information becomes available.

Sections related to the commitment to responsibilities, auditing, training, reporting, tracking, supply chain, etc. shall be set up and refined by the Contractor prior to commencement of works.

In developing the RWMP, the Contractor will re-use materials where practicable, where permitted under the relevant waste legislation, and where the material meets engineering requirements. The methods outlined in *Construction Code of Practice for the Sustainable Use of Soils on Construction Site*s (2009) will be taken into consideration in order to maintain the quality of moved and stored soils and minimise impacts on soil structure and quality. Vermin control will also be implemented by the Contractor.

A.2 Waste Management Legislation and Policy Context

The Contractor must ensure that the Contractor's RWMP is updated to reflect current legal requirements and the waste management practices of the Designated Development as necessary, both prior to and during the construction works. The Contractor must ensure all required authorisations are obtained.

[7] Environmental Protection Agency (EPA), 2021. *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects*. Available at: https://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf

The following information is reproduced from the RWMP Guidelines[8].

The European Waste Framework Directive (Directive 2008/98/EC),[9] as amended by Directive (EU) 2018/851[10] (Waste FD) sets the basic concepts and definitions related to waste management, such as definitions of waste, recycling and recovery. It also includes definitions for when waste ceases to be waste and becomes a secondary raw material (end-of-waste criteria) and how to distinguish between waste and a by-product. The Waste FD is enacted in Ireland under European Communities (Waste Directive) Regulations 2011.[11]

Waste is defined by Article 1(a) of the Waste FD[9] as "*any substance or object (in the categories set out in Annex I) which the holder discards or intends or is required to discard"*.

The legal definition of waste also covers substances or objects, which fall outside of the commercial cycle or out of the chain of utility. In particular, most items that are sold or taken off-site for recycling are wastes, as they require treatment before they can be resold or reused.

In practical terms, wastes include surplus earthworks materials and soil, scrap, unwanted surplus materials, packaging, recovered spills, office waste, and damaged, worn-out, contaminated or otherwise spoiled plant, equipment and materials.

In Ireland, the primary waste legislation is the Waste Management Act 1996,[12] as amended, and Section 32 of the Act places a general obligation on the holder of waste to comply with legislation and ensure all wastes are managed within the requirements of the Act. In short, the obligation to manage waste legally lies with the holder of waste, which means the waste producer or the person who is in possession of the waste. At a construction site, the mandatory obligation to appropriately manage waste generated at a construction site lies with the Client and the Principal Contractor.

Under Section 3(1) of the Act,[12] the requirements do not apply to the following materials, which hence are not considered 'waste':

- Land (in-situ) including unexcavated contaminated soil and buildings permanently connected with land – relates to land and buildings prior to any construction or demolition where material remains untouched. Once it has been excavated or otherwise removed, the material may enter into the control regime set down by the Waste Management Act.
- Uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated.

In addition, there are two important provisions within the European Communities (Waste Directive) Regulations 2011[11] that are of relevance to the construction sector and the prevention of waste and these allow for the classification of resources out of the waste regime as follows:

- Article 27 allows for the notification of a material as a by-product rather than a waste where certain criteria can be demonstrated by the legal person (i.e. further use is certain, no need for further processing, produced as part of a process and further use is lawful).

[8] EPA (2021). *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects*.
[9] The European Parliament and The Council of the European Union, 2008. *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives*.
[10] European Union, 2018. *Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste.*
[11] Government of Ireland (2011). *S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011*.
[12] Government of Ireland (1996). *Waste Management Act 1996*.

- Article 28 sets out the grounds by which a material, which is recovered or recycled from waste, can be deemed to be no longer a waste and complies with a set of end-of-waste criteria (substance / object to be used for specific purposes, a market or demand exists, fulfils technical requirements and no overall adverse impact to human health or the environment).

Policy

A Waste Action Plan for a Circular Economy, Ireland's National Waste Policy 2022-2025[13] sets out Ireland's approach to transitioning to a circular economy.

For construction and demolition (C&D) waste, the plan supports the provisions and targets of the European Communities (Waste Directive) Regulations 2011[11] by undertaking to streamline the decision-making processes for by-product notifications and end-of-waste and updating best practice guidance in line with the Waste Hierarchy.

The Plan calls for the replacement of the existing Regional Waste Management Plans with a single National Waste Management Plan containing targets for reuse, repair, resource consumption and a reduction in contamination. The single Plan will aim to build on the progress from 2015, strengthen national capacity and delivery while retaining a regional focus for implementation. Development of this National Waste Management Plan commenced in 2021 and will be informed by the outcomes of this evaluation.

For the purposes of waste management planning, Ireland is divided into three regions. The Designated Development is located within the Southern Region and the Southern Region Waste Management Plan 2015-2021 provides the framework for the prevention and management of wastes in a safe and sustainable manner.

A.3 Waste and Recycling Targets

The environmental assessment of the Designated Development is based on it achieving certain performance standards with respect to the recovery of C&D waste.

Member States such as Ireland must ensure that the preparation for reuse, recycling, and other material recovery of non-hazardous C&D waste (excluding naturally occurring material defined in List of Waste category 17 05 04) is a minimum of 70% by weight. The Waste FD specifies that this target should be achieved by preparing for reuse, recycling, and other material recovery, including backfilling operations using waste to substitute other material. However, as outlined in the RWMP Guidelines,[14] the Waste FD C&D recovery target is designed for national statistics and is not an appropriate target for individual projects.

As outlined in the RWMP Guidelines the responsibility for setting any project target lies with the Client who may dictate the appropriate performance specification for the project through imposing mandatory contractual obligations on the Contractor. Clients and Design Teams are recommended to reference the relevant industry practice, design standards and certification schemes in setting any project-specific target for the Contractor.

The following can be taken into consideration when setting waste targets:

- Standard, good, and best practice recovery rates by material are provided by WRAP.[15] Recovery rates for key construction materials and other construction wastes relevant to the Project are provided in **Table A-1** below.
- The EPA's 'Progress to EU Targets'[16] reports Ireland's performance against targets set out in European Directives shows performance of 84% was reported for 2019, exceeding the 70% target.

[13] Government of Ireland (2020). *Waste Action Plan for a Circular Economy, Ireland's National Waste Policy 2022-2025*.
[14] EPA 2021. *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects*.
[15] WRAP, 2007. Waste Recovery Quick Wins. Improving Recovery Rates without Increasing Costs. No longer available online.
[16] Environmental Protection Agency, 2021. Progress to EU Waste Targets. 1 December 2021.

Table A-1: Standard, Good and Best Practice Recovery Rates by Material

Material	Standard Practice Recovery (%)	Good Practice recovery (%)	Best Practice Recovery (%)
Metals	95	100	100
Packaging	60	85	95
Concrete	75	95	100
Inert	75	95	100
Plastics	60	80	95
Miscellaneous	12	50	75
Electrical equipment	Limited information	70	95
Cement	Limited information	75	95
Liquids and oils	100	100	100
Hazardous	50	Limited information, cannot be 100% since some hazardous waste e.g., asbestos must be landfilled.	

A.4 Indicative Roles and Responsibilities

The main RWMP roles and responsibilities as outlined in the RWMP Guidelines are shown in **Table A-2**. The Contractor will complete and add any additional roles to **Table A-2** prior to the commencement of the construction phase.

Table A-2: Roles and Responsibilities

Position	Name	Contact Details	RWMP Responsibility
Client Advisory Team (e.g., Engineers, architects, consultants etc.) Project Manager			• Drafting and maintaining the RWMP through the design, planning and procurement phases of the project. • Appointing a Resource Manager (RM) to track and document the design process, inform the Design Team, and prepare the RWMP. • Include details and estimated quantities of all projected waste streams. This should also include data on waste types (e.g., waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team. • Incorporate relevant conditions imposed in the planning permission into the RWMP. • Handover of the RWMP to the Contractor at commencement of construction for the development of the RWMP in a similar fashion to how the safety file is handed over to the Contractor. • Work with the Contractor as required to meet the performance targets for the project.
Client Project Manager			• Establishing the ambition and the performance targets for the project. • Set out these commitments and targets in relation to prevention and minimisation in the project brief, tendering documentation including pre-qualification requirements, invitation to tender, etc. • Require the preparation and submission of an updated RWMP as part of the construction process. • Ensure that the RWMP is agreed and submitted to the Applicant prior to commencement of works on-site. • Request the end-of-project RWMP from the Contractor.
Contactor Project Manager			• Preparing, implementing, and reviewing the RWMP through construction (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines.

Position	Name	Contact Details	RWMP Responsibility
			• Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP. • Identifying all hauliers to be engaged to transport each of the resources / wastes off-site. Note that any resource that is legally a 'waste' must only be transported by a haulier with a valid Waste Collection Permit. • Identifying all destinations for resources taken off-site. • End-of-waste and by-product notifications addressed with EPA where required. • Clarification of any other statutory waste management obligations, which could include on-site processing. • Full records of all resources (both wastes and other resources) should be maintained for the duration of the project. • Preparing a RWMP Implementation Review Report at project handover.

A.5 Approach to Waste Management

The Applicant is committed to delivering a development that is sustainable in regard to matters relating to waste management and will comply with the relevant statutory requirements. This requirement will be passed onto the Contractor. Decisions made at the detailed design stage of the Designated Development will impact on the quantity and types of materials used, the quantity and types of waste arising and the management of materials and waste.

Waste elimination will start as early as possible, and the Contractor and their design team will work in conjunction with the Applicant to design and plan waste minimisation. The Designated Development's design development has and will continue to apply the principles of Designing out Waste (DoW), which include:

- Design for reuse and recycling;
- Design for green procurement;
- Design for off-site construction;
- Design for materials optimisation; and
- Design for deconstruction and flexibility.

The proposed construction phase RWMP will identify the types and quantities of waste anticipated to be generated, along with the definition of suitable disposal routes. The construction phase RWMP will also include details as to how material reuse and recycling options will be maximised. The construction phase RWMP will be maintained as a live document, to be updated and monitored by the Contractor, in order to demonstrate compliance with the Waste Duty of Care and other relevant regulations.

The RWMP will require that the Contractor segregates waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from the Site will be undertaken by fully licensed waste carriers and taken to permitted waste facilities.

Prior to construction, the Contractor must record, in the contractor RWMP, all actions to be implemented to reduce waste or material use on the Designated Development, and the resulting benefits.

In general, the following measures shall be considered during the design and construction phases of the Designated Development, where technically, economically, and environmentally practicable:

- designing the Designated Development in a manner that facilitates the reuse of acceptable material arisings, for example those associated with earthworks and other excavations;
- achieving an earthworks balance (cut and fill material) within the design of the Designated Development, where possible, to minimise the need to import and export material;

- the inclusion of land within the Designated Development boundary for the temporary on-site storage of soils, excavated materials and other materials;
- the appropriate sizing of construction compounds to enable the segregation and storage of waste, and to facilitate off-site recovery;
- the retention of existing infrastructure within the Designated Development design where feasible, to minimise the need for the demolition of components and infrastructure and the associated generation of waste material;
- the reuse of excavated materials and the recycling of demolition and construction materials within the Designated Development, where practicable, to minimise the need to import and export material;
- the optimisation of designs through the incorporation of precast concrete elements to reduce on-site waste arisings;
- importing alternative (recycled and secondary) aggregate materials during construction, where practicable, and establishing procedures to ensure it is uncontaminated.
- Establishing Key Performance Indicators (KPIs) for monitoring and reporting data on waste arising and diversion from landfill.

Waste Types and Actions

At this stage it is not possible to confirm the anticipated type and estimated volumes of waste to be produced from construction. **Table A-3** provides a summary of the anticipated waste types and how each waste type is expected to be managed to reduce adverse impacts.

Table A-3: Waste Types and Management

Waste Type	Main Management Process
Soil arisings	Reuse on-site where appropriate, remediate where necessary.
Concrete, masonry, and aggregates	Crush and reuse, investigate potential for off-site use.
Metals	Recycle via appropriate waste carrier.
Paper and cardboard	Segregate and recycle via appropriate waste carrier.
Sanitary waste	Remove by specialist waste contractor.
Plastics and glass	Recycle via appropriate waste carrier.

A further source of construction waste would relate to packaging waste associated with materials used during construction.

Any excess spoil generated during construction will be managed through the RWMP that would form part of the final CEMP. Spoil which cannot be re-used will be removed from site for re-use, treatment, or disposal at a permitted facility. The re-use of excavated materials during construction will be governed by relevant legislation and guidance such as Regulation 27 of the European Communities (Waste Directive) Regulations 2011, as amended and Article 28 of the European Communities (Waste Directive) Regulations 2011, as amended, as well as any other relevant legislation and guidance.

Management of Excavated Materials

The Contractor will set out within the RWMP, their proposal for the management and re-use of any excavated materials on or off site, where permitted in accordance with the relevant legislation.

Where the Contractor proposes to maximise the re-use of any excavated material in order to minimise the generation of waste, it will set out how it proposes to manage and document this re-use and will be carried out in line with all relevant legislation and guidance.

The Contractor will establish the controls necessary to manage the generation, handling, and storage of waste at the Site.

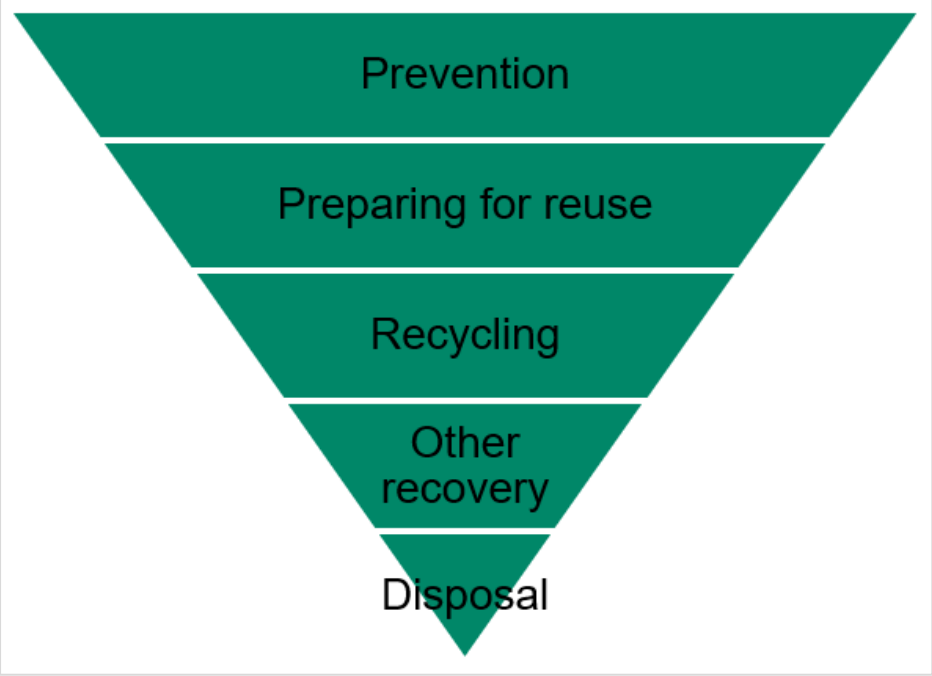
These controls may rely on the other plans within the CEMP, for example the protection of stockpiles against rainwater ingress and leachate runoff, the bunding of hazardous waste storage areas containing liquids (e.g., oils, paints), and the management of waste collection vehicles both within and when leaving the Site (dust and noise).

Waste Minimisation Actions and Mitigation

The Waste Hierarchy sets out the priority order that should be considered when managing wastes. A basic representation is provided in Plate A.1 shows the waste hierarchy. The Principal Contractor will use the Waste Hierarchy as a guide to encourage the prevention of waste and to define waste management options.

When considering waste management options for the Designated Development, the Principal Contractor will take account of the site's location, natural environment, and available infrastructure. The Principal Contractor will consider the following options when determining the preferred waste management option for each waste stream.

Plate A.1: The Waste Hierarchy[17]



The aim of prevention and preparing for reuse is to reduce the potential impacts from materials and waste, and to achieve high levels of sustainability in the Designated Development as a whole. The Principal Contractor will apply the principles of the Waste Hierarchy and adopt best practice measures (BPM) which go beyond statutory compliance.

This may include BPMs set out in construction industry guidance for example, guidance from the Considerate Constructors Scheme (CCS), Waste & Resources Action Programme (WRAP) and Construction Industry Research and Information Association (CIRIA).

[17] European Commission (2022). Waste Framework Directive.

Recycling aims to reuse materials won on-site by recycling them into an alternative form that can be used for construction purposes (for example crushing concrete, brick, or other inert wastes to produce aggregate material). By recycling on-site, as far as practicable, the quantity of waste requiring off-site management is reduced and carbon emissions associated with transportation are eliminated. Recycling may also be achieved by utilising materials with a recycled content, such as recycled aggregates produced off-site.

