# BALLYNALACKEN WINDFARM PROJECT

# APPROPRIATE ASSESSMENT REPORT 2025

## Stage 1: Screening for AA

## Stage 2: Natura Impact Statement

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# 1 Stage I Screening

## 1.1 Introduction to the Appropriate Assessment Report 2024

This Appropriate Assessment Report 2024 has been prepared by Inis Environmental Consultants Ltd. to determine whether Stage 2 of the Appropriate Assessment process is likely to be required by the Planning Authority for the Ballynalacken Windfarm Project application. This Report provides:

- Description of the Project and the aspects which have the potential to cause impacts to Natura 2000 Sites;
- Description of the Natura 2000 Sites which could be affected by the Project;
- Screening assessment to ascertain whether significant effects to the Natura 2000 Sites can be ruled out in view of the Sites conservation objectives; and
- Screening Conclusion.

The preparation of this Stage 1 Screening has had regard to;

- EU Habitats Directive (92/43/EEC) and EU Birds Directive (Council Directive (2009/147/EC);
- Part XAB of the Planning and Development Act 2000;
- European Communities (Birds and Natural Habitats) Regulations 2011;
- Assessment of Plans and Projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2021);
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government (DoEHLG, 2010); and
- Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC (European Commission, 2018).

### 1.1.1 Appropriate Assessment Process

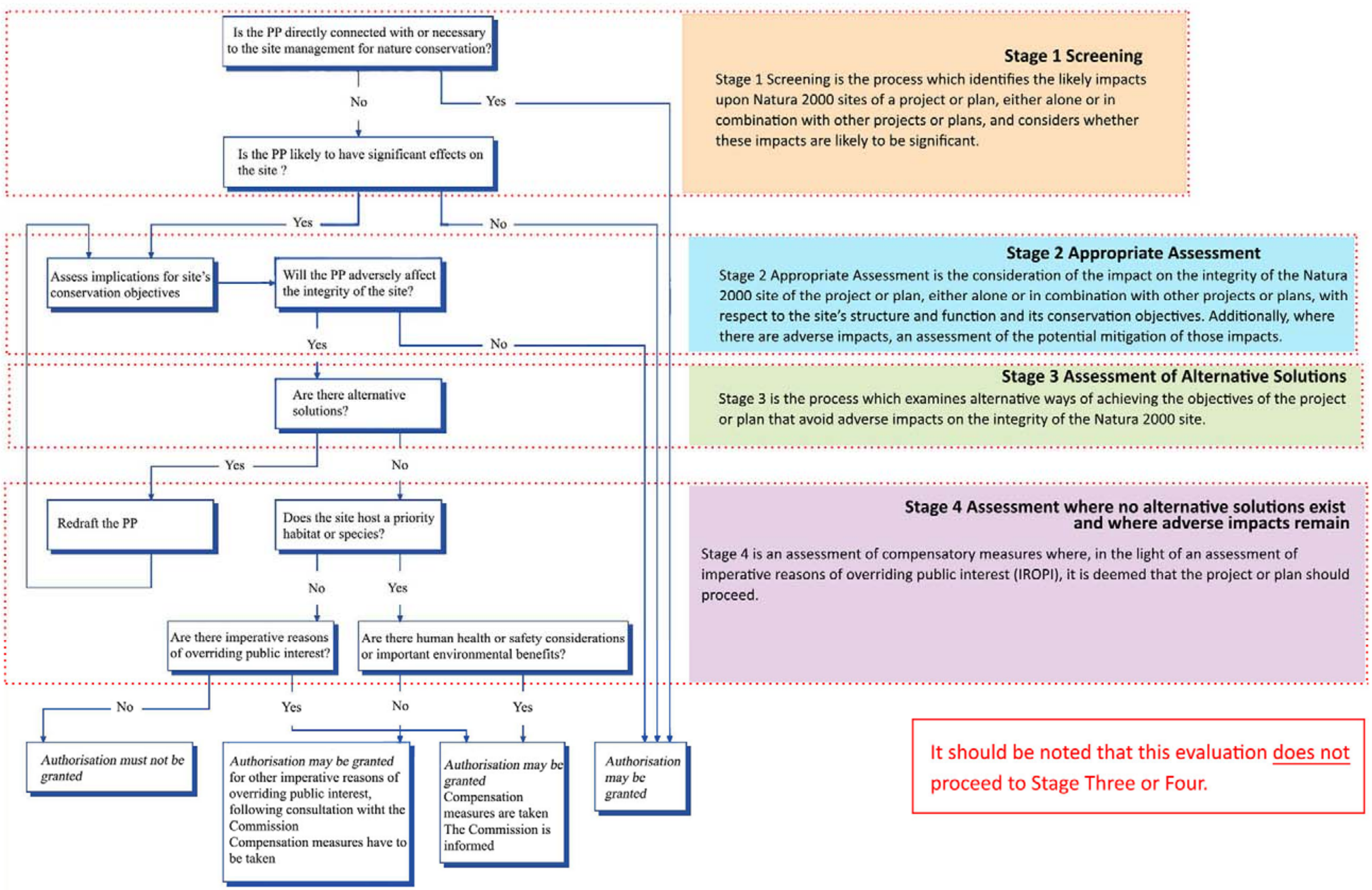
Under Article 6(3) of the Habitats Directive, an Appropriate Assessment of the implications of any plan or project on a Natura 2000 site is required before a project is approved. This must include all the aspects of the plan or project which can, either individually or in combination with other plans or projects, affect the conservation objectives of that Natura 2000 site, in the light of the best scientific knowledge in the field. The competent national authorities are to authorise a plan, project or activity only if they have made certain that it will not adversely affect the integrity of any Natura 2000 site.

This current document comprises a Screening to determine whether an Appropriate Assessment is required. The Screening identifies whether the project, alone or in combination with other plans and projects, is likely to have significant effects on any Natura 2000 site in view of the qualifying interests and conservation objectives of these sites; or whether the potential for such significant effects can be excluded. This test is completed with cognisance of emerging case law.

#### 1.1.1.1 Stages of the Appropriate Assessment Process

Appropriate Assessment involves a number of steps and tests that are applied using a stage-by-stage approach. Each step or stage in the assessment process precedes and provides a basis for other steps. The four stages in an Appropriate Assessment (AA), as outlined in EC Guidance on Assessment of Plans and Projects (2001) are illustrated in the following flow chart (over).

**STAGES OF THE APPROPIATE ASSESSMENT PROCESS FOR A PLAN OR PROJECT (PP)**

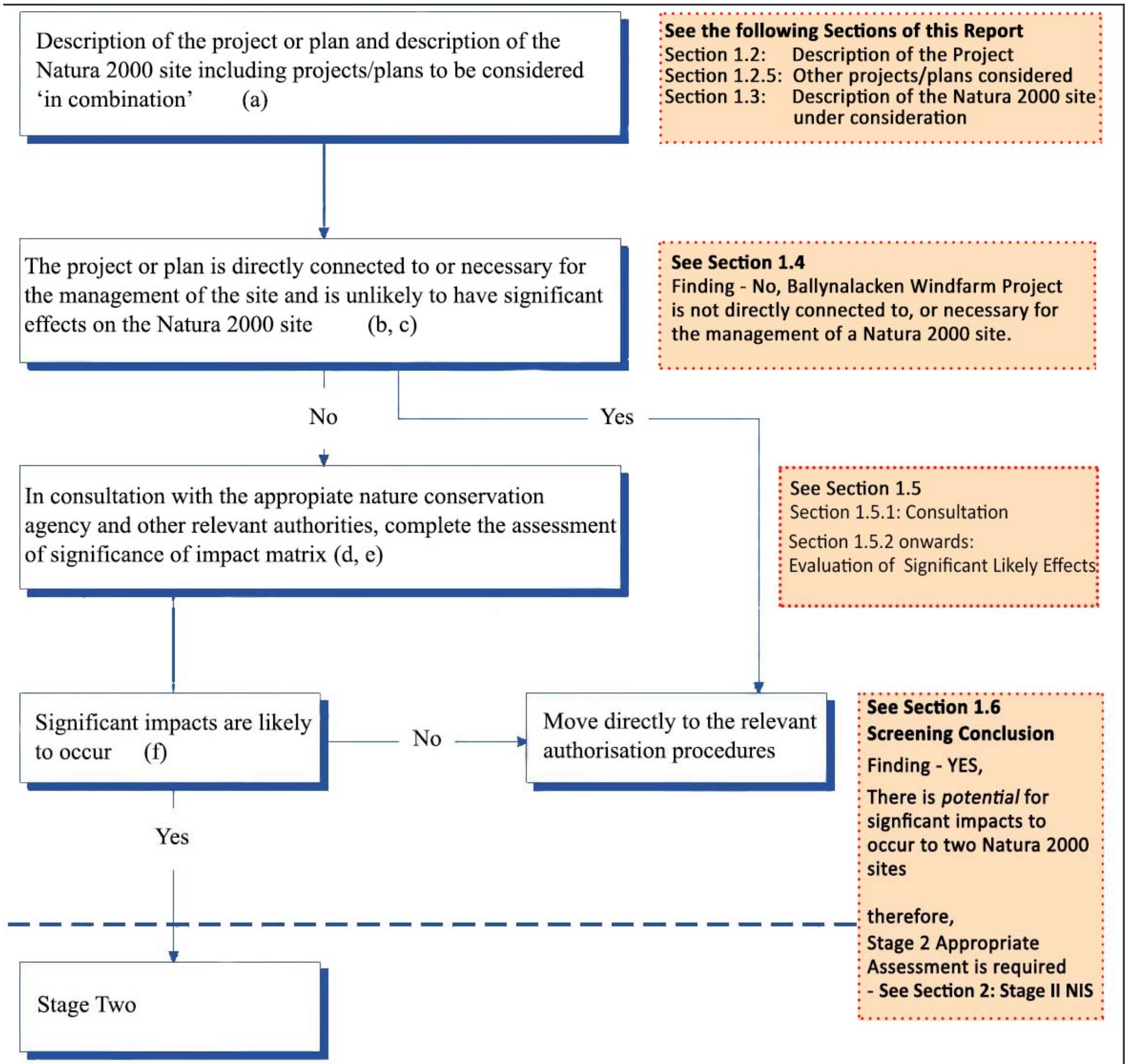



It should be noted that this evaluation <u>does not</u> proceed to Stage Three or Four.

*Source: Flow Chart and Description Notes from Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission 2001*

### 1.1.2 Screening Evaluation Process

The Screening stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. The Screening process comprises four steps, as outlined in the diagram below.




*Source: Flow Chart from Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) of the Habitats Directive 92/43/EEC, European Commission 2001*

The Screening evaluation, contained herein, examines the effects of the Proposed Ballynalacken Windfarm Project both alone and in combination and considers whether it can be objectively concluded that effects (if any) will not be significant in relation to Natura 2000 sites. The evaluation takes cognisance of the description of the Proposed Ballynalacken Windfarm Project and of the detailed ecological studies which have been carried out.

The range of mitigation measures for the Proposed Ballynalacken Windfarm Project, as set out in Stage II of this Appropriate Assessment Report and in the Ballynalacken Windfarm Environmental Management Plan (2025) are not taken into account at the Screening stage of the AA process herein.

## 1.2 Description of the Proposed Ballynalacken Windfarm Project

### 1.2.1 Overview of the proposed Ballynalacken Windfarm Project

The proposal is to build a 12-turbine windfarm and ancillary works to be called Ballynalacken Windfarm Project and to connect the windfarm by underground cabling to the EirGrid Ballyragget Substation.