Recovery generally aims to recover energy from waste which cannot otherwise be reused or recycled. This may include waste materials such as hazardous liquids or solids that can be sent to energy from waste facilities. Recovery may also include the beneficial use of materials on land for restoration (backfilling operations).

The least preferred option in the Waste Hierarchy is a final disposal route such as landfill. Some waste streams will inevitably end up with such a solution. When placing waste disposal contracts, the Principal Contractor will consider the implications of long-distance travel in terms of health and safety risk, commercial terms, and increased emissions from vehicles.

Waste minimisation actions relating to site generated construction waste will include consideration of:

- agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- implementation of a ‘just-in-time’ material delivery system, as far as reasonably practical, to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
- attention to material quantity requirements to avoid over-ordering and generation of waste materials;
- Wherever possible, leftover materials (e.g., timber off cuts) and any suitable demolition materials shall be reused on-site;
- segregation of waste at source where practical; and
- re-use and recycling and recovery of materials and waste off-site where re-use on-site is not practical (e.g., through use of an off-site waste segregation or treatment facility and re-sale for direct re-use or re-processing off-site).
- Facilitate recycling and appropriate disposal by on site segregation of all waste materials generated during construction into appropriate categories, including:
  - Topsoil, subsoil, gravel hard-core
  - Concrete, bricks, tile, ceramics, plasterboard
  - Asphalt, tar, and tar products
  - Metals
  - Dry Recyclables e.g., cardboard, plastic, timber.
- All waste assessed as 'not suitable for reuse' shall be stored in skips or other suitable receptacles in a designated area of the site, to prevent cross contamination between waste streams, dispersion, and leaching;
- Uncontaminated excavated material (top-soil, sub soil, etc.) shall be segregated, stockpiled, and reused on site in preference to importation of clean fill, where possible;
- If excavated material cannot be used on site, the potential for its transfer to another site under, for example, Article 27 of the European Communities (Waste Directive) Regulations 2011 should be explored;

- Where possible, the Contractor shall ensure that all waste leaving site will be recycled or recovered.

Additional Actions for Dealing with Waste

The Contractor will regularly review and update where required the assumptions on waste arisings and management and record and implement procedures for assessing, managing, and recording waste arising on-site.

In addition to the waste management measures as detailed in the 'Approach to Waste Management' section above, there are actions that will be introduced as part of the construction RWMP which would contribute to the general reduction of waste generation during construction, including:

- appointment of an CECMPC/Environmental Site Officer who will hold overall responsibility for waste management, coordinate all waste and environmental issues on-site, monitor waste data and identify training needs. Sites with such personnel tend to perform better in managing waste;
- accurate record keeping of waste types, volumes and disposal routes and destinations;
- staff awareness training to ensure all personnel know the correct procedures on-site for waste segregation, disposal and actively promote recycling on-site through clear signage;
- setting of targets/ Key Performance Indicators (KPIs) for waste recycling and reduction; and
- establishing a good management structure, which will allow prompt decision making relating to improvements in waste management and recycling initiatives.

A.6 Waste Identification, Classification, Quantification and Handling

Waste arising for the project shall be segregated, identified, and classified by the contractor in accordance with applicable waste regulations and guidance.

Wastes shall not be removed from the site until properly classified, assigned a correct LoW code and all appropriate tracking and disposal documentation is in place.

For each waste stream identified and classified, and for each waste stream that may arise during the course of the works, the following shall be identified and documented by the Contractor in their RWMP:

- an appropriate waste classification and correct LoW code; the classification of materials as non-hazardous and/or hazardous waste will be determined in accordance with EPA (2018) Guidance "Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-hazardous" using the www.hazwasteonline.com web-based waste assessment system (as recognized by the Environmental Protection Agency) and using Waste Acceptance Criteria in accordance with the European Communities (EC) Council Decision 2003/33/EC, which establishes criteria for the acceptance of waste at landfills;
- a suitable Waste Collection Contractor in possession of a valid Waste Collection Permit for the collection of waste within the Kerry County Council area;
- appropriate waste recovery, recycling, or disposal facilities, including any required transfer stations whereupon the said facilities shall be in possession of a valid Waste Facility Certificate of Registration, permit or Waste License, as appropriate.

Where any material is being recovered onsite or offsite for reuse, the Contractor shall provide confirmation of any application to the EPA under Article 27 or Article 28 to classify material as a by-product or as end-of-life waste respectively; and final reconciled waste quantities generated, including details of waste disposal, reuse, and recovery quantities.

The Applicant will require that the contractor segregates waste streams on-site, prior to them being taken to a waste facility for recycling or disposal.

A.7 Segregation and Storage

The following minimum segregation and storage strategy requirements shall be adhered to:

- waste streams shall be individually segregated; and all segregation, storage & stockpiling locations will be clearly delineated on site drawings. At the waste storage areas, the Contractor must segregate waste into the following types as a minimum: inert; wood; metals; packaging; general waste; hazardous solid wastes; hazardous liquid wastes. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage;
- waste storage, fuel storage, stockpiling and movement are to be undertaken with a view to protecting any essential services (electricity, gas, water) and with a view to protecting environmentally sensitive areas (e.g., watercourses, ditches, treelines, hedgerows) and existing localised groundwater quality boreholes (if applicable);
- contaminated or potentially contaminated soil shall be stockpiled only on hard-standing or high-grade polythene sheeting to prevent cross-contamination of the soil below and should be located away from watercourses, drainage systems, ditches etc.;
- roles and responsibilities of those managing the segregation and storage areas shall be identified;
- the waste storage area should contain suitably sized containers for each waste stream. The number and sizing of containers shall be agreed with the waste Contractors in advance of the commencement of the project;
- all segregation and waste storage areas shall be inspected regularly by the appointed Resource Manager;
- waste shall be stored on site, including metals, asphalt, and soil stockpiles, in such a manner as to:
  - prevent environmental pollution (bunded and/or covered storage, minimise noise generation and implement dust/odour/pest control measures, as may be required);
  - maximise waste segregation to minimise potential cross contamination of waste streams and facilitate subsequent reuse, recycling, and recovery; and
  - prevent hazards to site workers and the general public during construction phase (largely noise, vibration, dust, and pests).
- construction materials that are stored on-site must be in designated areas that are flat, accessible, and secure in order to avoid damage or loss. Materials must be stored in appropriate conditions to avoid damage through, for example, water ingress or vermin. Materials must be retained in their original packaging to protect them from damage.
- the Contractor must ensure that the construction site compounds incorporate designated waste storage areas for skips or similar suitable waste receptacles. The Contractor must ensure that these areas are surfaced with an impermeable barrier, such as hardstanding/tarmac or using impermeable membranes; should be suitably contained, bunded or defined as required; and the location of any existing drainage will be noted.
- the Contractor shall ensure containers are clearly labelled using a colour coding system so that users know what wastes can be placed in each container. Waste containers must be appropriately colour coded using generic colour codes, an example is shown in **Figure A.2**.

- lockable storage shall be provided for all hazardous waste.
- all waste containers must be sited at least 50m away from watercourses, ditches, drains and other areas of environmental sensitivity.
- liquid wastes must be stored in enclosed/lidded containers and stored within a suitable bunded area, or otherwise provided with secondary containment.
- separate containers must be provided for each type of hazardous waste.
- each type of hazardous waste must not be mixed with any other hazardous or non-hazardous waste.

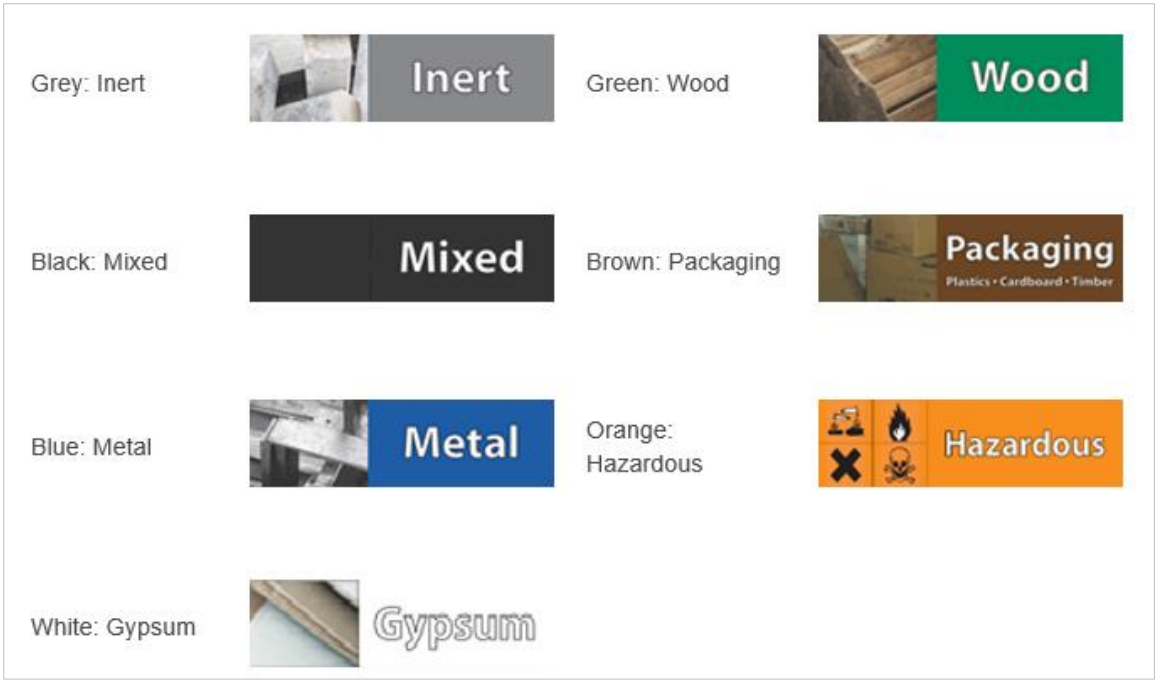


Figure A.2: Example of Waste Container Colour Codes

A.8 Documentation of Waste

The Contractor will develop a Waste Documentation System within the overall documentation system for the works in accordance with the *Best Practice Guidelines for The Preparation of Resource Management Plans for Construction & Demolition Projects* (EPA, 2021). The documentation to be maintained in relation to wastes includes the following (where applicable):

- the names of the agent(s) and the transporter(s) of the wastes and hold a copy of associated waste collection permits;
- the name(s) of the person(s) responsible for the ultimate recovery or disposal of the wastes, and hold a copy of associated waste facility permits and licences;
- the ultimate destination(s) of the wastes;
- written confirmation of the acceptance and recovery or disposal of any hazardous waste consignments;
- the tonnages and EWC (European Waste Catalogue) Code for the waste materials;
- details of any rejected consignments;
- the Waste Transfer Forms for hazardous wastes transferred from the Site; and

- the Certificates of Recycling, Re-use or Disposal for all wastes transferred from the Site.

A.9 Audit Monitoring and Review

To be most effective, it is important that the construction phase RWMP is a live document which, like the Final / Contractor's CEMP, is regularly reviewed and updated. Waste will be monitored routinely through regular site inspections (weekly at a minimum). Monitoring of waste and implementation of waste management plans will assist in achieving waste minimisation obligations, as detailed within the construction phase RWMP as well as helping to identify opportunities for improvements and potential cost reductions.

The following is not an exhaustive list and represents typical activities undertaken at each stage.

Waste monitoring, including:

- updating the construction phase RWMP at regular intervals to illustrate changes to the Site, such as waste types, volumes, sub-contractors, and changes in personnel and to drive continual improvement in promoting management of wastes as high up the waste hierarchy as possible;
- monitoring compliance with relevant legislation and regulations and checking that the construction phase RWMP is being implemented appropriately, monitored through regular (weekly at a minimum) site inspections;
- completing monthly logs detailing the volume of material brought on-site and the volume of waste generated, including the type and route of disposal/ recovery; and
- collating monthly data detailing all waste movements into a quarterly report to be submitted to the Environmental Site Officer for use during the annual waste audit and waste review.

Waste auditing (undertaken annually as a minimum), including collating/ reviewing:

- operations/ staffing levels, composition, waste monitoring reports and quantity of waste generated;
- current waste management procedures;
- existing activities including, for example, key roles and responsibilities; and
- an estimation of waste volumes including a comparison from previous and projected years (where appropriate);

The results of the waste audit will be used to inform the waste review.

A waste review would be undertaken following the completion of a waste audit and the completion of regular waste monitoring. The review would provide an opportunity to consider the suitability of the management strategies that are in place in relation to relevant regulations and best practice procedures, and identify areas for improvement, lessons to be learnt and improved cost saving and sustainability; and the review would consider monthly, quarterly, and annual reports, compare waste related data that has been collected and include guidance and proposals to drive continual improvement.

The monitoring procedures detailed above will be undertaken as a minimum and defined within the construction phase RWMP.

A.10 Conclusion and Summary

This Framework RWMP presents the approach that will be implemented during the construction phase.

This Plan illustrates and seeks to guide the Contractor and Applicant to:

- recognise that the construction phase RWMP will underpin the approach to waste management for the Designated Development construction phase;
- define indicative roles and responsibilities within the organisations to ensure those responsible for waste management are aware of their remit;
- demonstrate that key waste legislation will be met, and local and regional drivers will be fulfilled, including reviewing procedures should waste legislation and guidance be amended or updated in future;
- demonstrate that the construction phase will minimise waste as far as reasonably practicable in accordance with best practice via the implementation of a construction phase RWMP;
- develop a proactive and coordinated approach to sustainable waste management, reuse and recycling that will be encouraged and implemented at the Site through a number of recycling initiatives to divert as much recyclable waste as possible from landfill; and
- record and audit waste movement during construction

Where individual waste types have not been identified within this Framework RWMP, these will be assessed in the construction phase RWMP.

Appendix C Projects Assessed for In-Combination Effects with the Designated Development

The temporary emergency electricity generation proposed at the ESB site at Shannonbridge, West Offaly is a part of the 450MW of emergency electricity generation plant designated under the Development (Emergency Electricity Generation) Act 2022, thus was included in the assessment for in-combination effects. The ESB site at Shannonbridge is over 100km from the SSE site at Tarbert.

Table B1 provides details of the other projects considered in the assessment of in-combination effects in this NIS.

Table B1. Projects included in assessment of in-combination effects

Planning application reference	Date submitted	Summary details	Applicant	Status	Distance from the Designated Development
PA08.311233	27/08/2021	10-year permission for proposed Shannon Technology and Energy Park consisting of power plant, battery energy storage system, floating storage and regasification unit, jetty, onshore receiving facilities, above ground installation and all ancillary structures/works.	Shannon LNG Limited	Requires further consideration	4.2km west
21549	25/05/2021	(a) a high intertia synchronous compensator (hisc) compound containing 1 no. hisc unit enclosed within a steel clad framed style structure (12.1m max height) and supported by 8 no. electrical equipment containers (containing ancillary power supply products including a static frequency converts, mv switchgear, exciters, lv distribution, control room, welfare and office), main auxiliary and start-up electrical transformers, generator circuit breaker, switchgear equipment, external cooler units and 1 no. back up diesel generator and associated diesel storage tank; (b) a 220kv high voltage gas insulated switchgear (gis) substation compound containing a gis substation building with all control and hv equipment within a single storey building (13.2m max height). the building will be surrounded by a compound road and contained within a 2.6m high galvanised steel palisade fence; (c) a battery storage compound containing 5 no. battery storage containers, enclosed in steel containers of dimensions approximately 13m by 2.5m by 3m, housing individual battery components with 2 no fitted external hvac systems for each unit and supported by 13 no. inverter stations, 14 no. auxiliary transformers and control container; (d) 220kv underground cable to the existing adjoining EirGrid substation; (e) associated elements comprising various underground cables and ducts, equipment plinths, boundary security fence, compound lighting and palisade gates and fencing, secuirty lighting, cctv, internal access roads, hardstanding areas and all necessary foundations works for the above compounds. the planning application is on lands where grid stabilisation facility was previously permitted under planning register no 19/115. planning permission to construct the development is sought for a period of 10 years. a Natura Impact Statement has been prepared in respect of the Designated Development and accompanies the application.	Donal Murphy Glencloosagh Energy Limited	Application Finalised - Conditional	1.7km south-west
20850	18/09/2020	For changes to the previously permitted peaker power plant development (planning ref. 13/138). it is proposed to change the energy source for the charging of the battery energy storage system (bess) containers from diesel to charging off the national grid and to change the permitted layout for electrical equipment based on the consequence of the proposed change in energy source at an area located within the permitted development. It is also proposed to include a small metering enclosure adjacent to the constructed substation building within the permitted development. a five year planning permission is being sought for the Designated Development.	Kilpaddoge Green Energy Ltd.	Application Finalised - Conditional	1.75km south-west