The proposed 12-turbine Ballynalacken Windfarm Project will comprise the following elements:

| Element | Overview Description |
|---|---|
| Ballynalacken Windfarm | 12 No. Wind Turbines and associated works including foundations and hardstanding areas, windfarm roads, electrical control building and internal underground cabling connecting the wind turbines to the control building, to be located in the townlands of Byrnesgrove; Commons; Ballymartin; Ballynalacken; Ballyouskill and Loughill. |
| Internal Cable Link | Underground cabling through the townlands of Ballymartin and Tinnalintan which will connect the Windfarm Control Building to the Tinnalintan Substation. |
| Tinnalintan Substation | 110kV Electrical Substation in Tinnalintan townland and associated access road. |
| Ballynalacken Grid Connection | Underground Grid Connection from the Tinnalintan Substation to the existing EirGrid Ballyragget Substation through Tinnalintan, Coole and Moatpark townlands, and facilitating works in the EirGrid Substation. |
| Ancillary Works | Site entrances at the windfarm site and at the Tinnalintan Substation site, 1 no. met mast and associated access road, 1 no. telecoms relay pole, site drainage network, temporary construction compounds, temporary borrow pits, public road widening works and temporary works in private lands and along the public road corridor to facilitate turbine component delivery, and landscaping and reinstatement works. |

### 1.2.2 Location of the Proposed Ballynalacken Windfarm Project

The proposed Ballynalacken Windfarm site is located entirely within County Kilkenny on elevated lands equidistant between the towns of Ballyragget (4.3km) and Castlecomer (4.2km) in County Kilkenny, and 3.2km from the village of Ballinakill in County Laois. The villages of Ballyouskill and Attanagh are located 3km and 3.9km respectively to the northwest of the windfarm. See AA Figure 1: Ballynalacken Windfarm Project Location on Discovery Mapping,

The proposed Ballynalacken Windfarm site location is typical of Kilkenny rural countryside with lands enclosed by hedgerows. There are farmsteads and one-off housing located in the open countryside and generally the commercial, civic and community services are in the surrounding small towns and villages. Farming in the area is predominantly grassland supporting dairy and beef cattle and to a lesser extent sheep farming, with some large commercial forestry plots on the higher ground.

Ballynalacken Windfarm site itself comprises agricultural grassland and commercial forestry, with the turbine sites evenly split between these two landuse types. The Internal Cable Link connecting the windfarm to the Tinnalintan Substation is located underground through agricultural lands and public road; Tinnalintan Substation is located in agricultural lands, while the Ballynalacken Grid Connection is wholly under private and public roads.

### 1.2.3 Purpose of the Project

The purpose of the Ballynalacken Windfarm is to generate electricity from the power in the wind and export that electricity to the national electricity system.

**Climate Action**: The Irish government launched the Climate Action Plan – Climate Action Plan 2023 (CAP23) in December 2022[1], which sets out how Ireland can accelerate the actions that are required to respond to the climate crisis, putting climate solutions at the centre of Ireland's social and economic development. The current Climate Action Plan 2024 (CAP24) is the third annual update to Ireland's Climate Action Plan. The Plan was approved by Government on 20 December 2023.

Ballynalacken Windfarm is aligned with CAP24 and will contribute positively to the increasing imperative to ameliorate climate change by generating electricity without polluting greenhouse gas (GHG) emissions. This was evaluated as a **Significant Positive Effect** of the Ballynalacken project in the Climate chapter of the EIA Report which accompanies the planning application. It is predicted that the Ballynalacken Windfarm will produce 140 million kilowatt hours of electricity annually, without emitting greenhouse gases (GHG) or causing air pollution and this will avoid an equal amount of electricity being generated from gas, coal or oil, which does emit GHG. This offsetting of electricity production from non-renewable sources would avoid 35,700 tonnes of $CO_2e$ (Carbon Dioxide equivalent) being emitted to the atmosphere.

**Security of Supply**: On 10th /11th March 2022, in response to Russia's invasion of Ukraine, the heads of state of the EU member States issued the Versailles Declaration[2]. The Declaration addressed reducing the EU's dependence on Russian energy supplies by phasing out the EU's dependency on Russian gas, oil and coal imports as soon as possible. In response, the Commission has proposed an emergency strategy to boost Europe's energy independence, called REPowerEU, which is based on two pillars 1) Diversifying gas supplies and 2) Accelerating renewables and energy efficiency. Relevant to this application, the Commission recognises the central role of wind energy: the EC wants 510 GW of wind energy by 2030, up from 190 GW today.

**Renewable Energy Directive**: in line with the EU's climate commitments, the new Renewable Energy Directive introduces a 42.5% binding minimum target for the share of renewables in the EU gross final energy consumption (Directive 2018/2001/EU), with a further indicative 2.5% top up to reach 45%. Each Member State must contribute to meeting this target and to achieving sector-specific sub-targets for renewables in transport, industry, buildings and district heating and cooling. As such, the new Renewable Energy Directive will help the European Union to meet the higher climate mitigation efforts agreed by the Member States for 2030 and, respectively, to reduce the EU's dependence on Russian fossil fuels. In 2023, 24.1% of the EU energy consumption came from renewables. There remains a gap of 18.4% to fulfil the current target for 2030.

The Ballynalacken Windfarm Project will positively promote the REPowerEU plan for indigenous European Union renewable electricity supplies through the production of 140 million kWh per annum of renewable generated electricity (RE-E) from the power in the wind at the Proposed Ballynalacken Windfarm Project site.

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[1] CAP23.pdf (www.gov.ie)

[2] https://www.consilium.europa.eu/media/54773/20220311-versailles-declaration-en.pdf

### 1.2.4 Aspects of the Project that could generate impacts

The following aspects of the Project could become sources of impact upon Natura 2000 Sites:

- Vegetation clearance and landcover change along the footprint of the Project, mostly at the windfarm site;
- Excavation, reuse and storage of topsoil, subsoil and rock material from the footprint of the Project hardstanding areas, with the largest volumes associated with the windfarm site;
- Instream works and works in close proximity to 1st and 2nd order watercourses and to wet drainage channels;
- Works to bridge over 2nd order watercourse to raise the height of the parapet walls (option-a), or horizontal directional drilling (HDD) works under the 2nd order watercourse (option-b);
- General works and moving/operating vehicles and machinery – emissions of noise and visual intrusion
- Use of hydrocarbons and cementitious materials
- Forestry felling at the windfarm site
- Runoff/Pollution
- Increase in hardstanding areas
- Importation/Movement of Materials onto/within the Project site
- Hedgerow planting
- Operational turbines at the windfarm site
- Operational Maintenance Works and Activities
- Decommissioning works and activities.

### 1.2.5 Other Plans or Projects to considered for in-combination effects

Article 6(3) of the Habitats Directive requires that the Project is considered in-combination with the effects with other plans and projects. In-combination effects can arise when the spatial extent of effects from two or more projects or plans overlap, or could be sequential - where the spatial extents do not overlap. Plans and projects that have been approved or proposed (i.e., for which an application for approval or consent has been submitted) (EC, 2021) are included in the in-combination evaluation. Existing projects are also taken into consideration.

In relation to cumulative impacts, there are a number of other projects or plans which could contribute to in-combination effects, these projects include:

- Pinewood Windfarm and associated substation (consented);
- Other large wind farm projects within the wider Nore catchment area; Monaincha, Cullenagh, Lisheen III, Bruckana, Lisdowney, Gortahile, Bilboa, and White Hills Wind Farms;
- Developments in the vicinity of the Ballynalacken Grid Connection into the existing EirGrid Ballyragget Substation at Moatpark: Grid connections for Farranrory Wind Farm and Parksgrove & Ballyragget solar farms; Two separate Battery Energy Storage System developments adjacent to the Eirgrid Ballyragget Substation; and the Laois-Kilkenny Grid Reinforcement Project and extension of Ballyragget Substation compound;
- Tirlán Processing Plant and associated wastewater treatment plan and proposed anaerobic digestor project; Tirlán solar farm;
- Kilkenny County Council Ballyragget Masterplan (2024), which promotes a potential River Park along the banks of the River Nore, this potential River Park would be located along a new looped walk around the settlement area of Ballyragget.

## 1.3 Identification and Description of Natura 2000 sites under consideration

### 1.3.1 Source-Pathway-Receptor (S-P-R) Model

Current guidance informing the approach to screening for AA defines the zone of influence of a proposed project as the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests (QIs) of a Natura 2000 site. It is recommended that this is established on a case-by-case basis using the S-P-R model.

The likely effects of the proposed project on Natura 2000 sites have been appraised using the S-P-R model, where:

**S)** A 'Source' is defined as the individual element of the proposed project that has the potential to impact on a Natura 2000 site, its qualifying features and its conservation objectives;

**P)** A 'Pathway' is defined as the means or route by which a source can affect the ecological receptor; and

**R)** A 'Receptor' is defined as the Special Conservation Interests (SCIs) of a Special Protection Area (SPA) or Qualifying Interests (QIs) of a Special Area of Conservation (SAC) for which Conservation Objectives (COs) have been set for the Natura 2000 sites being screened.

An S-P-R model is a standard tool used in environmental assessment. For an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of Natura 2000 sites, and their QIs/SCIs, with potential links to Natura 2000 sites. These are termed 'relevant' Natura 2000 sites/QIs/SCIs throughout this report.

### 1.3.2 Zones of Influence

During the initial scoping of this report, suitable Zone(s) of Influence (ZoI) of the Project were identified.

A precautionary approach has been used, which minimises the risk of overlooking distant or obscure effect pathways, while also avoiding reliance on buffer zones within which all Natura 2000 sites should be considered. This follows European Commission guidance, which recommends that the ZoI should in particular, identify:

i. "Any Natura 2000 sites geographically overlapping with any of the actions or aspects of the plan or project in any of its phases, or adjacent to them;
ii. Any Natura 2000 sites within the likely zone of influence of the plan or project. Natura 2000 sites located in the surroundings of the plan or project (or at some distance) that could still be indirectly affected by aspects of the project, including as regards the use of natural resources (e.g. water) and various types of waste, discharge or emissions of substances or energy;
iii. Natura 2000 sites in the surroundings of the plan or project (or at some distance) which host fauna that can move to the project area and then suffer mortality or other impacts (e.g. loss of feeding areas, reduction of home range);
iv. Natura 2000 sites whose connectivity or ecological continuity can be affected by the plan or project" (European Commission, 2021, p.10).

The Zones of Influence (ZoI) for the proposed Ballynalacken Windfarm Project have been established taking into account the guidance set out by the National Roads Authority (NRA, 2009) and the OPR Guidance note (2021). Ecological features can be static or mobile. The ZoI of the proposed Project on mobile species (e.g., birds, mammals, and fish), is considered differently to the ZoI of the proposed Project on static species and habitats (e.g., saltmarshes, woodlands, and flora), depending on the characteristics of the species/habitat. Mobile species can have 'ranges' which can occur outside of the Natura 2000 site in which they are QI/SCI. The ranges of mobile QI/SCI species varies considerably, from several metres (e.g., in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of some migratory wetland bird species). Whilst static species and habitats are generally considered to have ZoIs within close proximity of proposed works, some species and habitats can be significantly affected at considerable distances from an effect source and the ZoI of proposed works could be much larger; for example, where hydrological linkages between proposed works and Natura 2000 sites (and their QIs/SCIs) can occur over significant distances; however, any effect will be site specific depending on the receiving environment and nature of the potential impact.

#### 1.3.2.1 Identifying the Zones of Influence for the proposed Ballynalacken Windfarm Project

Adopting the precautionary principle in identifying potentially affected Natura 2000 sites, the following Zones of Influence have been applied to the structures and features of the various elements, and to the works and activities associated with the proposed Ballynalacken Windfarm Project – these ZoIs are described in the table below. Any Natura 2000 sites which occur within these ZoI's are also identified in the table. The locations of these Natura 2000 sites in relation to the Project are illustrated in AA Figure 2: Natura 2000 sites within the Zones of Influence of the Project.