Planning application reference	Date submitted	Summary details	Applicant	Status	Distance from the Designated Development
19115	12/02/2019	The development will consist of a grid stabilisation facility comprising of: the construction up to 4 no. rotating stabilisers, 5 no. battery storage containers, 1 no. control room, 2 transformers and ancillary equipment within a site area of approx. 1.46 hectares. it is proposed to connect the Designated Development to the adjacent EirGrid substation by underground cable which will traverse the permitted and under construction peaking plant. the rotating stabilisers will be supported by 10 no. electrical equipment rooms which will contain ancillary power supply products including a static frequency convert (sfc), mv switchgear, exciters and lv distribution, and step-up / down transformers. a heating ventilation and air conditioning system (hvac) will be attached to each rotating stabiliser, 4 no. auxiliary transformers are also proposed. the battery containers will house individual battery components with 2 no. fitted external hvac system for each. 13 no. inverter stations and 14 auxiliary transformers are proposed for the battery containers. the entire site will consist of various underground cables and ducts, boundary securing fence, compound lighting and palisade gates and fencing, new internal access track, security lighting, cctv, hardstanding areas and all necessary foundation works. permission is also sought for 2 electrical transformers (up to 220kv), associated hv equipment and underground electrical grid connection cabling and ducting connecting the development to the national grid at the adjacent ESB/EirGrid substation. Planning permission is sought for a period of 10 years. A Natura Impact Statement accompanies this application.	Glencloosagh Energy Limited	Application Finalised - Conditional	1.65km south-west
181290	21/12/2018	Construct up to 4 no. rotating stabilisers, 5 no. battery storage containers, 1 no. control room, 2 transformers and ancillary equipment within a site area of approximately 1.46 hectares. The permission relates to alterations to the permitted and under construction Kilpaddogue peaking plant permitted by Kerry County Council pursuant to ref 13/138 as extended by ref 13/9138. the rotating stabilisers will be supported by 10 no. electrical equipment rooms which will contain ancillary power supply products including a static frequency converter (sfc), mv switchgear, exciters and lv distribution and step-up/down transformers. a heating ventilation and air conditioning system (hvac)will be attached to each rotating stabiliser. 4 no. auxiliary transformers are also proposed. the battery containers will house individual battery component switch 2 no. fitted external hvac system for each. 13 no. inverter stations and 14 auxiliary transformers are proposed for the battery containers. The entire site will consist of various underground cables and ducts, boundary securing fence, compound lighting and palisade gates and fencing , new internal access track, security lighting, cctv, hardstanding areas and all necessary foundation works. permission is also sought for 2 electrical transformers (up to 220kv), associated hv equipment and underground electrical grid connection cabling and ducting connecting the development to the national grid at the adjacent ESB substation . Planning permission is sought for a period of 10 years. A Natura Impact Statement accompanies this application.	Glencloosagh Energy Limited	Incomplete Application	1.65km south-west
18878	10/09/2018	For a 10 year permission to construct a battery energy storage system (bess) facility on a total site area of up to 0.6ha that will provide gird balancing services to the Irish electrical grid, to include up to 26 no. self-contained battery container units with associated heating ventilation and air conditioning systems (hvac), power conversion systems (pcs), step-up transformers, control systems and ancillary electrical components, 1 no . single – storey electricity control building, 1 no. 110kv esb substation, single storey substation control building and associated electrical infrastructure, 1 no. 110 kv generator transformer, all necessary ground and foundation works, associated compound cabling and ducting, palisade security fencing and lighting, cctv security cameras, new site access from existing private road, temporary construction compound and all associated ancillary infrastructure and site development works. A Natura Impact Statement is now submitted in support of the application.	Shannon Clean Tech Ltd	Application Finalised - Conditional	1.86km south-west

Appendix D Air Quality Modelling Assessment

Tarbert Power Station - Temporary Emergency Generation

Air Quality Appendix

February 2023

Delivering a better world

Quality information

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Revision History

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Table of Contents

1. Introduction 5
2. Legislation and Policy 5
National Air Quality Standards 5
Relevant Environmental Legislation 6
National Planning Policy 7
3. Methodology 7
Construction Emissions 7
Operational Phase Emissions 8
Source Emissions Data 8
Cumulative Source Emissions Data 9
Model Receptors 14
Background Pollutant Concentrations 17
Meteorological Data 17
Modelled Buildings and Structures 17
Terrain Data 18
Pollutant Conversions 19
Describing Likely Main Effects on Environment 19
EPA AG4 Approach 19
Alternative Approaches 20
Overall Significance 22
4. Baseline Conditions 23
Monitored Baseline 23
Local Meteorological Data 25
Likely Main Effects on Environment 27
Construction Phase – Mitigation Measures 32
Control of Dust 33
5. Summary 35

Figures

Plate 3.1: Proposed location of the three stacks on the Site.
Plate 3.2: Modelled cumulative emission locations
Plate 3.3: Ecological Receptors
Plate 3.4: Human Health Receptors
Plate 3.5: Modelled buildings within ADMS (facing west)
Plate 4.1. Wind Rose plots

Tables

Table 2.1: Relevant Air Quality Standards (AQS)
Table 2.2: Relevant Environmental Assessment Levels
Table 3.1: ADMS 5 Model Source Input Data
Table 3.2: Cumulative Sources ADMS 5 Model Source Input Data
Table 3.3: Modelled Ecological Receptors
Table 3.4: Modelled Human Health Receptors
Table 3.5 EPA Zone D Background Concentrations and Deposition Rate
Table 3.6. Building Dimensions
Table 3.7: The description of impacts referred to in the IAQM/EPUK Guidance
Table 4.1: Annual Mean NO_2 Zone D Monitoring Data

Table 4.2: Annual Mean NO_X Zone D Monitoring Data
Table 4.3: Annual Mean PM_{10} Monitoring Data
Table 4.4: Annual Mean $PM_{2.5}$ Zone D Monitoring Data
Table 4.5: Annual Mean SO_2 Zone D Monitoring Data
Table 4.6: Annual Mean CO Zone D Monitoring Data
Table 4.7. Modelled Emissions at Human Health Receptor Locations
Table 4.8 Modelled Emissions at Ecological Receptor Locations for NO_X impacts
Table 4.9 Modelled Emissions at Ecological Receptor Locations for Nitrogen Deposition
Table 4.10 Modelled Emissions at Ecological Receptor Locations for SO_2 impacts
Table 4.11: Likely Site Activities and Appropriate Methods of Controlling Dust

1. Introduction

This section reports the assessment of the impact of emissions to air from the operation of the three 50MW Temporary Emergency Generation units at the Site. It considers the impact of emissions on sensitive nature conservation habitats and selected human health receptors within a 15km radius of the Site.

It is anticipated that during the construction phase of the Designated Development, construction activities will have the potential to generate dust and finer particulate emissions that could adversely affect sensitive receptors located close to the Site boundary, and receptors located close to public roads used by construction traffic. The assessment considers the potential for impacts from emissions to air during the construction phase, based on the assumption that construction dust can be appropriately controlled by the application of best practice dust mitigation which will be implemented, which is standard practice on all well managed construction sites across the country. The construction vehicle movements will be of a frequency and duration that such emissions are unlikely to put an Air Quality Standard (AQS) or Environmental Assessment Level (EAL) at risk of an exceedance.

During the operational phase, the Designated Development will be a source of nitrogen oxides (NO_X), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), particulate matter with an aerodynamic diameter of <10µm in diameter (PM_{10}) and particulate matter with an aerodynamic diameter of <2.5µm in diameter ($PM_{2.5}$) emissions, which have the potential to harm species of flora at nearby habitats and nearby human health receptors. Dispersion modelling of emissions is therefore required to predict the contribution of site emissions to annual mean NO_X, annual mean and hourly mean (99.79th percentile) concentrations of NO_2, hourly mean, 24-hour mean and annual mean SO_2, 8-hour rolling CO concentration, annual mean and 24-hour mean of PM_{10}, and annual mean of $PM_{2.5}$. This assessment also considers the annual rate of nitrogen deposition at the nearest relevant sensitive ecological receptors within 15km of the Site.

The predicted pollutant contribution and total concentrations at selected receptors have been compared with relevant Air Quality Standards (AQSs) and environmental assessment levels (EALs) to determine the magnitude of impact and subsequent effects.

2. Legislation and Policy

National Air Quality Standards

The National Air Quality Standards[1] Government of Ireland, 2011) were transcribed from the following EU legislation:

- European Union (EU) air quality legislation is provided within Directive 2008/50/EC (Clean Air for Europe (CAFE)) [2] , which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:
    - Directive 99/30/EC - the First Air Quality 'Daughter' Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_X), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM10);
    - Directive 2000/69/EC - the Second Air Quality 'Daughter' Directive - sets ambient AQLVs for benzene and carbon monoxide; and
    - Directive 2002/3/EC - the Third Air Quality 'Daughter' Directive - seeks to establish long term objectives, target values, an alert threshold, and an information threshold for concentrations of ozone in ambient air.
    - The fourth daughter Directive was not included within the consolidation and is described as Directive 2004/107/EC. This sets health-based limits on polycyclic aromatic hydrocarbons,

[1] Government of Ireland (2011) *Air Quality Standards Regulations* https://www.irishstatutebook.ie/eli/2011/si/180/made/en/pdf
[2] Council for European Communities (2008) *Ambient air quality and cleaner air for Europe Directive, 2008/50/EC*

cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

- Directive 2008/50/EC has been implemented through the Air Quality Standards Regulations 2011. These regulations set out upper and lower assessment thresholds for the pollutants of concern. The Air Quality Standards include thresholds to encourage a higher standard of air quality where possible.

The EU Limit Values and National Air Quality Standards that are of relevance to this assessment are presented in Table 2.1.

Table 2-1: Relevant Air Quality Standards (AQS)

Averaging Period	Air Quality Standard (µg/m^3)
Annual mean NO_2 concentration	40
Annual mean NO_X concentration	30[1]
1-hour NO_2 concentration	200
Annual mean SO_2 concentration	20[1]
1-hour SO_2 concentration	350
24-hours SO_2 concentration	125
Max 8-hours CO concentration	10,000
Annual PM_{10} concentration	40
24-hours PM_{10} concentration	50
Annual $PM_{2.5}$ concentration	25

[1]Applicable only at ecologically sensitive receptors.

In addition to the relevant AQSs outlined in Table 2.1, the impacts at ecological receptors have also been assessed against appropriate Environmental Assessment Levels (EALs) for nitrogen deposition, referred to as Critical Loads (CL). The CLs reported in Table 2.2 have been sourced from the Air Pollution Information System (APIS)[3] based on habitats identified within the relevant Conservation Objective Reports[4,5].

Table 2-2: Relevant Environmental Assessment Levels

Habitat	Critical Nitrogen load (kg/N/hr/yr)
Coastal saltmarshes	20
Molinia meadows	15
Woodland	10
Perennial Vegetation of Stony Banks	8
Bogs	5

Relevant Environmental Legislation

Other national legislation that relates to air quality and are of relevance to this assessment are listed as follows:

- European Union (Environmental Impact Assessment) (Environmental Protection Agency Act 1992) (Amendment) Regulations 2020, S.I. No. 191 of 20206;
- European Communities (Birds and Natural Habitats) (Amendment) Regulations 2015[7];
- European Union (Industrial Emissions) Regulations 2013 S.I. 138 of 2013[8];

[3] APIS (2016) *Habitat/species pollutant impacts database* https://www.apis.ac.uk/search-pollutant-impacts
[4] National Parks and Wildlife Services (NPWS) (2022) *Special Protection Areas (SPA)* https://www.npws.ie/protected-sites/spa
[5] National Parks and Wildlife Services (NPWS) (2022) *Special Areas of Conservation (SAC)* https://www.npws.ie/protected-sites/sac
[6]European Union (Environmental Impact Assessment) (Environmental Protection Agency Act 1992) (Amendment) Regulations 2020. https://www.irishstatutebook.ie/eli/2020/si/191/made/en/pdf
[7] European Communities (Birds and Natural Habitats) (Amendment) Regulations 2015. https://www.irishstatutebook.ie/eli/2015/si/355/made/en/pdf

- Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013 S.I. 137 of 2013[9]; and
- European Communities (Birds and Natural Habitats) Regulations 2011[10].

National Planning Policy

Project Ireland 2040 is the Government's long-term overarching strategy for future development and infrastructure in Ireland. It consists of several documents, including the National Planning Framework (NPF)[11], which is the Government's high-level strategic Plan for shaping the future growth and development of Ireland up to 2040.

The NPF includes the following overarching aim that is relevant to this assessment:

> *'Creating a Clean Environment for a Healthy Society:*
>
> *…Promoting Cleaner Air: Addressing air quality problems in urban and rural areas through better planning and design.'*

The NPF includes National Policy Objective 64, which stresses the importance of improving ambient air quality:

> *'National Policy Objective 64: Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings and homes, heating systems with zero local emissions, green infrastructure planning and innovative design solutions.'*

Project Ireland 2040 also includes the Government's National Development Plan[12]. This document is focused on Ireland's long-term economic, environmental, and social progress up to 2027, and references improvements in air quality as an additional benefit to improving energy efficiency for the primary purpose of reducing carbon emissions.

Local Planning Policy

Kerry County Development Plan[13] sets out the following objectives with regards to local air quality:

- **Objective AQ1:** Protect local air quality from emissions that are harmful to human health and the local environment
- **Objective HH1:** Protect the public from threats to health and wellbeing across the functions of relevance to the KCDP

3. Methodology

Construction Emissions

The construction work proposed has the potential to generate emissions from construction activities, site plant and non-road mobile machinery.

[8] European Union (Industrial Emissions) Regulations 2013. https://www.irishstatutebook.ie/eli/2013/si/138/made/en/pdf
[9] Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013. https://www.irishstatutebook.ie/eli/2013/si/137/made/en/pdf
[10] European Communities (Birds and Natural Habitats) Regulations 2011. https://www.irishstatutebook.ie/eli/2011/si/477/made/en/pdf
[11] Government of Ireland (2019) *National Planning Framework*. https://www.gov.ie/pdf/?file=https://assets.gov.ie/166/310818095340-Project-Ireland-2040-NPF.pdf
[12] Government of Ireland (2021) *National Development Plan (2021 – 2030)* file:///C:/Users/ReevesI/Downloads/200358_a36dd274-736c-4d04-8879-b158e8b95029.pdf
[13] Kerry County Council (2022) Kerry County Development Plan 2022-2028 Volume 5 http://docstore.kerrycoco.ie/KCCWebsite/planning/devplan/vol5updatednew.pdf

A qualitative assessment has been undertaken in line with Institute of Air Quality Management (IAQM) guidance[14]. The approach set out in the guidance is to identify the level of mitigation required, based on the likely magnitude of emissions generated by the work and the sensitivity of the area to the impact of such emissions, to ensure that that effect of emissions is not significant.

It is predicted that the construction and decommissioning phases of the Designated Development will lead to an increase of 186 two-way Heavy Goods Vehicle (HGV) movements per day and 100 two-way car movements per day. This is below the threshold number of vehicle movements that would trigger a requirement for air quality modelling under the Transport Infrastructure Ireland (TII) construction screening criteria[15]. This screening criteria (as outlined in section 4.9.3.4 of the TII guidance) is as follows:

- Road alignment will change by 5m or more; or
- Annual average daily traffic (AADT) flows will change by 1,000 or more; or
- Heavy goods vehicle (HGV) (vehicles greater than 3.5 tonnes, including buses and coaches) flow will change by 200 AADT or more; or
- Daily average speed change by 10kph or more; or
- Peak hour speed will change by 20kph or more.

As both the HGV and AADT vehicle movements are well below the relevant criteria and the fact that these will access the Designated Development along the existing public road network, no significant change in air quality is likely from traffic during the construction or decommissioning phases. Therefore, consideration of vehicle effects has been screened out of this assessment.

Operational Phase Emissions

The assessment of operational phase emissions has made use of the current version of the Atmospheric Dispersion Modelling System ADMS 5 (version 5.2.4), published by Cambridge Environmental Research Consultants (CERC). ADMS 5 is software approved for use by the EPA and has been subject to successful validation studies undertaken by CERC and other entities independent from CERC. The general model parameters are discussed in detail in this section.

Source Emissions Data

Source characteristics and emissions data has been obtained from information provided by the Applicant's design team. Information provided has included proposed stack emissions monitoring reports. This information has been scrutinised and data relevant to the dispersion modelling assessment extracted and used as model input data, as listed in Table 3.1. Stack locations are illustrated on Plate 3.1.