**Table 1-1: Natura 2000 sites within the Zones of Influence of the Ballynalacken Windfarm Project**

| Zone of Influence | ZoI extent | Natura 2000 sites within the Zone of Influence |
|---|---|---|
| Natura 2000 sites geographically overlapping | Red Line Boundary and/or works area boundaries associated with the Ballynalacken Windfarm Project. | N/A – the Project red line boundary and works areas outside the red line boundary (i.e. associated with the turbine haul route) do not overlap the boundary of any Natura 2000 site. |
| **Natura 2000 sites with static terrestrial QI species & habitats** | Static species and habitats are considered to have ZoIs within 100m of a development. | N/A - Terrestrial QI species and habitats listed for the Natura 2000 sites are not present within an appropriate distance to be considered likely receptors to potential impacts arising from the proposed development under an SPR model ZoI. |
| Natura 2000 sites with mobile terrestrial invertebrate QI species | Only relates to Marsh Fritillary and Kerry Slug, as no other terrestrial invertebrate species in Ireland are listed as Annex II species. Mobile terrestrial invertebrate QI species (Marsh Fritillary, Kerry Slug) are generally considered to have ZoIs within 500m of a development<br>*Note: Whorl snail is a semi-terrestrial species but requires riverside and floodplains to support its population. As such, its ZoI is more accurate to consider in the static aquatic species.* | N/A – no Natura 2000 site which includes Marsh Fritillary or Kerry Slug as QI species within the ZoI. No reasonable pathway identified.<br>. |
| Natura 2000 Sites downstream of the | A reasonable worst-case ZoI for potential water pollution impact pathways are considered to be | River Barrow and River Nore SAC,<br>River Nore SPA. |

| Zone of Influence | ZoI extent | Natura 2000 sites within the Zone of Influence |
|---|---|---|
| proposed Ballynalacken Windfarm Project | the surface water continuous pathway between proposed works and the first Water Framework Directive (WFD) transitional water body. | |
| Natura 2000 sites with static aquatic QI species or habitats | | River Barrow and River Nore SAC, River Nore SPA. |
| Natura 2000 sites with mobile aquatic QI species | The zone of impact extends downstream of the Project works suitable for these mobile species as far as the designated sites downstream of the Ballynalacken Windfarm Project within the Nore_SC_060, Dinin[North]_SC_010, Nore_SC_80 and Nore_SC_100 sub-catchments of the River Nore Catchment in which the Project is located. | River Barrow and River Nore SAC, River Nore SPA, |
| Natura 2000 sites with mobile QI species - Otter | In addition to the ZoI for mobile QI aquatic species above, the ZoI for Otter also includes areas 300m from any watercourse stream or river suitable to support couching or holt sites connected to the above mentioned sub-catchments and 50m from Project works areas for foraging/commuting habitat. | River Barrow and River Nore SAC |
| Natura 2000 sites with mobile QI species –Bats | 5km<br>Only relates to the Lesser Horseshoe Bat, as no other bat species in Ireland are listed as Annex II species. As per Lesser Horseshoe Bat Species Action Plan (NPWS & VWT 2022), any site of international importance for this species' roosting habitat considers the linear features within 5km of the site that are important to facilitating commuting to and from foraging grounds. Where a Lesser Horseshoe Bat Roost is located within 5km of a project, it is considered within the screening for potential effects. Where a roost is within 2.5km of the project, it has potential to interact with a site specific conservation objective related to a "connectivity" attribute/target and must be considered in any changes to linear habitat features and suitable foraging grounds for adverse effects. | N/A – no sites designated for Lesser Horseshoe Bats Roosts within 5km of the Project, no Lesser Horseshoe Bat roosts within 5km of the Project. |
| Natura 2000 sites with mobile SCI species – Birds of Prey | 10km for wintering; 2km for breeding season; Birds of prey have large ranges in winter and as such any SPA listing Birds of Prey within 10km for their winter distribution have potential to interact with the Project and were considered | N/A – no sites designated for Birds of Prey within 10km of the Project, no wintering grounds within 10km |

| Zone of Influence | ZoI extent | Natura 2000 sites within the Zone of Influence |
|---|---|---|
| | for adverse effects. SPAs within 2km listing birds of prey for their breeding population were considered. This is based on Hen Harrier breeding sensitivity being considered at 2km for windfarm developments. | |
| Natura 2000 sites with mobile SCI species – Waders, Wetland and Waterbirds | 5km for wetland/waterbird; 10km for geese/swan species;<br>Where an SPA listing geese/swan species lies within 10km of a windfarm development, the potential ZoI is based on the species with the largest range (i.e. the White Fronted Goose). Where extensive foraging habitat lies in proximity to a project between two or more SPAs, the ZoI would be based on the species with the highest sensitivity to disturbance. | N/A - No such SPAs listing geese or swan species, or other wetland or waterbird species, are located within the 5km or 10km ZoI, nor does any large/extensive area of suitable foraging habitat exist in proximity to the Project with ex-situ connectivity to SPAs across the wider region. |
| Natura 2000 sites with SCI species - Kingfisher | Downstream to first WFT transitional water body for indirect water quality effects.<br><br>For ex-situ effects, the zone of impact extends downstream of the Project works in suitable habitat for Kingfisher as far as the designated sites downstream of the Ballynalacken Windfarm Project within the Nore_SC_060, Dinin[North]_SC_010, Nore_SC_80 and Nore_SC_100 sub-catchments of the River Nore Catchment in which the Project is located | River Nore SPA *(indirect water quality impacts)*<br><br>N/A – no suitable habitats within the ZoI upstream (ex-situ)of the SPA site |
| Features of the landscape that serve as ecological linkages | Features of the landscape that connect Natura 2000 sites or that may obstruct the movement of species | N/A - The Project will not affect features of the landscape that connect Natura 2000 sites or that may obstruct the movement of species. |
| | | |

## 1.3.3 Description of Natura 2000 sites within the Zones of Influence

### 1.3.3.1 River Barrow and River Nore SAC (IE0002162)

**Locational Context within the ZoI**: Downstream, c.90m to Ballynalacken Grid Connection (c.80m as the crow flies), 1.6km to nearest turbine (T12), c.18m to nearest Haul Route Works (Kilkenny Town HR2)

**Brief Overview**: The site supports many Annexed habitats including the priority habitats of alluvial woodland and petrifying springs. Quality of habitat is generally good. The site also supports a number of Annex II animal species - *Salmo salar, Margaritifera margaritifera, M.m. durrovensis, Alosa fallax, Austropotamobius pallipes, Petromyzon marinus, Lutra lutra, Lampetra fluviatilis* and *L. planeri*. Annex I Bird species include *Anser albifrons flavirostris, Falco peregrinus, Cygnus cygnus, Cygnus columbianus bewickii, Limosa lapponica, Pluvialis apricaria and Alcedo atthis*. A range of rare plants and invertebrates are found in the woods along these rivers and rare plants are also associated with the saltmarsh.

Protected Habitats & Species: 6 Coastal and salt-tolerant, 1 Freshwater, 1 Heath and scrub, 1 Grassland, 1 Bog, mires and fens, 2 Forests, 22 Birds, 6 Fishes, 3 Invertebrates, 1 Mammal

#### 1.3.3.1.1 Conservation Objectives of the River Barrow and River Nore SAC [002162]

The conservation objectives and associated attributes and targets are provided below for the River Barrow and River Nore SAC. This information has been extracted from the Conservation Objectives for this Natura 2000 site, which is available in full on the National Parks & Wildlife Service website at https://www.npws.ie/protected-sites and a copy of the Conservation Objectives is also included as **AA Appendix 1.** The conservation objectives, attributes and targets which are reproduced in the table below should be read in conjunction with any other supporting documentation on the NPWS website.

| Desmoulin's whorl snail (*Vertigo moulinsiana*) [1016] | |
|---|---|
| Objective: | To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 |
| Population size: adults | At least 5 adult snails in at least 50% of samples |
| Population density | Adult snails present in at least 60% of samples per site |
| Area of occupancy | Minimum of 1ha of suitable habitat per site |
| Habitat quality: vegetation | 90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011) |
| Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) |
| Nore freshwater pearl mussel (*Margaritifera durrovensis*) [1990] | |
| Objective: | To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution: | Maintain at 15.5km. See map 7 |
| Population size: adult mussels | Restore to 5,000 adult mussels |
| Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length |
| Population structure: adult 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 length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning |

| | | |
|---|---|---|
| Water quality: Macroinvertebrates and phytobenthos (diatoms) | | Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 |
| Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | | Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes 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 5cm depth in substrate |
| Hydrological regime: flow variability | | Restore appropriate hydrological regimes |
| Host fish: | | Maintain sufficient juvenile salmonids to host glochidial larvae |
| Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] | | |
| The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species. | | |
| | | |
| White-clawed Crayfish (*Austropotamobius pallipes*) [1092] | | |
| Objective: | To maintain the favourable conservation condition of White-clawed Crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: | |
| Attribute | | Target |
| Distribution | | No reduction from baseline. See map 7 |
| Population structure: recruitment | | Juveniles and/or females with eggs in at least 50% of positive samples |
| Negative indicator species | | No alien crayfish species |
| Disease | | No instances of disease |
| Water quality | | At least Q3-4 at all sites sampled by EPA |
| Habitat quality: heterogeneity | | No decline in heterogeneity or habitat quality |
| Sea Lamprey (*Petromyzon marinus*) [1095] | | |
| Objective: | To restore the favourable conservation condition of Sea Lamprey in the River Barrow and River Nore SAC, 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/m² |
| 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 |
| Brook Lamprey (*Lampetra planeri*) [1096] | | |
| Objective: | To restore the favourable conservation condition of Brook Lamprey in the River Barrow and River Nore SAC, which is 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/m² |
| 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 |
| River Lamprey (*Lampetra fluviatilis*) [1099] | | |

| | |
|---|---|
| Objective: | To restore the favourable conservation condition of River Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary |
| Population structure of juveniles | At least three age/size groups of river/brook lamprey present |
| Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² |
| 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 |
| Twaite Shad (*Alosa fallax*) [1103] | |
| Objective: | To restore the favourable conservation condition of Twaite Shad in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary |
| Population structure: age classes | More than one age class present |
| Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats |
| Water quality: oxygen levels | No lower than 5mg/l |
| Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plant) growth |
| Atlantic Salmon (*Salmo salar*) (only in fresh water) [1106] | |
| Objective: | To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC, 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 minutes sampling |
| Out-migrating smolt abundance | No significant decline |
| Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes |
| Water quality | At least Q4 at all sites sampled by EPA |
| Estuaries [1130] | |
| Objective: | To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC, 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. See map 2 |
| Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 |
| Community extent | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 |
| Mudflats and sandflats not covered by seawater at low tide [1140] | |
| Objective: | To maintain the favourable condition of Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC, 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. See map 3 |

| | |
|---|---|
| Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex, Sand to muddy fine sand community complex. See map 4 |
| *Salicornia* and other annuals colonizing mud and sand [1310] | |
| Objective: | To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the River Barrow and River Nore SAC, 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 the one sub-site mapped: Ringville – 0.03ha. See map 5 |
| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |
| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 & Ryle, 2009). |
| Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] | |
| Objective: | To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 |
| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |
| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 & Ryle, 2009) |
| Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Otter (*Lutra lutra*) [1355] | |
| Objective: | To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution | No significant decline |