[14] Holman et al (IAQM) (2014) *IAQM Guidance on the assessment of dust from demolition and construction*, Institute of Air Quality Management, London, Updated 2016, https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf
[15] TII (2022) Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Development PE-ENV-01106 (tiipublications.ie)

Table 3-1: ADMS 5 Model Source Input Data

Source	Gas Turbine 1 (GT 1)	Gas Turbine 2 (GT 2)	Gas Turbine 3 (GT 3)
Stack location X	107145	107118	107090
Stack location Y	149454	149466	149479
Release heights (m)	30	30	30
Stack diameter (m)	4.0	4.0	4.0
Exit Velocity (m/s)	15	15	15
Exhaust Mass Flow (kg/s)	138.1	138.1	138.1
Temperature (°C)	451.6	451.6	451.6
Exhaust Volume Flow (Nm^3/h)	392636	392636	392636
NO_X Emission conc. (mg/Nm^3)	90.0	90.0	90.0
CO Emission conc. (mg/Nm^3)	100.0	100.0	100.0
PM_{10} Emission conc. (mg/Nm^3)	17.0	17.0	17.0
SO_2 Emission conc. (mg/Nm^3)	66.0	66.0	66.0
Emission rate (g/s NO_X)	9.8	9.8	9.8
Emission rate (g/s CO)	10.9	10.9	10.9
Emission rate (g/s PM_{10})	1.9	1.9	1.9
Emission rate (g/s SO_2)	7.2	7.2	7.2

[1]Stack locations are in Irish National Grid

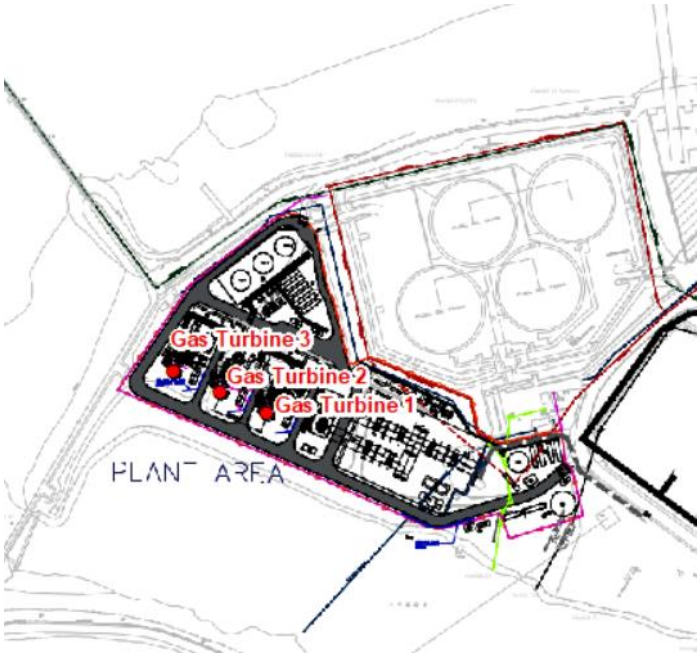


Plate 3.1: Proposed location of the three stacks on the Site.

Notes: Stacks (emission release points) shown as numbered red points

Cumulative Source Emissions Data

In addition to the Designated Development's sources, cumulative sources from the surrounding area have also been modelled for NO_X and NO_2. The cumulative sources included within this assessment are Shannon LNG, Moneypoint Power Station and Tarbert Power Station. Although Tarbert Power Station is due to close by the end of 2023, it is possible that there will be up to five weeks of operational overlap between the Designated Development and Tarbert Power Station, so this has been included within the cumulative assessment. Source characteristics and emissions data has been obtained from information provided by the Applicant's design team, licences and stack emissions monitoring reports. Information provided has included proposed stack emissions

monitoring reports. This information has been scrutinised and data relevant to the dispersion modelling assessment extracted and used as model input data, as listed in Table 3.2. Stack locations are illustrated in Plate 3.1. It should be noted that only NO_2 and NO_X cumulative impacts have been considered as part of this assessment, to account for the worst-case scenario.

Table 3-2: Cumulative Sources ADMS 5 Model Source Input Data

	Tarbert Power Station	Money Point Power Station			Shannon LNG[2]							
Source	**Unit 3**	**A1-1**	**A1-3**	**Aux. Boiler**	**FSRU Main Engine 1_NG**	**FSRU Main Engine 2_NG**	**FSRU Main Engine 3_NG**	**FSRU Main Engine 4_NG**	**FSRU Main Engine 1_LF**	**FSRU Main Engine 2_LF**	**FSRU Main Engine 3_LF**	**FSRU Main Engine 4_LF**
Stack location X[1]	107616	103503	103637	103549	102932	102931	102931	102930	102932	102931	102931	102930
Stack location Y[1]	149543	151696	151646	151802	149328	149332	149336	149340	149328	149332	149336	149340
Release heights (m)	152	220	220	3	50	50	50	50	50	50	50	50
Stack diameter (m)	3.7	6.89	6.89	0.45	1.07	1.13	1.13	1.13	1.07	1.13	1.13	1.13
Exit Velocity (m/s)	13.11	28.94	14.47	11.8	17.1	18.9	18.9	18.9	9.98	12.2	12.2	12.2
Exhaust Mass Flow (kg/s)	-	-	-	-	-	-	-	-	-	-	-	-
Temperature (°C)	140	72	72	200	303	319	319	319	284	297	297	297
Exhaust Volume Flow (Nm^3/h)	177.26	666.67	333.33	0.97	-	-	-	-	-	-	-	-
NO_X Emission conc. (mg/Nm^3)	1100.00	200	200	350	-	-	-	-	-	-	-	-
Emission rate (g/s NO_X)	194.99	133.33	66.67	0.34	1.95	2.60	2.60	2.60	5.13	5.13	5.13	5.13
Hours per year	840				8322	8322	8322	8322	438	438	438	438

[1]Stack locations are in Irish National Grid

[2]FSRU = Floating Storage Regasification Unit; NG = Natural Gas; LF = Liquid Fuel; CCGT = Combined Cycle Power Plant; LNGC = Liquified Natural Gas Carriers

	Shannon LNG										
Source	**FSRU Regas 1**	**FSRU Regas 2**	**FSRU Regas 3**	**LNGC_NG**	**LNGC_LF**	**CCGT 1**	**CCGT 2**	**CCGT 3**	**CCGT 4**	**CCGT 5**	**CCGT 6**
Stack location X[1]	102922	102922	102923	102937	102937	102263	102282	102348	102368	102434	102453
Stack location Y[1]	149336	149333	149328	149392	149392	148549	148561	148601	148613	148654	148666
Release heights (m)	50	50	50	35	35	35	35	35	35	35	35
Stack diameter (m)	1.47	1.47	1.47	0.6	1.68	3	3	3	3	3	3
Exit Velocity (m/s)	21.4	21.4	21.4	9.3	4.2	19	19	19	19	19	19
Exhaust Mass Flow (kg/s)	-	-	-	-	-	-	-	-	-	-	-
Temperature (°C)	450	450	450	400	316	76	76	76	76	76	76
Exhaust Volume Flow (Nm^3/h)	-	-	-	-	-	-	-	-	-	-	-
NO_X Emission conc. (mg/Nm^3)	-	-	-	-	-	-	-	-	-	-	-
Emission rate (g/s NO_X)	2.86	2.86	2.86	1.17	2.03	5.63	5.63	5.63	5.63	5.63	5.63
Hours per year of operation	4380	4380	4380	1155	1155	8760	8760	8760	8760	8760	8760

[1]Stack locations are in Irish National Grid

[2]FSRU = Floating Storage Regasification Unit; NG = Natural Gas; LF = Liquid Fuel; CCGT = Combined Cycle Power Plant; LNGC = Liquified Natural Gas Carriers

Plate 3.2: Modelled cumulative emission locations

Model Receptors

The model predicts the contribution of emissions of NO_X and SO_2 to annual mean concentrations at the discrete ecological receptors listed in Table 3.3 and shown in Plate 3.3. Within 15km of the Designated Development, a total of 15 sensitive nature conservation site receptors have been selected to adequately represent various habitats across the Special Areas of Conservation (SAC) and sections of the Special Protection Area (SPA), including various habitats within the River Shannon and River Fergus Estuaries SPA.

Sensitive habits inside SACs and SPAs were identified by the AECOM project ecologists. The project ecologists selected coordinates that would be representative of the specific sensitive habitats inside the SAC and SPA areas. Receptor points were modelled at air quality sensitive habitats at the closest point to the Designated Development. Ecological receptors have been modelled at a height of 0m above the ground.

The model also predicts the contribution of emissions of the following pollutants to concentrations at discrete human health receptors:

- Annual and 1-hour mean NO_2 concentrations
- 1-hour and 24-hour mean SO_2 concentrations
- Rolling 8-hour mean CO concentrations
- Annual and 24-hour mean PM_{10} concentrations
- Annual mean $PM_{2.5}$ concentrations

Within 15km of the Designated Development, a total of 15 human health receptors have been selected to represent the potential impacts across this area. These receptors are all residential properties. All human health receptors have been modelled at height of 1.5m above the ground.

The human health receptors were selected to represent worst-case exposure at locations where there is relevant sensitivity and represent other receptors in their vicinity. For example, in a cluster of houses, only one discrete receptor point has been modelled. The human health points were places on the closest point of a property to the Designated Development (e.g., on the façade of a residential property).

Table 3-3: Modelled Ecological Receptors

Receptor ID	X	Y	Receptor Description	Habitat
E1a	107195	149405	River Shannon and River Fergus Estuaries SPA	Intertidal
E1b	107557	149217	River Shannon and River Fergus Estuaries SPA	Intertidal
E1c	107669	149668	River Shannon and River Fergus Estuaries SPA	Intertidal
E2a	107596	147662	Lower River Shannon SAC	Coastal Saltmarsh
E2b	107596	147662	Lower River Shannon SAC	Atlantic Salt Meadows
E2c	107596	147662	Lower River Shannon SAC	Molina meadows on calcareous, peaty or clayey-silt-laden soils
E2d	92652	153760	Lower River Shannon SAC	Salicornia and other annuals colonising mud and sand
E2e	108960	152912	Lower River Shannon SAC	Mediterranean Salt Meadows
E2f	107382	149078	Lower River Shannon SAC	Estuaries
E2g	97505	152660	Lower River Shannon SAC	Coastal Lagoons
E2h	99734	150585	Lower River Shannon SAC	Large Shallow Inlets and Bays
E2i	102360	152365	Lower River Shannon SAC	Perennial Vegetation of Stony Banks
E2j	110440	136312	Lower River Shannon SAC	Broadleaved deciduous woodland

Receptor ID	X	Y	Receptor Description	Habitat
E3	109997	143730	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Bog
E4	104582	135652	Moanveanlagh Bog SAC	Bog

Plate 3.2: Ecological Receptors

Notes: Location of the Designated Development (three red points), 15km buffer (yellow border), Special Areas of Conservation (SACs) (red hatched areas), modelled ecological receptors (green points)

Table 3-4: Modelled Human Health Receptors

Receptor ID	X	Y	Receptor Description
R1	107422	149253	Residential Property
R2	107461	149255	Residential Property
R3	107524	149283	Residential Property
R4	107669	149264	Residential Property
R5	107219	148479	Residential Property
R6	106804	147938	Residential Property
R7	107171	147741	Residential Property
R8	108525	147540	Residential Property
R9	109259	147679	Residential Property
R10	110044	150178	Residential Property
R11	109576	150532	Residential Property
R12	107565	152788	Residential Property
R13	105946	152181	Residential Property
R14	104522	151779	Residential Property
R15	104206	148150	Residential Property

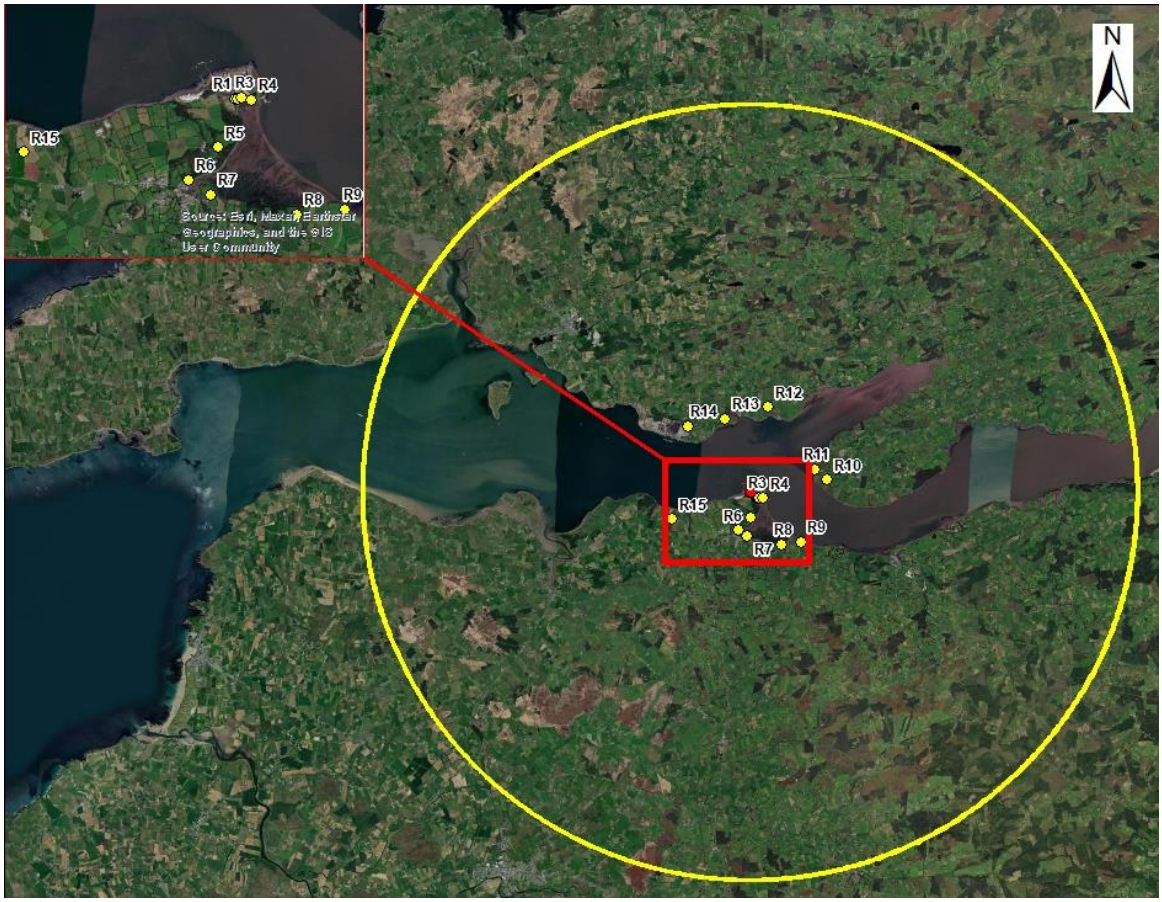


Plate 3.3: Human Health Receptors

Notes: Location of the Designated Development (three red points), modelled human health receptors (yellow points), 15km buffer (yellow border)

Background Pollutant Concentrations

Background pollutant data is added to the modelled pollutant concentrations and deposition rates to estimate total pollutant concentrations and deposition rates, which can then be compared against the relevant AQSs and EALs.

Background concentrations were sourced from EPA monitoring data for monitoring locations in EPA Zone D, which is used to represent rural locations. The relevant background concentrations used to inform this assessment are summarised in Table 3.5.

Table 3-5 EPA Zone D Background Concentrations and Deposition Rate

Pollutant	Averaging Period	Concentration (µg/m^3) or Deposition Rate (kg/ha/yr)
NO_x[3]	Annual mean	14.2
NO_2[3]	Annual mean	7.5
	1-hr	15.0
SO_2	Annual mean	4.2
	1-hr	8.4
	24-hr	8.4
N deposition[4]	Annual rate	12.1
CO	8-hr rolling	0.3
PM_{10}	Annual mean	11.9
	24-hr	23.8
$PM_{2.5}$	Annual mean	8.7

[1]Average across Zone D monitoring sites taken from summary tables that informed the Air quality in Ireland 2021 report.
[2]Short-term background concentrations are double the annual mean concentrations.
[3]Includes elevated NO_x concentrations monitored at Birr due to proximity to N52.
[4]National average reported in EPA Research – Development of Critical Loads for Ireland: Simulating Impacts on Systems (SIOS) Author: Julian Aherne, Jason Henry and Marta Wolniewicz.

Meteorological Data

Hourly sequential wind speed, wind direction, precipitation, temperature, and relative humidity data has been sourced from the meteorological station at Shannon Airport, to inform the dispersion modelling. Wind rose plots are discussed in Section 4 and illustrated in Plate 4.1. Shannon Airport data was selected as being the most representative site to the study area for which data capture (with the exception of cloud cover) was sufficient.

The use of five years of data allows the assessment to consider inter-annual variation. The contribution of emissions to pollutant concentrations and deposition rates reported at each receptor location is the worst-case value calculated at that location over the five years modelled.