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| Extent of terrestrial habitat | No significant decline. Area mapped and calculated as 122.8ha above high-water mark (HWM) and 1136.0ha along riverbanks / around ponds |
| Extent of marine habitat | No significant decline. Area mapped and calculated as 857.7ha |
| Extent of freshwater (river) habitat | No significant decline. Area mapped and calculated as 616.6km |
| Extent of freshwater (lake) habitat | No significant decline. Area mapped and calculated as 2.6ha |
| Couching sites and holts | No significant decline |
| Fish biomass available | No significant decline |
| Mediterranean salt meadows (*Juncetalia maritimi*) [1410] | |
| Objective: | To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 |
| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |
| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Killarney Fern (*Trichomanes speciosum*) [1421] | |
| Objective: | To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution | No decline. Three locations are known, with three colonies of gametophyte and one sporophyte colony. See map 7 |
| Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds |
| Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations |
| Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations |
| Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations |
| Hydrological conditions: humidity | No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable |
| Light levels: shading | No changes due to anthropogenic impacts |
| Invasive species | Absent or under control |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | |

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| Objective: | To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Habitat distribution | No decline, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes |
| Hydrological regime: river flow | Maintain appropriate hydrological regimes |
| Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation |
| Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments |
| Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits |
| Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments |
| 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 |
| European dry heaths [4030] | |
| Objective: | To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat distribution | No decline from current habitat distribution, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations |
| Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop |
| Vegetation structure: sub-shrub indicator species | Cover of characteristic sub- shrub indicator species at least 25%: gorse (*Ulex europaeus*) and where rocky outcrops occur bilberry (*Vaccinium myrtillus*) and woodrush (*Luzula sylvatica*). Some rock outcrops support English stonecrop (*Sedum anglicum*), sheep's bit (*Jasione montana*) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages |
| Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% |
| Vegetation structure: browsing | Long shoots of bilberry with signs of browsing collectively less than 33% |
| Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% |
| Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g., gorse and associated dry heath/ acid grassland flora |
| Vegetation structure: positive indicator species | Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora |
| Vegetation composition: bryophyte and non-crustose lichen species | Number of bryophyte or non- crustose lichen species present at least 2 |
| Vegetation composition: bracken (*Pteridium aquilinum*) | Cover of bracken less than 10% - however see 'Notes' |
| Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% |
| Vegetation composition: non-native species | Cover of non-native species less than 1%. |

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|---|---|
| Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (*Orobanche rapum-genistae*) and the legally protected clustered clover (*Trifolium glomeratum*) |
| Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) |
| Vegetation structure: burning | No signs of burning within sensitive areas |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | |
| Objective: | To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat distribution | No decline, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes |
| Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes |
| Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height |
| Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% |
| Vegetation composition: typical species | At least 5 positive indicator species present |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) |
| *Petrifying springs with tufa formation (*Cratoneurion*) [7220] | |
| Objective: | To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in the River Barrow and River Nore SAC, 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. See map 6 for recorded location |
| Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes |
| Water quality | Maintain oligotrophic and calcareous conditions |
| Vegetation composition: typical species | Maintain typical species |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] | |
| Objective: | To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 |
| Habitat distribution | No decline. Surveyed locations shown on map 6 |
| Woodland size | Area stable of 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 |
| 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 |

| | |
|---|---|
| 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 sessile oak (*Quercus petraea*) and birch (*Betula pubescens*) |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control |

*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]

| | |
|---|---|
| Objective: | To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |

| Attribute | Target |
|---|---|
| Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 |
| Habitat distribution | No decline. Surveyed locations shown on map 6 |
| Woodland size | Area stable of 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; sub canopy 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 |
| Woodland structure: dead wood | At least $30m^3$/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 ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control |

<u>Threats & Pressures:</u>
High - Agricultural intensification
High - Dykes and flooding defence in inland water systems
High - Erosion
High - Modifying structures of inland water courses
High - Pollution to surface waters (limnic, terrestrial, marine & brackish)
Medium - Changes in abiotic conditions
Medium - Dredging/ removal of limnic sediments
Medium - Fishing and harvesting aquatic resources
Medium - Forest and Plantation management & use
Medium - Forestry activities not referred to above
Medium - Human-induced changes in hydraulic conditions
Medium - Intensive cattle grazing
Medium - Invasive non-native species
Medium - Peat extraction
Medium - Reduction in migration/ migration barriers
Medium - Use of fertilizers (forestry)
Medium - Water abstractions from surface waters
Low - Industrial or commercial areas
Low - Intensive fish farming, intensification
Low - Leisure fishing
Low - Netting
Low - Port areas
Low - Removal of hedges and copses or scrub
Low - Sand and gravel quarries
Activities, Management
Low - Forest replanting (native trees)

#### 1.3.3.2 Description of Natura 2000 site - River Nore SPA (IE0004233)

**Locational Context within ZoI**: The River Nore SPA [Site Code: 004233] is a long, linear site that includes the River Nore from Borris in Ossory in County Laois to Inistioge in Co. Kilkenny, along with sections of the Owveg River, Delour River, Erkina River, Goul River and the Kings River. The boundary of the SPA is overlapped by the River Barrow and River Nore SAC.

The River Nore SPA is c.1.8km from the windfarm site (as the crow flies, from the nearest turbine hardstand) and 0.18km from Ballynalacken Grid Connection watercourse crossing works at W3. The SPA is located downstream from the main wind farm works – 4km from the SPA via the Owveg River, and 16km from the SPA along the main River Nore channel via the Cloghnagh River/Dinin River.

**Brief Overview**: The River Nore SPA includes the river channel and marginal vegetation. This SPA site supports a nationally important population of Kingfisher. A survey in 2010 recorded 22 pairs of Kingfisher (based on 16 probable and 6 possible territories) within the SPA (Cummins *et al.* 2010).

The River Nore supports Kingfisher *Alcedo atthis*. Other species which occur within the site include *Cygnus olor*, *Anas platyrhynchos*, *Phalacrocorax carbo*, *Ardea cinerea*, *Gallinula chloropus*, *Gallinago gallinago* and *Riparia riparia*.