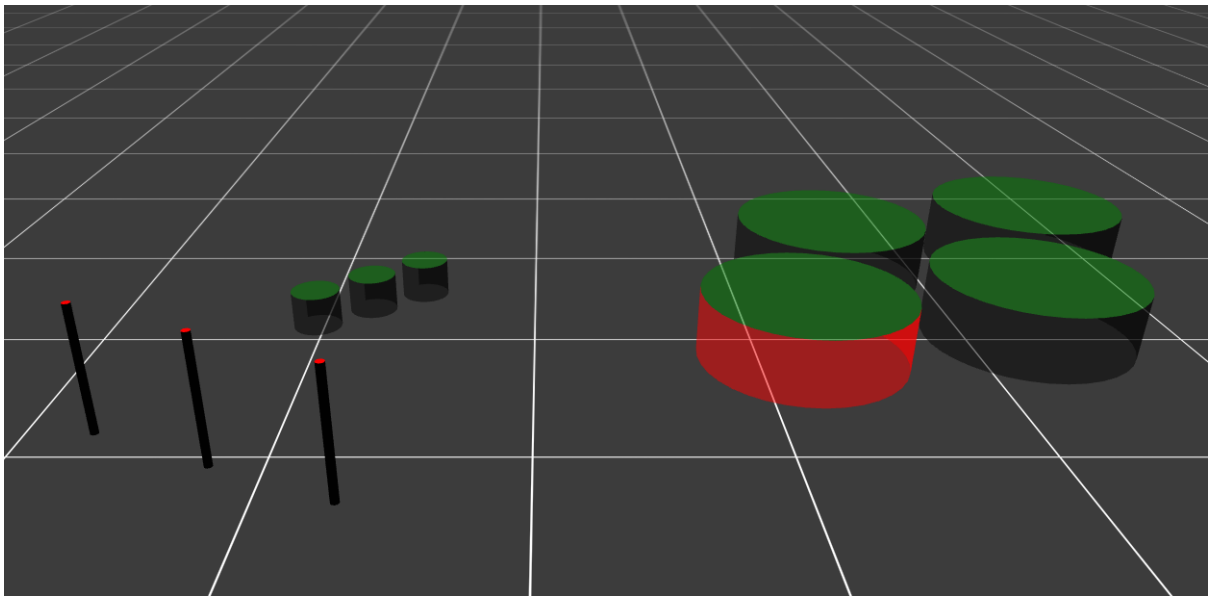
In terms of how the dispersion model utilises the meteorological data, the latitude of the study area was set at 53º, the surface roughness of the study area set at 0.3m, to account for the fact that the study area is a combination of the estuary waterbody and swathes of open countryside with limited urban areas. The minimum Monin-Obukhov length set at 10m, to represent small towns and rural areas. For the meteorological site, the surface roughness was set at 0.2m to represent a typical meteorological site, which should be distanced well away from nearby buildings and structures.

Modelled Buildings and Structures

The buildings and structures around the Site that make up the existing Tarbert Power Station have the potential to affect the dispersion of emissions from the exhaust stacks. The ADMS 5 buildings effect module has therefore

been used to incorporate building downwash effects as part of the modelling procedure. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within eight to 10 stack heights of the emissions source. Therefore, all structures within 300m of the exhaust stacks have been included within the dispersion model, as illustrated in Plate 3.5.

Plate 3.4: Modelled buildings within ADMS (facing west)



Note: Looking north and showing the generator stacks, proposed storage tanks and existing storage tanks. The main building (as modelled within ADMS) in the model is shaded in red.

The dimensions of the structures that have been modelled as buildings within ADMS are provided in Table 3.6. The height data was provided by the Applicant's design team.

Table 3-6. Building Dimensions

Building	X	Y	Z (m)	Diameter (m)	Shape
Existing Tank 3	107249	149514	16.5	50	Circular
Existing Tank 1	107266	149564	16.5	50	Circular
Existing Tank 2	107324	149577	16.5	50	Circular
Existing Tank 4	107306	149525	16.5	50	Circular
Proposed Tank 1	107130	149531	9.6	12	Circular
Proposed Tank 2	107143	149541	9.6	12	Circular
Proposed Tank 3	107155	149551	9.6	12	Circular

Terrain Data

Terrain data was sourced from the U.S. Geological Survey, which provides data with a 50m resolution. ADMS 5 is limited to 66,000 terrain points in a model run. Using terrain data with a resolution of 50m, it could not be used to cover the full 15km area that was required for this assessment. Therefore, the terrain data was processed to provide a variable resolution of 50m for the majority of the study area and 200m resolution of the rest of the study area. This allowed for the consideration of terrain over a wider area whilst maintaining a suitable resolution for dispersion modelling. The lower resolution terrain begins ~10km to the south of the Designated Development. The 50m resolution terrain data south-western extent of the terrain data is at ING 91438, 140678 and the 200m resolution terrain data south-western extent of the terrain data is at ING 91382, 134741. The total terrain extends 25km to the west and 20km to the north from the southwestern point of the 200m resolution terrain data.

The lowest point of the terrain data is 4m below sea level and occurs 10km west of the Designated Development, however the Shannon Estuary does not have height data and has been assumed as zero, however it is likely to be lower than this. The highest point of the terrain data is 251m above sea level and occurs 17km southwest.

Pollutant Conversions

NO_X to NO_2

To quantify annual mean NO_2, it was assumed that 100% of NO_X emissions released from the stack are converted to NO_2 in the atmosphere. This represents a precautionary approach in that in reality, this conversion is ozone-limited and not all NO_X emissions will be converted.

Nitrogen deposition was calculated from annual mean NO_X concentrations.

To quantify 1-hour NO_2, it was assumed that 50% of NO_X emissions released from the stack are converted to NO_2 in the atmosphere.

NO_2 to N Deposition

Annual mean NO_2 concentrations are converted to N deposition using the following factors as set out in EPA guidance:

- Deposition flux (as $\mu g/m^2/s$) is calculated by applying a deposition velocity factor of 0.0015 m/s to the annual mean NO_2 contribution as ($\mu g/m^3$) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.003 m/s to annual mean NO_2 as ($\mu g/m^3$) contribution at habitats with tall vegetation (woodland); and
- Deposition rate (as kgN/ha/yr) is then calculated by applying a unit conversion factor of 95.9 to the calculated deposition flux (as $\mu g/m^2/s$).

Describing Likely Main Effects on Environment

The EPA EIAR Guidelines[16] do contain a method to determine and describe the effect of a development, but that approach is not wholly appropriate for air quality. This is because the relationship between magnitude of change in air quality conditions and receptor sensitivity is not linear. Receptor sensitivity to air quality impacts does not have a graded scale and instead, receptors are considered either sensitive to air quality impacts or not sensitive. Furthermore, the impact description of a change in pollutant concentration is not based on the magnitude of change alone, but that change relative to the pollutant concentration experienced at a receptor once the Designated Development is in operation. The reason for this is to take account that smaller changes in air quality conditions can constitute a greater level of impact than a large change in conditions, where they occur at receptors that are predicted to experience pollutant concentrations close to or in excess of an Air Quality Standard or Environmental Assessment Level.

EPA AG4 Approach

The EPA AG4[17] guidance document on dispersion modelling does not include the specific means by which to describe the significance of effect on local air quality as a result of new emissions, with regards to determining the suitability of a development from a planning perspective. It does, however, provide criteria that Environmental Licence applicants should aim to achieve in terms of the maximum allowable air quality impacts from an Environmental Licencing perspective.

In its section on *model accuracy and sensitivity studies*, AG4 guidance state that "*the process contribution (PC) should be less than 75% of the ambient air quality standard and less than this where background levels account for a significant fraction of the ambient air quality standard based on the formula*":

- Maximum Allowable PC = 0.75*(AQS) where there is no significant background concentration; or
- Maximum Allowable PEC = 0.75*(AQS–BC) where there is a significant background concentration

[16] EPA (2022). *Guidelines on the information to be contained in Environmental Impact Assessment Reports*.
[17] EPA (2019) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

Alternative Approaches

In the UK, the Environment Agency (EA) and IAQM/Environmental Protection UK have both developed guidance to determine whether or not an air quality effect can be screened as insignificant or not by the regulator[18], or significant or not by the planning authority[19], respectively.

The UK EA and IAQM/EPUK Guidance provide an alternative and more precautionary approach to determining whether the impact of a Designated Development has an effect that is potentially significant or not. Although, it should be noted that the UK Guidance is intended for use in areas of the UK where pollutant concentrations are often elevated close to or above the Air Quality Standards. For application in rural Ireland, it can be considered a conservative means of determining potential significance. It should also be noted that the IAQM guidance is predominantly for urban development projects where road traffic emissions are often the biggest contributor to air quality impacts, rather than industrial installations, although there is no reason why the significance criteria described within it cannot be adopted for industrial sites also.

The approaches described in these documents have been considered and utilised alongside the EPA AG4 guidance in this assessment. Where possible, the approaches described in the air quality specific guidance have been reported in a manner that is compatible with the requirements of the *EPA Guidelines*.

UK EA Approach

According to the UK EA Guidance, an impact on human health sensitive receptors may be considered insignificant where:

- The short-term Process Contribution (PC - impact) is <=10% of the Air Quality Standard or Environmental Assessment Level; and
- The long-term Process Contribution (impact) is <=1% of the Air Quality Standard or Environmental Assessment Level.

Where an impact on human health sensitive receptors cannot be screened out at this stage, additional criteria is provided, including consideration of the Predicted Environmental Concentration (PEC – total pollutant concentration), where the PC is added to the background (or ambient) concentrations. The impact may be considered insignificant where:

- The short-term PEC is <20% of the Air Quality Standard or Environmental Assessment Level minus the short-term background; and
- The long-term PEC is <70% of the Air Quality Standard or Environmental Assessment Level.

Where an impact on human health sensitive receptors still cannot be screened as insignificant at this stage, it does not necessarily mean that the effect is now significant. At this stage, model inputs are reviewed, and detail enhanced where it can be. The predicted PC and PEC are then reviewed relative to the appropriate Air Quality Standards and Environmental Assessment Levels and the headroom (gap between the PEC and the Standards and Assessment Levels) that remains once the Designated Development is in operation - *i.e.*, is there a risk of an exceedance of an Air Quality Standard and Environmental Assessment Level and/ or does the operation of the Designated Development constrain future development of the area.

For this assessment, the 'insignificant' terminology used in the UK EA guidance[20] applies to effects that can be described as 'Imperceptible' to 'Slight' in the EPA Guidelines[21]. It may also apply to effects that can be described as 'Moderate' in the EPA Guidelines, where such effects relate to a limited number of sensitive receptors and / or the Air Quality Standards and Environmental Assessment Levels remain not at risk of any exceedance.

For impacts in nature conservation receptors, the UK EA Guidance states that they may be considered insignificant ('not significant') where:

- The short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and

[18] UK EA (2016). *Air Emissions Risk Assessment for your Environmental Permit Guidance – Updated 2022.*
[19] Moorcroft and Barrowcliffe. et al., (2017). *Land-use Planning & Development Control: Planning for Air Quality. v1.2.*
[20] UK EA (2016). *Air Emissions Risk Assessment for your Environmental Permit Guidance – Updated 2022.*
[21] EPA (2019) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

Where the long-term process contribution exceeds this criteria, impacts on ecologically sensitive receptors may also be considered insignificant ('not significant') where:

- The long-term PEC is <70% of the Air Quality Standard, Environmental Assessment Level or Critical Load.

Where an impact on nature conservation sensitive receptors still cannot be screened as insignificant at this stage, again it does not necessarily mean that the effect is now significant. Model inputs and assumptions shall be reviewed, and detail enhanced where it can be. The predicted PC and PEC are then reviewed relative to the appropriate Air Quality Standards and Environmental Assessment Levels and the headroom that remains once the Designated Development is in operation – *i.e.*, is there a risk of an exceedance of an Air Quality Standard and Environmental Assessment Level and / or does the operation of the Designated Development constrain future development of the area.

Again, the 'insignificant' terminology used in the UK EA Guidance applies to effects that can be described as 'Imperceptible' to 'Slight' in the EPA EIAR Guidelines. It may also apply to effects that can be described as 'Moderate' in the EPA EIAR Guidelines, where such effects relate to a limited number of sensitive receptors and/or the Air Quality Standards and Environmental Assessment Levels remain not at risk of any exceedance. Ultimately, the significance of air quality impacts on nature conservation sites shall be determined by a professional ecologist.

IAQM / EPUK Approach

Like the UK EA Guidance, the IAQM/EPUK approach does not define a graduating scale of human health receptor sensitivity. Instead, human health receptors are considered either sensitive or not, depending on the period of time for which they are exposed to emissions. The absolute magnitude of change in pollutant concentrations between the baseline and operational phase scenarios, in relation to the Air Quality Standards and Environmental Assessment Levels, is described and this is used to consider the risk of those Standards and Levels being exceeded.

For a change in annual mean concentrations of a given magnitude, IAQM have published recommendations for describing the impacts at individual receptors, as set out in the Table 3.7.

Table 3-7: The description of impacts referred to in the IAQM/EPUK Guidance

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)				
	<1 (Imperceptible)[1]	1 (Very Low)[1]	2 to 5 (Low)[1]	6 to 10 (Medium)[1]	>10 (Large)[1]
75% or less of AQAL	Negligible[2]	Negligible[2]	Negligible[2]	Slight[2]	Moderate[2]
76% - 94% of AQAL	Negligible[2]	Negligible[2]	Slight[2]	Moderate[2]	Moderate[2]
95% - 102% of AQAL	Negligible[2]	Slight[2]	Moderate[2]	Moderate[2]	Substantial[2]
103% - 109% of AQAL	Negligible[2]	Moderate[2]	Moderate[2]	Substantial[2]	Substantial[2]
110% or more of AQAL	Negligible[2]	Moderate[2]	Substantial[2]	Substantial[2]	Substantial[2]

Notes:

[1] For this assessment, IAQM magnitude of change, descriptions are now aligned with EPA Guidelines as magnitude of effect as follows: Imperceptible = Negligible; Very Low = Low; Low = Low; Medium = Medium; and Large = High.

[2] For this assessment, IAQM effect descriptions are aligned with EPA Guidelines as follows: Negligible = Imperceptible; Slight = Not Significant to Slight; Moderate = Moderate; and Substantial = Significant to Profound

The IAQM / EPUK Guidance states that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. It also states that it is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the objective value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the objective value, rather than being exactly equal to it.

A change in predicted long-term (annual mean) concentrations of less than 0.5% of an Air Quality Standard or Environmental Assessment Level is considered to be 'imperceptible'. A PC (impact) that is 'Negligible', given normal bounds of variation, will not be capable of having a direct effect on local air quality that could be considered to be significant.

The guidance suggests the potential for 'Low' air quality impacts as a result of changes in pollutant concentrations between 2% and 5% of relevant Air Quality Standards and Environmental Assessment Levels. For example, for long-term NO_2 concentrations, this relates to changes in concentrations ranging from 0.6 - 2.1µg/m^3. In practice, changes in concentration of this magnitude, and in particular changes at the lower end of this band are likely to be very difficult to distinguish due to the inter-annual effects of varying meteorological conditions. Therefore, in the overall evaluation of significance the potential for impacts to have significant air quality effect within this band will be considered in this context and will not be capable of having a direct effect on local air quality that can be considered to be significant.

Changes in concentration of more than 5% ('Medium' and 'High', the two highest bands) are considered to be of a magnitude which is far more likely to be discernible above the natural variation in baseline conditions and, as such, carry additional weight within the overall evaluation of significance for air quality. 'Moderate' impacts do not necessarily constitute a significant effect, where they do not contribute to an exceedance or risk of an exceedance of an Air Quality Standard or Environmental Assessment Level, particularly where such impacts relate to a small minority of receptors with the majority experiencing lesser impacts. A 'significant' to 'Profound' impact will almost certainly constitute a significant effect that will require additional mitigation to address it.

The IAQM / EPUK Guidance also provides thresholds for determining whether short-term impacts on human health sensitive receptors have the potential to cause a significant effect or not. It is noted that the IAQM guidance is not specific to industrial facilities, but still provides a useful guide to scale the severity of impacts. This guidance deviates from the UK EA Guidance in that the criteria it provides does not take account of background concentrations, although the guidance does state that this is not intended to play down the importance of total short-term concentrations; the IAQM Guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the PC is used to measure impact, not the overall concentration at a receptor. The peak short-term PC from an elevated source has been adopted for this assessment as follows:

- PC <=10% of the Air Quality Standard or Environmental Assessment Level represents an impact that is 'Imperceptible' to 'Not significant';
- PC 11-20% of the Air Quality Standard or Environmental Assessment Level is small in magnitude representing a 'Slight' impact;
- PC 21-50% of the Air Quality Standard or Environmental Assessment Level is medium in magnitude representing a 'Moderate' impact; and
- PC >51% of the Air Quality Standard or Environmental Assessment Level is large in magnitude representing a 'Significant' to 'Profound' impact.

Overall Significance

Following the assessment of each individual air quality effect (construction dust, traffic and operational plant), the significance of all of the reported effects is then considered for the Designated Development in overall terms. The potential for the Designated Development to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the Air Quality Standards and Environmental Assessment Levels (which also relate to compliance with Kerry County Council goals for local air quality management and objectives set for the protection of human health).

In terms of the significance of the effects (consequences) of any adverse impacts, an effect is reported as being either significant or not. If the overall effect of the Designated Development on local air quality or on amenity is found to be 'Moderate' (where a large proportion of sensitive receptors are affected and / or there is risk of Air Quality Standards and Environmental Assessment Levels being exceeded) or 'Significant' to 'Profound', this is deemed to be significant for EIAR purposes. Effects found to be 'Moderate' (where limited sensitive receptors are

affected and there is no risk of exceedance of an Air Quality Standard or Environmental Assessment Level) to 'Imperceptible' are not considered to be significant.

4. Baseline Conditions

Monitored Baseline

The existing environment has been described with reference to the most recently published EPA Air Quality Report and supplementary data.

The EPA manages the national ambient air quality network, which consists of over 100 monitoring stations located across the country that monitor a range of pollutants, including some of those of relevance to this assessment. The EPA data used to inform this assessment was gathered in 2021 and earlier.

EU legislation on air quality requires that Member States divide their territory into zones for the assessment and management of air quality. The zones in place in Ireland during the most recently available report of monitoring are:

- Zone A: Dublin conurbation;
- Zone B: Cork conurbation;
- Zone C: large towns with a population >15,000; and
- Zone D: the remaining area of Ireland.

Data gathered across monitoring sites in Zone D over the past few years are summarised in Table 4.1 to Table 4.6 as well as the yearly average across all sites. Any elevated concentrations are due to the proximity of a monitoring station to a local source of the pollutant being monitored. For example, the highest annual mean NO_2 measurement in 2021 was gather in Birr. The monitoring station in Birr is located at a roadside location in the middle of the town centre.

The data demonstrates that air quality in Zone D locations is well below the relevant AQSs.

Table 4-1: Annual Mean NO_2 Zone D Monitoring Data

Year	Emo Court	Birr	Castlebar	Carrick-on-Shannon	Kilkitt	Edenderry	Yearly Average
2021	3.6	12.8	6.3	11.2	2.4	8.8	**7.5**
2020	4	9	6	17	2	-	**7.6**
2019	4	-	8	-	5	-	**5.7**
Site Average	**3.9**	**10.9**	**6.8**	**14.1**	**3.1**	**8.8**	**6.9**

Table 4-2: Annual Mean NO_X Zone D Monitoring Data

Year	Emo Court	Birr	Castlebar	Carrick-on-Shannon	Kilkitt	Edenderry	Yearly Average
2021	5.2	31.5	10.9	21.9	3.1	12.3	**14.2**
2020	4.7	23.2	8.9	40.1	2.5	-	**15.9**
2019	4.8	-	11.1	-	7.6	-	**7.8**
Site Average	**4.9**	**27.4**	**10.3**	**31.0**	**4.4**	**12.3**	**12.6**

Table 4-3: Annual Mean PM_{10} Monitoring Data

Year	Tipperary Town	Carrick-on-Shannon	Enniscorthy	Birr	Askeaton	Macroom	Castlebar	Cobh Carrignafoy	Claremorris	Kilkitt	Cavan	Roscommon Town	Edenderry	Mallow	Longford	Cobh Cork Harbour	Yearly Average
2021	12.7	9.4	13.7	12.2	8.7	14.6	9.8	12.0	9.5	7.8	10.6	10.3	17.8	14.7	13.9	13.4	**11.9**
2020	12	10	15	10	7	15	14	13	10	8	9	11	-	-	-	-	**11.2**
2019	9	-	18	-	-	28	16	13	11	7	-	12	-	-	-	-	**14.3**
Site Ave.	**11.2**	**9.7**	**15.6**	**11.1**	**7.9**	**19.2**	**13.3**	**12.7**	**10.2**	**7.6**	**9.8**	**11.1**	**17.8**	**14.7**	**13.9**	**13.4**	**12.5**

Table 4-4: Annual Mean $PM_{2.5}$ Zone D Monitoring Data

Year	Tipperary Town	Carrick-on-shannon	Mallow	Enniscorthy	Birr	Askeaton	Macroom	Longford	Cobh Carrignafoy	Claremorris	Cavan	Roscommon Town	Edenderry	Yearly Average
2021	8.6	5.9	7.9	9.8	7.9	5.7	10.1	9.4	7.4	8.2	7.4	7.1	17.8	**8.7**
2020	8	7	10	12	6	4	11	9	8	5	6	7	**-**	**7.8**
2019	6	-		14	-	-	15	9	8	4	**-**	9	**-**	**9.3**
Site Ave.	**7.5**	**6.5**	**9.0**	**11.9**	**7.0**	**4.9**	**12.0**	**9.1**	**7.8**	**5.7**	**6.7**	**7.7**	**17.8**	**8.6**

Table 4-5: Annual Mean SO_2 Zone D Monitoring Data

Year	Kilkitt	Letterkenny	Cork Harbour	Askeaton	Edenderry	Yearly Average
2021	1.7	10.2	5.5	1.6	1.8	**4.2**
2020	1.4	11.8	1.8	1.6	-	**4.2**
2019	0.7	6.8	-	1.8	-	**3.1**
Site Average	**1.3**	**9.6**	**3.7**	**1.7**	**1.8**	**3.8**

Table 4-6: Annual Mean CO Zone D Monitoring Data

Year	Birr
2021	0.3
2020	0.4
2019	-
Site Average	**0.4**

Local Meteorological Data

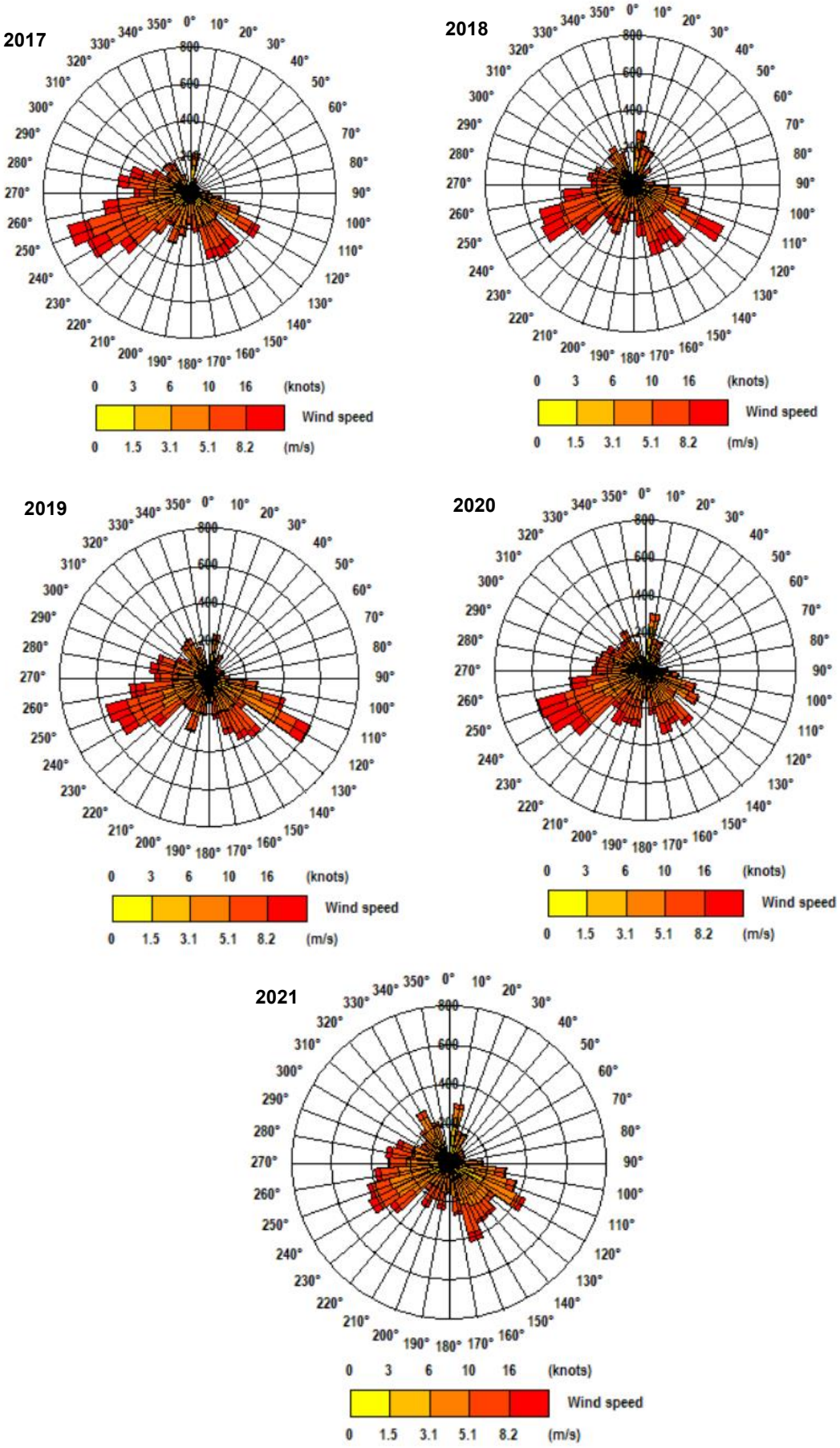
The closest and most representative site of hourly sequential meteorological data to the Designated Development, with adequate data capture for wind speed and wind direction, is the meteorological station at Shannon Airport. This station is approximately 32km to the northeast of the Designated Development.

Plate 4.1 illustrates wind rose plots for five recent calendar years monitored at Shannon Airport. Wind rose plots show the frequency of winds blown for specific sectors and wind speeds. It can be seen that, over the five years presented, winds most frequently blow from the southwest quadrant, which is typical of much of the UK and Ireland.

The use of five years of data allows the assessment to consider inter-annual variation. The contribution of emissions to pollutant concentrations and deposition rates reported at each receptor location is the worst-case value calculated at that location over the five years modelled.

In terms of how the dispersion model utilises the meteorological data, the latitude of the study area was set at 52.58º, the surface roughness of the study area set at 0.3m, to account for the fact that the study area is a combination of the estuary waterbody and swathes of open countryside with limited urban areas. The minimum Monin-Obukhov length set at 10m, to represent small towns and rural areas. For the meteorological site, the surface roughness was set at 0.2m to represent a typical meteorological site, which should be distanced well away from nearby buildings and structures.

Plate 4.1. Wind Rose plots



Likely Main Effects on Environment

This assessment has quantified the contribution of emissions from the three emergency generators to pollutant concentrations at 15 human health sensitive receptors and pollutant concentrations and deposition rates at 15 ecological sensitive receptors. The contribution has been compared to relevant AQSs and EALs to determine the magnitude of impact. The pollutant contribution to pollutant concentrations and deposition rates has been added to the background contribution to provide an estimate of total pollutant concentrations and deposition rates. These values can then be directly compared to the relevant AQSs and EALs.

The results of the assessment are presented in Table 4.7 to Table 4.10. Table 4.7 details the modelled emissions at the four worst impacted human health receptor locations. Table 4.8 to Table 4.10 show the modelled emissions at all ecological receptor locations. In the tables, the contribution of emergency generator emissions is referred to as the Process Contribution (PC). The total pollutant concentrations, once the PC had been added to the background contribution (BC), is referred to as the Predicted Environmental Concentration (PEC). The PC reported in Table 4.7 to Table 4.10, and subsequent PEC, is based on the maximum impact at each receptor over the five meteorological years modelled.

Table 4-7. Modelled Emissions at Human Health Receptor Locations

Receptor ID	Averaging Period	EAL (µg/m3)	Tarbert emissions only					Cumulative emissions				
			PC (µg/m3)	PC/ AQS (%)	BC1,2 (µg/m3)	PEC (µg/m3)	PEC/ AQS (%)	PC (µg/m3)	PC/ AQS (%)	BC1,2 (µg/m3)	PEC (µg/m3)	PEC/ AQS (%)
Receptor ID R3												
NO_2	Annual Mean	40	0.1	0.2	7.5	7.6	18.9	1.2	3.0	7.5	8.7	21.8
	1-hr	200	22.5	11.2	15.0	37.5	18.7	26.1	13.0	15.0	41.1	20.5
SO_2	1-hr	350	32.3	9.2	8.4	40.7	11.6	-	-	-	-	-
	24-hr	125	14.6	11.7	8.4	23.0	18.4	-	-	-	-	-
CO	8-hour Rolling	10,000	55.2	0.6	0.3	55.5	0.6	-	-	-	-	-
PM_{10}	Annual mean	40	<0.1	<0.1	11.9	11.9	29.8	-	-	-	-	-
	24-hr mean	50	0.7	1.3	23.8	24.5	48.9	-	-	-	-	-
$PM_{2.5}$	Annual mean	25	<0.1	<0.1	8.7	8.7	34.8	-	-	-	-	-
Receptor ID R4												
NO_2	Annual Mean	40	0.1	0.2	7.5	7.6	18.9	1.2	3.0	7.5	8.7	21.7
	1-hr	200	21.9	10.9	15.0	36.9	18.4	23.7	11.9	15.0	38.7	19.4
SO_2	1-hr	350	31.4	9.0	8.4	39.8	11.4	-	-	-	-	-
	24-hr	125	14.8	11.8	8.4	23.2	18.5	-	-	-	-	-
CO	8-hour Rolling	10,000	52.6	0.5	0.3	52.9	0.5	-	-	-	-	-
PM_{10}	Annual mean	40	<0.1	<0.1	11.9	11.9	29.8	-	-	-	-	-
	24-hr mean	50	0.9	1.8	23.8	24.7	49.4	-	-	-	-	-
$PM_{2.5}$	Annual mean	25	<0.1	0.1	8.7	8.7	34.9	-	-	-	-	-
Receptor ID R5												
NO_2	Annual Mean	40	<0.1	<0.1	7.5	7.5	18.8	1.2	2.9	7.5	8.7	21.6
	1-hr	200	7.7	3.9	15.0	22.7	11.4	29.7	14.9	15.0	44.7	22.4
SO_2	1-hr	350	10.2	2.9	8.4	18.6	5.3	-	-	-	-	-
	24-hr	125	3.4	2.7	8.4	11.8	9.5	-	-	-	-	-
CO	8-hour Rolling	10,000	17.8	0.2	0.3	18.1	0.2	-	-	-	-	-
PM_{10}	Annual mean	40	<0.1	<0.1	11.9	11.9	29.8	-	-	-	-	-
	24-hr mean	50	0.1	0.2	23.8	23.9	47.8	-	-	-	-	-
$PM_{2.5}$	Annual mean	25	<0.1	<0.1	8.7	8.7	34.8	-	-	-	-	-
Receptor ID R15												

NO_2	Annual Mean	40	<0.1	<0.1	7.5	7.5	18.8	2.3	5.6	7.5	9.8	24.4
	1-hr	200	3.0	1.5	15.0	18.0	9.0	20.0	10.0	15.0	35.0	17.5
SO_2	1-hr	350	4.3	1.2	8.4	12.7	3.6	-	-	-	-	-
	24-hr	125	1.6	1.3	8.4	10	8.0	-	-	-	-	-
CO	8-hour Rolling	10,000	6.2	0.1	0.3	6.5	0.1	-	-	-	-	-
PM_{10}	Annual mean	40	<0.1	<0.1	11.9	11.9	29.8	-	-	-	-	-
	24-hr mean	50	<0.1	0.1	23.8	23.8	47.7	-	-	-	-	-
$PM_{2.5}$	Annual mean	25	<0.1	<0.1	8.7	8.7	34.8	-	-	-	-	-

[1] Average across Zone D monitoring sites taken from summary tables that informed the Air quality in Ireland 2021 report.
[2] Short-term background concentrations are double the annual mean concentrations.

Table 4-8 Modelled Emissions at Ecological Receptor Locations for NO_x impacts

Rec ID	NO_X Tarbert emissions only					NO_X Cumulative emissions				
	PC (µg/m³)	PC/ AQS (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	PC (µg/m³)	PC/ AQS (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)
E1a	<0.01	<0.1	14.2	14.2	47.3	1.27	4.2	14.2	15.5	51.6
E1b	0.05	0.2	14.2	14.2	47.5	1.18	3.9	14.2	15.4	51.3
E1c	0.17	0.6	14.2	14.4	47.9	1.43	4.8	14.2	15.6	52.1
E2a	0.01	<0.1	14.2	14.2	47.4	0.99	3.3	14.2	15.2	50.6
E2b	0.01	<0.1	14.2	14.2	47.4	0.99	3.3	14.2	15.2	50.6
E2c	0.01	<0.1	14.2	14.2	47.4	0.99	3.3	14.2	15.2	50.6
E2d	0.01	<0.1	14.2	14.2	47.4	0.68	2.3	14.2	14.9	49.6
E2e	0.01	<0.1	14.2	14.2	47.4	1.31	4.4	14.2	15.5	51.7
E2f	0.03	0.1	14.2	14.2	47.4	1.17	3.9	14.2	15.4	51.2
E2g	0.01	<0.1	14.2	14.2	47.4	0.91	3.0	14.2	15.1	50.4
E2h	0.01	<0.1	14.2	14.2	47.4	1.42	4.7	14.2	15.6	52.1
E2i	0.01	<0.1	14.2	14.2	47.4	1.23	4.1	14.2	15.4	51.4
E2j	<0.01	<0.1	14.2	14.2	47.3	0.38	1.3	14.2	14.6	48.6
E3	0.01	<0.1	14.2	14.2	47.4	0.51	1.7	14.2	14.7	49.0
E4	<0.01	<0.1	14.2	14.2	47.3	0.15	0.5	14.2	14.4	47.8

Table 4-9 Modelled Emissions at Ecological Receptor Locations for Nitrogen Deposition

Rec ID	Critical Load	N Deposition Tarbert emissions only					N Deposition Cumulative emissions				
		PC (kg/N/ha/yr)	PC/ EAL (%)	BC (kg/N/ha/yr)	PEC (kg/N/ha/yr)	PEC/ EAL (%)	PC (kg/N/ha/yr)	PC/ EAL (%)	BC (kg/N/ha/yr)	PEC (kg/N/ha/yr)	PEC/ EAL (%)
E1a	20	<0.01	<0.1	12.1	12.1	60.5	0.18	0.9	12.1	12.3	61.4
E1b	20	0.01	<0.1	12.1	12.1	60.5	0.17	0.9	12.1	12.3	61.4
E1c	20	0.02	0.1	12.1	12.1	60.6	0.21	1.0	12.1	12.3	61.5
E2a	20	<0.01	<0.1	12.1	12.1	60.5	0.14	0.7	12.1	12.2	61.2
E2b	20	<0.01	<0.1	12.1	12.1	60.5	0.14	0.7	12.1	12.2	61.2
E2c	15	<0.01	<0.1	12.1	12.1	80.7	0.14	0.9	12.1	12.2	81.6
E2d	20	<0.01	<0.1	12.1	12.1	60.5	0.10	0.5	12.1	12.2	61.0
E2e	20	<0.01	<0.1	12.1	12.1	60.5	0.19	0.9	12.1	12.3	61.4
E2f	20	<0.01	<0.1	12.1	12.1	60.5	0.17	0.8	12.1	12.3	61.3
E2g	20	<0.01	<0.1	12.1	12.1	60.5	0.13	0.7	12.1	12.2	61.2
E2h	20	<0.01	<0.1	12.1	12.1	60.5	0.41	2.0	12.1	12.5	62.5
E2i	8	<0.01	<0.1	12.1	12.1	151.3	0.18	2.2	12.1	12.3	153.5
E2j	10	<0.01	<0.1	12.1	12.1	121.0	0.11	1.1	12.1	12.2	122.1
E3	5	<0.01	<0.1	12.1	12.1	242.0	0.07	1.5	12.1	12.2	243.5
E4	5	<0.01	<0.1	12.1	12.1	242.0	0.02	0.4	12.1	12.1	242.4

Table 4-10 Modelled Emissions at Ecological Receptor Locations for SO_2 impacts

Rec ID SO_2 Tarbert emissions only

	PC (µg/m^3)	PC/ AQS (%)	BC (µg/m^3)	PEC (µg/m^3)	PEC/ AQS (%)
E1a	<0.01	<0.1	4.2	4.2	21.0
E1b	0.04	0.2	4.2	4.2	21.2
E1c	0.12	0.6	4.2	4.3	21.6
E2a	0.01	<0.1	4.2	4.2	21.0
E2b	0.01	<0.1	4.2	4.2	21.0
E2c	0.01	<0.1	4.2	4.2	21.0
E2d	<0.01	<0.1	4.2	4.2	21.0
E2e	0.01	<0.1	4.2	4.2	21.0
E2f	0.02	0.1	4.2	4.2	21.1
E2g	0.01	<0.1	4.2	4.2	21.0
E2h	0.01	<0.1	4.2	4.2	21.0
E2i	0.01	<0.1	4.2	4.2	21.0
E2j	<0.01	<0.1	4.2	4.2	21.0
E3	0.01	<0.1	4.2	4.2	21.0
E4	<0.01	<0.1	4.2	4.2	21.0

The results of the human health assessment provided in Table 4.7 demonstrate the following:

- The results demonstrate that when the emissions from the Designated Development are considered in isolation, the PC to annual mean NO_2, PM_{10}, $PM_{2.5}$, and 8-hour CO is less than 1% of the relevant AQSs at the worst affected receptors. The PC to 24-hour PM_{10} it is less than 2% of the AQS. The PC to 1-hour SO_2 is less than 10% of the AQS and 24-hour SO_2 is less than 12% of the standard. The PC to 1-hour NO_2 is also less than 12% of the standard.
- With the addition of the BC, the PEC for annual mean NO2, PM_{10} and $PM_{2.5}$, 24-hour mean PM_{10}, 8-hour CO and 1-hour SO_2 and NO_2 are well below their respective AQS to the extent that the effect of impacts is not considered significant following EPA AG4, UK EA and IAQM/EPUK guidance.
- 24-hour SO_2 has a PC impact of greater than 10% and a PEC greater 20% of the Air Quality Standard or Environmental Assessment Level minus the short-term background. In line with the EPAAG44, UK EA approach and IAQM/EPUK approach, 24-hour SO_2 cannot be screened as insignificant. However as noted previously, the Designated Development will only operate for a maximum of 500 hours per year. The AQS for 24-hour SO_2 is based on a 125 µg/m3 concentration not being exceeded more than three times in a calendar year. In this assessment, it has been assumed that the 500 hours of operation could occur on any hour of the calendar year and therefore coincide with the worst hourly meteorological conditions at each receptor. In reality, 500 hours accounts for around 6% of the year and the coincidence of operation occurring during the worst meteorological hours of the year at each receptor is highly unlikely. Hypergeometric analysis of the 24-hour PC for every 24-hour period of the worst meteorological year at R4 has been undertaken to better understand the likely impact. That analysis has demonstrated that on the 4th worst 24-hour of the year, the probability of the PC being 10% or more of the AQS is 0.014% and the probability of the PEC greater 20% of the Air Quality Standard or Environmental Assessment Level minus the short-term background is 0.06%. This demonstrates that there is very little likelihood of a PC and PEC occurring to the extent that the effect would be significant.
- When the NO_2 impacts from the Designated Development are considered with other cumulative sources in the local area, the PC to annual mean NO_2 is less than 6% of the relevant AQSs at the worst affected receptors. The PC to 1-hour NO_2 is less than 15% of the AQS at the worst affected receptors. With the addition of the BC, the PEC for both annual mean and 1-hour NO_2 are well below their respective AQS

to the extent that the effect of impacts is not considered significant following EPA AG4, UK EA and IAQM/EPUK guidance.

- The impacts at human health receptors can therefore be screened as insignificant.

The results of the ecological assessment provided in Table 4.8 to Table 4.10 demonstrate the following:

- When the impacts from Designated Development are considered in isolation, for all of the ecological receptors, the impacts are less than 1% of the AQSs and EALs and can be screened as insignificant. It clear from the PEC across the range of habitats reported in Table 4.9 that those most sensitive to N deposition are constrained by the background contribution. In terms of N deposition, the Site has no perceptible impacts (<1%) at any SAC or SPA designated habitat.
- However, when the NOx impacts from the Designated Development are considered with other cumulative sources in the local area, the worst affected receptor is predicted to experience an annual mean NOx PC of 4.8% of the AQS. As the PEC for NO_X remains well below the AQSs (53%), the impact of this pollutant can be screened as insignificant.
- When the impacts of Nitrogen Deposition from the Designated Development are considered with other cumulative sources in the local area, the majority of receptors still are predicted to have impacts less than 1% of the EALs and can be screened as insignificant. The exception to this occurs at E1c, E2h, E2i, E2j and E3. Receptors E1c, E2j and E3 all experience a nitrogen deposition PC of 1.5% or less of their respective critical loads. Receptor E2h, a large shallow inlets and bays habitat within the Lower River Shannon SAC, to the north-west of the Site experiences a nitrogen deposition PC of 2.0% of the critical load. Whereas Receptor E2i, a perennial vegetation of stony banks habitat within the Lower River Shannon SAC, to the north-west of the Site experiences a nitrogen deposition PC of 2.2% of the critical load.
- With the addition of the BC, receptors E1c and E2h are well below the EAL (61.5% and 62.5% respectively), and the impact of nitrogen deposition can be screened as insignificant at these receptors.
- With the addition of the BC, receptors E2i, E2j and E3 exceed their respective EALs. Receptor E2j is Broadleaved deciduous woodland located within the Lower River Shannon SAC, to the south of the Site, and Receptor E3 is a bog within located Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA to the southeast of the Site. These locations are constrained by the background contribution, which already exceeds the EALs before any contributions of the Designated Development or cumulative sources are considered. As such, at these designated ecological receptor locations, baseline air pollution is already well in excess of the site-specific critical loads and no new exceedances of the critical load are predicted
- For all ecological receptors it should be noted that the main contribution to the cumulative PC concentrations is plant at Shannon LNG. This development is still going through planning and is not committed yet. It should be noted that when plant for this development is not included, cumulative impacts at all receptors fall below 1% PC.

Construction Phase – Mitigation Measures

Negative air quality impacts can come from many sources during construction, and as such there are a number of ways in which air quality effects will be minimised by the Contractor to avoid creating nuisance. Works will be planned to take into account the location of sensitive receptors (such as local residents in the vicinity of the Site and the ecological receptors adjacent to the Site), local topography, wind direction, and any potential sources of pollution.

In line with guidance published by the Institute of Air Quality Management (IAQM) (Holman et al, 2014) unmitigated construction phase impacts are most likely to occur:

- up to 350m beyond the Designated Development boundary and 50m either side of the construction traffic route (for a distance of up to 500m from the entrance of the proposed works site), for the identification of human health receptors; and
- up to 50m from the boundary of the proposed works site or either side of the construction traffic route (for a distance of up to 500m from the entrance of the proposed works site) for the identification of ecological receptors.

Mitigation measures will therefore be undertaken so that construction works are carried out in such a manner that emissions of dust and other pollutants are limited, and that best practicable means are employed to minimise

disruption, risks to human health, and to avoid unnecessary impacts on ecological habitats. These control measures will be reflected within the Final Construction Environmental Management Plan (CEMP), based on relevant guidance from Section 8.2 of the Guidance on the assessment of dust from demolition and construction (February 2014) for 'Medium Risk' sites. The mitigation measures discussed in Table 4.11 outline those required to avoid, prevent or reduce and, if possible, offset the likely main effects on the environment.

Control of Dust

Dust is generated in many ways during a construction project, various activities can mobilise dust which can then be deposited beyond the site boundary, harming amenity and vegetation, and if particles are small enough, inhaled by site workers, local residents and non-motorised road users. The Contractor will implement measures to prevent disturbance caused by dust preparation of the temporary construction compound, construction, and site clearance (including removal of existing hardstanding). Excavation and earthworks can be potential sources of dust if they are not properly controlled, especially in dry and windy weather. These measures are:

- Activities which have the potential to generate dust will be subject to a risk assessment, taking into account their proximity to sensitive receptors and duration. This allows mitigation and management techniques outlined in Table 4.11 to be implemented before works commence;
- Visual inspections will be undertaken when dust-raising activities are occurring. Inspections will take into account prevailing meteorological conditions, and results will be recorded and maintained. These inspections will take place at least daily during these actives, and will determine the effectiveness of the applied mitigation and management techniques as identified during the risk assessment; and
- Activities will be temporarily suspended if unacceptable levels of dust cannot be avoided, these will be identified through substantiated complaints received from the public and/or surrounding receptors.

Mitigation measures will be incorporated into the CEMP reflecting the requirements of best practicable means refer to Table 4.11. These measures to minimise the amount of dust produced include:

- Dampening haul roads and stockpiles;
- Keeping roads clean; and
- Using covers to minimise dust blow from lorries.

Conversely, wet weather creates potential for mud being carried onto public road network by vehicles entering or exiting the Site. The Site is mostly hardstanding and traffic will be required to use the designated access points on the N67, thus increasing control over construction vehicles exiting Site. Measures implemented to control dust will reflect the nature of the construction activity (type, dust source points, construction operation periods and time of year) as well as ameliorating conditions (such as prevailing wind directions and speeds, typical precipitation, and the dampening effect of retained soil moisture). The methods of reducing and controlling dust emissions during construction are detailed in the following table.

Table 4-11: Likely Site Activities and Appropriate Methods of Controlling Dust

Activity	Dust Control Methods
– Communication	– Develop and implement stakeholder communication measures that include community engagement before work commences on site. – Display the name and contact details of the person(s) accountable for air quality and dust issues on the site boundary – Display the head or regional office contact information – Develop and implement dust management measures as part of the CEMP, which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include, as a minimum, the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
– Site Management	– Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken – Make the complaints log available to the local authority when asked – Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the logbook
– Monitoring	– Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log

Activity	Dust Control Methods
	available to the local authority when asked – Carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked – Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions – If required, agree dust deposition, dust flux or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks, and construction.
– Preparing and maintaining the Site	– Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible – Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site – Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period, where possible – Avoid site runoff, or water, or mud – Keep site fencing, barriers and scaffolding clean using wet methods – Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site – Cover, seed, or fence stockpiles to prevent wind whipping,
– Operating vehicle/machinery and sustainable travel	– Ensure all vehicles switch off engines when stationary – no idling vehicles – Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable – Impose and signpost a maximum speed limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work area – Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
– Operations	– Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays. – Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation – Use enclosed chutes and conveyors and covered skips – Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. – Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
– Waste Management	– Prohibition of bonfires and burning of waste materials on Site
– Earthworks	– Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. – Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable – Only remove the cover in small areas during work and not all at once.
– Construction	– Avoid scabbling (roughening of concrete surfaces) if possible – Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
– Track-out	– Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. – Avoid dry sweeping of large areas. – Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. – Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. – Record all inspections of haul routes and any subsequent action in a site logbook. – Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site when reasonably practicable).
– Source: Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/ text/guidance/construction-dust-2014.pdf.	

5. Summary

A dispersion modelling assessment has been undertaken on emissions associated with the operation of three 50MWe emergency generators operating for up to 500 hours per year on air quality sensitive Special Area of Conservation (SAC) and Special Protection Area (SPA) habitats and selected human health receptors within 15km.

A dispersion modelling assessment has been undertaken with reference to EPA AG4 guidance. The assessment method has accounted for generator emissions data, five years of representative meteorological data, variation of local terrain, the effect of building downwash from the neighbouring buildings, and representative air quality sensitive receptors.

For human health receptors, the assessment has determined that the impact of the Designated Development and subsequent total pollutant concentrations (PEC) does not result in a significant effect on local air quality. The assessment did identify an elevated PC and PEC for 24-hour SO_2 at a couple of receptors, but this was due to the precautionary nature of that assessment. Further analysis demonstrated that probability of a significant effect occurring was very low. This is also the case for the cumulative assessment.

For ecological receptors, the stand-alone assessment has determined that N deposition rates and annual mean NO_X and SO_2 are less than 1% of the relevant AQS and EALs at all habitats considered.

However, when the cumulative emissions are considered, all receptors experience >1% PC for annual mean NO_X, however the PEC are less than 70% of the AQS and are therefore considered insignificant.

The assessment has determined that N deposition rate impacts are below 1% of the EAL at all receptors considered apart from five receptors. These receptors experience less than 2.5% PC impact of the EAL. It should be noted that the main contributor to these impacts comes from Shannon LNG which is currently not been approved at the planning stage. When Shannon LNG's emissions are removed from the results, all N deposition rates are well below 1% of the EAL.

Where these impacts occur, two of the receptors PEC is well below the relevant EAL and the operation of the Designated Development does not put these objectives at risk of an exceedance. For the other three receptors (Broadleaved deciduous woodland and perennial vegetation of stony banks, both located within the Lower River Shannon SAC and a bog within located Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle), the BC already exceeds the relevant EALs. At these designated ecological receptor locations baseline air pollution is already well in excess of the site-specific critical loads and no new exceedances of the critical load are predicted

It is therefore concluded that the air quality impact of the Designated Development can be screened as insignificant at all air quality sensitive SAC and SPA habitats and selected sensitive human health receptors.

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Appendix E Predicted construction noise levels of the Temporary Emergency Generator at SSE Tarbert

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Appendix E: Predicted Construction Noise Levels of Temporary Emergency Generation Power Plant at SSE Tarbert

Tarbert Emergency Generation
Tarbert Power Station

SSE Generation Ireland Limited

February 2023

Delivering a better world

Quality information

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Table of Contents

Appendix E: Predicted Construction Noise Levels of the Temporary Emergency Generator at SSE Tarbert 1
1.1 Ecological Assessment Criteria 2
1.2 Sound Source Definitions 2
1.3 Noise Modelling Setup 3
1.4 Predicted construction Noise Levels 4
1.5 Discussion of Results 6

Tables

Table 1: List of Construction Phase and Activities and their Sound Power Levels 2
Table 2: Total Sound Power Level for Construction Work Phases (and after on-time corrections applied) 3
Table 3: Definition of Receptor Locations and Heights 4
Table 4: Predicted noise levels at receptors during construction/demolition phase 4
Table 5: Methods of reducing noise levels from construction plant – BS5228 Table B.1 8

Appendix E: Predicted Construction Noise Levels of the Temporary Emergency Generator at SSE Tarbert

Tarbert Power Station, has been selected for a Temporary Emergency Generation (TEG) development, known as the “Designated Development”, by the Irish Government under new legislation, ‘*Development (Emergency Electricity Generation) Act 2022* ’. The facility will be connected to the existing 220kV EirGrid substation to the south of the Tarbert Power Station Site via an underground cable circa. 560m in length.

The Designated Development will involve construction works, installation and operation and decommissioning of three gas turbine powered units with a total operational output of 150MWe on 10.75ha of land owned by SSE within the Tarbert Power Station Site. The AECOM Acoustic team has been commissioned to undertake predictions of construction noise levels on behalf of SSE Generation Ireland Limited, ‘the Client’ for the Designated Development.

Effects arising from the process of decommissioning of the Designated Development are of a similar or lesser nature and duration to those arising from the construction process and therefore have not been considered separately in this document. Where this assessment refers to potential construction effects, these are also representative of predicted decommissioning effects.

Decommissioning phase noise levels are likely to be broadly similar to, or lower than, those during the construction phase, and therefore the construction phase noise levels are intended to represent a reasonable worst-case assessment.

The following outlines the ecological assessment criteria, potential construction activities and presents the predicted levels with an accompanying discussion of the results.

The following has been provided for the benefit of the project ecologists and it is not the purpose of this appendix to interpret the potential impacts arising from the predicted levels.

1.1 Ecological Assessment Criteria

The noise thresholds being considered for waterbirds are based on a report written by Cutts et al. (2013) and the findings of a literature review of disturbance to waterbirds. Waterbirds are the main ecological receptor for the Designated Development. The noise level effects on waterbirds are as follows:

- < 55 dB $L_{Aeq,T}$ being preferred and is considered to be a negligible impact;
- < 72 dB $L_{Aeq,T}$ being acceptable, but steps should be taken to minimise this as much as practical, this may have a temporary adverse effect;
- > 72 dB $L_{Aeq,T}$ not being acceptable and would have an adverse effect; and
- 60 dB L_{Amax} for impact sounds

1.2 Sound Source Definitions

Prediction of construction noise levels have been undertaken based on the list of equipment in Table 1, representing those which will be utilised during construction. The items and their sound power levels (L_{wA}) are taken from *British Standard BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Noise'* which is used in the absence of any specific Irish guidance.

It should be noted that the required piling type is unknown at the time of submission and the following message from the sites design team at General Electric (GE) summarises the position:

> *"To determine piling type, the civil subcontractor need to consider (apart from the equipment input and requirements in terms of settlement) the soil profile and the local availability of piling contractors and technologies. At this stage we are not in a position to discard any potential solution or limit to the equipment mentioned in AECOM report."*

Indicative predictions of both vibratory and impact piling noise have been undertaken to provide an assessment of the common piling techniques and their potential impact, together with consideration of the mitigation required to meet the ecological assessment criteria. However, whilst indicative, the sound power levels can vary depending on the specific piling type and rig selected and therefore this assessment should be updated once an appointed civil subcontractor has more information, as outlined above by GE.

Table 1: List of Construction Phase and Activities and their Sound Power Levels

Construction Phase	Construction Activity	Plant	Sound Power Level L_{wA} (dBA)	BS 5228 Table Ref No	% on time
Pre-construction	Clearing Site	Tracked excavator 22 t	106	C.2.3	50
	Distribution of Materials	Articulated dump truck 25 t	109	C.4.1	50
	Distribution of Materials	Articulated dump truck 25 t	109	C.4.1	50
	Breaking up concrete	Hand-held hydraulic breaker 20 kg	121	C.1.7	25
Ground Works	Ground Excavation/ Earth Works	Tracked excavator 22 t	99	C.2.21	25
	Distribution of Materials	Articulated dump truck 25 t	109	C.4.1	75
	Compacting Fill	Tracked Loaders	104	D.3.16	25
Construction	Ground Excavations/ Earthworks	Tracked excavator 22 t	99	C.2.21	50
	Distribution of materials	Articulated dump truck 25 t	109	C.4.1	50

Construction Phase	Construction Activity	Plant	Sound Power Level L_{wA} (dBA)	BS 5228 Table Ref No	% on time
	Mixing Concrete	Concrete mixer truck	108	C.4.20	25
	Pumping Concrete	Truck mounted concrete pump + boom arm 26t	108	C.4.29	25
	Concreting Other	Pump boom + vibrating poker	99	C.4.36	25
	Lifting, Mobile Telescopic Crane	Mobile telescopic crane 80t	105	C.4.39	50
	Lifting Diesel Scissor Lift	Diesel scissor lift 6t	106	C.4.59	50
	Trenching	Tracked excavator 21t	99	C.4.65	25
	Power for Site Cabins	Diesel generator	94	C.4.78	100
	Pumping Water	Water pump (diesel) 100 kg	96	C.4.88	75
Piling Option A (Vibratory)	Shallow piling, minicat top feed electric vibrator	Minicat Topfeed Electric Vibrator	123	C.12.59	25
	Shallow piling 360 Excavator	Tracked excavator 22 t	99	C.2.21	25
Piling Option B (Impact)	Shallow piling, minicat top feed electric vibrator	Minicat Topfeed Electric Vibrator	123	C.12.59	25
	Shallow piling 360 Excavator	Tracked excavator 22 t	99	C.2.21	25

The resulting sound power level (L_{wA}) for each stage has been determined from the octave band sound level spectra provided in BS 5228 and is presented in Table 2.

Table 2: Total Sound Power Level for Construction Work Phases (and after on-time corrections applied)

Construction Phase	Combined Sound Power Level (L_{wA})
Pre-Construction	116
Groundworks	108
Construction	111
Piling Option A (Vibratory)	117
Piling Option B (Impact)	128 (L_{Amax})

1.3 Noise Modelling Setup

Specialist environmental noise level modelling software CadnaA was used to predict construction noise levels at receptors.

Predictions for Pre-Construction, Ground Works and Construction phases were represented in the model by an area source with an extent equal to the area within the red line boundary attributed to the proposed generators and ancillary equipment. The sound power level (L_{wA}) was assigned to the area sources and therefore sound energy was distributed evenly over this area, representing a spatially averaged continuous level at receptors. In addition, heavy construction vehicles movements between the public access road and the plant area have been modelled and included in the noise level predictions. A total of 186 two-way Heavy Good Vehicles have been modelled over a 24-hour period based construction traffic estimates provided by the project team, resulting an assumption of approximately 8 HGV per hour.

For the piling phase predictions, the activities were represented by a single point source 4m above ground and approximately 14m away from the redline boundary and 44m from the nearest receptor, receptor J (an ecological receptor). This piling position was selected to represent the closest position at which piling activity would be undertaken to a sensitive receptor. This was on the basis that piling would only likely be required where building/structures are located. The assumed piling position is at the base of the closest planned ~30m high stack and therefore the piling distance used therefore represents a reasonable worst-case scenario.

The following assumptions and CadnaA settings were used:

- All land is assumed to be flat
- Ground absorption = 1.0 (Soft) – for grass areas to south of power station;
- Ground absorption = 0.0 (Hard) – for all other areas, including water; and
- Reflection order = 3.

We have also included mitigation in the form of a 4m high acoustic barrier along the southern and western boundaries of the Site.

Receptors A to O represent the ecological receptors locations, details of each receptor location are provided in Table 3.

Table 3: Definition of Receptor Locations and Heights

Receptor	Height (m)	Coordinates X (m)	Y (m)
A	0.5	507109	649254
B	0.5	507534	649219
C	0.5	507222	648818
D	0.5	507840	649091
E	0.5	508169	649974
F	0.5	507674	649681
G	0.5	507197	649801
H	0.5	506865	650602
I	0.5	505751	649835
J	0.5	507050	649486
K	0.5	506831	649480
L	0.5	507665	648601
M	0.5	507129	649416
N	0.5	507415	649739
O	0.5	507067	649013

1.4 Predicted construction Noise Levels

The predicted noise levels at the ecological receptors are shown in Table 4, both with and without barrier mitigation. The temporary 4m barrier mitigation has been placed around the south and west site boundary.

Table 4: Predicted noise levels at receptors during construction/demolition phase

Construction Phase	Receptor	Unmitigated (Dba)	Mitigated (Barrier Only) (dBA)
Pre Construction ($L_{Aeq,T}$)			
	A	53	48
	B	53	45
	C	41	38

Construction Phase	Receptor	Unmitigated (Dba)	Mitigated (Barrier Only) (dBA)
	D	46	41
	E	44	33
	F	51	41
	G	59	49
	H	44	34
	I	41	31
	J	69	54
	K	58	48
	L	42	34
	M	65	53
	N	56	46
	O	45	41
Groundworks ($L_{Aeq,T}$)			
	A	47	41
	B	48	43
	C	35	32
	D	41	36
	E	39	29
	F	46	35
	G	53	43
	H	39	29
	I	36	26
	J	63	49
	K	52	42
	L	37	29
	M	59	48
	N	50	40
	O	39	35
Construction ($L_{Aeq,T}$)			
	A	49	44
	B	50	44
	C	38	34
	D	42	38
	E	40	30
	F	48	37
	G	55	45
	H	41	30
	I	38	27
	J	65	51
	K	54	44
	L	39	31

Construction Phase	Receptor	Unmitigated (Dba)	Mitigated (Barrier Only) (dBA)
	M	61	50
	N	52	42
	O	42	37
Piling Option A ($L_{Aeq,T}$)			
	A	55	50
	B	54	46
	C	43	40
	D	50	40
	E	47	36
	F	53	43
	G	60	50
	H	48	37
	I	45	35
	J	76	64
	K	62	53
	L	37	37
	M	66	58
	N	57	47
	O	47	44
Piling Option B (L_{Amax})			
	A	58	58
	B	66	56
	C	48	48
	D	62	52
	E	59	48
	F	65	55
	G	71	**62**
	H	60	49
	I	58	47
	J	87	**75**
	K	73	**64**
	L	49	49
	M	77	**69**
	N	69	59
	O	52	52

1.5 Discussion of Results

The presented results are based on the information available to AECOM at the time of noise modelling and may change as more information becomes available. In particular any changes to the type of piling (we have assumed vibratory piling and impact piling) and inclusion of ground height information may have an effect on the predicted noise levels.

Piling activity (Options A & B) has been modelled as a point source at what is assumed to be the closest position that this activity will occur to receptor J. This is taken to represent a reasonable worst-case scenario as construction sound levels will decrease as distance from the activity increases. Note that Option A is concerned with the $L_{Aeq,T}$ level (an "average" noise level over a given duration) and Option B is concerned with the L_{Amax} level (an instantaneous noise level).

It can be seen that unmitigated noise levels of non-piling activities at ecological receptors are mostly below the preferred 55 dB $L_{Aeq,T}$ criterion. However, the 72 dB $L_{Aeq,T}$ criterion is exceeded during the Piling phase (Option A and B). The barrier mitigation improves this situation in general and reduces all non-piling activities to below the preferred 55 dB $L_{Aeq,T}$ criterion. Exceedances of the preferred 55 dB $L_{Aeq,T}$ criteria can still be observed for vibratory piling (Option A) at receptor J with mitigation but the predicted level of 64 dB $L_{Aeq,T}$ meets the 72 dB $L_{Aeq,T}$ criterion. Impact piling (Option B) results in exceedances of the 60 dB L_{Amax} criteria for impact sound after the reduction provided barrier mitigation at four receptors (G, J, K and M), with receptor J being the worst affected.

Additional mitigation measures to achieve the ~15 dB noise level reduction required at Receptor J to meet the target limit could be explored. Potential options are outlined below:

- A temporary acoustic shroud or covering can generally be fitted to the rig to act as an airborne noise absorbing/screening intervention at source, the performance will vary from piling rig model and shroud options. Specialist suppliers can be found to be quoting reductions up to 30 dB.
- Impact/hammer piling rigs can have their effective energy per blow reduced by decreasing the drop height of the hammer. This will likely increase the time required to drive the pile but will reduce both airborne noise and groundborne vibration levels.
- The amount of hammering can be reduced by adopting a combination of piling techniques. For example, in some situations a vibratory rig may be used to drive the piles to refusal initially and then impact piling used.
- BS 5228-1 provides a table of example piling mitigation which we have reproduced at the end of this memo as Table 5, for convenience

The construction activity in the other three phases has been spread out over the area assumed to be the most active part of the construction site as it encompasses the area where building/structures are planned. These predicted levels represent a spatially averaged level over the duration of the pre-construction, ground works and construction phases.

In addition to the temporary barrier at the south and west site boundaries, noise levels can also be minimised through the adoption of Best Practicable Means (BPM) standard working practices across the Designated Development to ensure that noise is reduced whenever practical. The following provisions, although not exhaustive, should be adhered to where practicable throughout the construction programme:

- Vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- Machines in intermittent use will be shut down or throttled down to a minimum when not in use;
- Pneumatic percussive tools will be fitted with mufflers or silencers;
- All compressors and generators will be "sound reduced" models fitted with properly lined and sealed acoustic covers or enclosures, which shall remain closed whenever the machines are in use;
- Equipment which breaks concrete, brickwork or masonry by bending, bursting or "nibbling" shall be used in preference to percussive tools. Where possible, the use of impact tools will be avoided where the site is close to occupied premises;
- Wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity;
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works;
- Plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum;

- All vehicles, plant and machinery used during the operations shall be fitted with effective exhaust silencers and all parts of such vehicles, plant or machinery shall be maintained in good order;
- Vehicles associated with works shall not wait or queue on the public highway or on the worksite with engines running;
- The contractor shall carry out regular site inspections, specialist BPM checks, random senior management tours and unannounced audits to confirm noise levels are acceptable and if required take steps to reduce them and to ensure all BPM mitigation measures have been implemented as required;
- Careful handling of tools/equipment, placement and handling of materials, and control of raised voices on site shall be covered in activity plans, briefings and 'toolbox talks' as appropriate;
- All site personnel will be instructed on Best Practicable Means ('BPM') measures to limit noise and vibration as part of their induction training and as required prior to specific work activities;
- Training, briefings and 'tool-box talks' shall be delivered to the site personnel to inform them of noise and vibration issues and the location of nearby receptors; and
- Suitable areas within the site compound have been provided for employees i.e., designated smoking areas, to reduce disruption around the site boundary.

It is worth noting the wider context of the Site in that the existing power station is known to be audible certainly at the nearest human receptor NSR1 from information given in the annual permit compliance reports and is therefore very likely to be audible at nearby ecological receptors such as receptor J.

Table 5: Methods of reducing noise levels from construction plant – BS5228 Table B.1

Plant	Source of noise	Possible remedies (to be discussed with machine manufacturers)	A-weighted sound reduction (dB)	Alternative Plant
Hammer drive piling	Pneumatic/diesel hammer or steam winch vibrator driver	Enclose hammer head and top of pile in acoustic screen	5 to 10 dB	Bored piling Vibratory system
	Sheet Pile	Acoustically dampen sheet piles to reduce levels of resonant vibration		Drop hammer completely enclosed in box with opening at top for crane access
	Impact on pile	Use resilient pad (dolly) between pile and hammer head. Packing needs to be kept in good condition		Steel jacket completely enclosing drop hammer with dolly and polystyrene chips fed to impact surface to dissipate energy
	Cranes cables, pile guides and attachments	Careful alignment of pile and rig		Pressed-in piling which generates its driving force from the frictional restraint of other piles
	Power units or base machine	Fix more efficient sound reduction equipment of exhaust. Acoustically dampen panels and covers. When intended by the manufacturer, engine panels need to be kept closed. Use acoustic screens when possible		

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