**Protected Species**: Kingfisher *Alcedo atthis* - A229.

##### 1.3.3.2.1 Conservation Objectives of the River Nore SPA [004233]

The conservation objectives and associated attributes and targets are provided below for the River Nore SPA. This information has been extracted from the Conservation Objectives for this Natura 2000 site, which is available in full on the National Parks & Wildlife Service website at https://www.npws.ie/protected-sites and a copy of the Conservation Objectives is also included as **AA Appendix 2.** The conservation objectives, attributes and targets which are reproduced in the table below should be read in conjunction with any other supporting documentation on the NPWS website.

| **Kingfisher** (*Alcedo atthis)* [A229] | |
|---|---|
| Objective: | To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. |
| Attribute | Target |
| Population size | No significant decline in the long term |
| Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing |
| Spatial distribution of territories | No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation |
| Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target |
| Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target |
| Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status |
| Barriers to connectivity | No significant increase |
| Disturbance to breeding sites | Disturbance occurs at levels that do not significantly impact upon breeding Kingfisher |
| Threats & Pressures:<br>Medium: Port Areas<br>Medium: Landfill, land reclamation and drying out, general | |

## 1.4 Screening – Is the Project directly connected to or necessary for the management of a Natura 2000 Site?

For a project or plan to be 'directly connected with or necessary to the management of the site', the 'management' component must refer to management measures that are for conservation purposes, and the 'directly' element refers to measures that are solely conceived for the conservation management of a site and not direct or indirect consequences of other activities.

Finding: NO, the Proposed Ballynalacken Windfarm Project is not directly connected to, nor necessary for the management of, a Natura 2000 site.

## 1.5 Screening Evaluation of Likely Significant Effects

### 1.5.1 Consultation

National Parks and Wildlife Service: A consultation request to NPWS was sent on June 5th 2024 for the overlapping hectads with the Project works boundary. The response was received on July 22nd 2024. Two hectads were noted to host Peregrine Falcon nest (S46, S55). An advisory note was made that the project overlapped within the Nore catchment hosting *Margaritifera sp.* (Freshwater Pearl Mussel) and due consideration to risk and harm to this species be made in any planning designs.

Developments Applications Unit: An information request was sent on June 2nd 2022. We received a response of "decline to comment at this time" on August 17th 2022. As such, no direct consideration was available beyond standard expectations related to windfarm projects in Ireland.

Inland Fisheries Ireland: A request for information was sent to IFI on June 2nd 2022 for any potential fisheries. A response was received on June15th 2022. The primary feedback related to considering the salmon and lamprey receptors within the River Nore and all river bodies duly considered for any potential impacts. Guidance included ensuring any EIAR, NIS and/or application for planning should include a Construction Environmental Management Plan (CEMP), a Surface Water Management Plan (SWMP), and an Emergency Response Plan (EMP) to preserve the integrity of the river waterbodies within the receiving environment.

### 1.5.2 Screening of River Barrow and River Nore SAC

Due to the proximity of the Project to the River Barrow and River Nore SAC, the hydrological connectivity with the Project, and the mobility of qualifying interest species, aspects of the Project have potential to affect the Natura 2000 site, through the following impacts:

- Habitat degradation
- Disturbance to species, or reductions in populations/densities
- Changes in ecological functions (e.g. water quality)
- Potential for interference with the key relationships that define the structure/function of the Site.

In relation to cumulative impacts, due to the location of Pinewood and Cullenagh wind farms within the same sub-catchment (Nore_SC_060) as the Ballynalacken Windfarm, there is potential for significant adverse effects to the SAC in the worse case scenario where all three windfarms build during the same period. There is also potential for in-combination effects with other projects consented/proposed in the area of the existing Eirgrid Ballyragget Substation, and with the draft plans for the Ballyragget town which promote a potential River Park alongside the banks of the River Nore and a looped walk around the town, due to the proximity of the projects and plans to the River Barrow and River Nore SAC, and it is evaluated that there is potential for significant adverse in-combination effects in the worst case scenario that all of these projects and plans are developed during the same period as the Ballynalacken Windfarm Project.

<u>Screening Conclusion</u>: It is considered that **there is potential for significant** impacts to the River Barrow and River Nore SAC as a result of the Project, both alone and in-combination, and therefore the SAC is **<u>screened in</u>** for further evaluation at Stage 2 of the Appropriate Assessment process.

### 1.5.3 Screening of River Nore SPA

Due to the proximity of the Project to the River Nore SPA, the hydrological connectivity with the Project, and the mobility of special conservation interest species, there is potential for aspects of the Project to cause a number of impacts:

- Habitat degradation of suitable habitat
- Disturbance to species, or reductions in populations/densities
- Changes in ecological functions (e.g. water quality)
- Potential for interference with the key relationships that define the structure/function of the Site.

In relation to cumulative impacts, due to the location of Pinewood and Cullenagh windfarms within the same sub-catchment (Nore_SC_060) as the Ballynalacken Windfarm, there is potential for significant adverse indirect effects to the SPA via reductions in water quality in the River Nore in the worse case scenario where all three windfarms build during the same period. There is also potential for in-combination effects with other projects consented/proposed in the area of the existing Eirgrid Ballyragget Substation, and with the draft plans for the Ballyragget town which promote a potential River Park alongside the banks of the River Nore and a looped walk around the town, due to the proximity of the projects and plan to the River Nore SPA, and it is evaluated that there is potential for significant adverse in-combination effects in the worst case scenario that all of these projects and plans are developed during the same period as the Ballynalacken Windfarm Project.

<u>Screening Conclusion</u>: It is considered that **there is potential for significant impacts to the River Nore SPA** as a result of the Project, both alone and in-combination, and therefore the SPA is **<u>screened in</u>** for further evaluation at Stage 2 of the Appropriate Assessment process.

## 1.6 Screening Conclusion

Inis Environmental Ltd. has prepared this report to inform an Appropriate Assessment screening to assess whether the proposed Ballynalacken Windfarm Project, alone or in combination with other plans or projects, and in view of best scientific knowledge, is likely to have significant effects on any Natura 2000 site(s).

The screening exercise was completed in compliance with the relevant European Commission guidance, national guidance, and case law. The potential impacts of the proposed Ballynalacken Windfarm Project, both alone and in-combination with other plans and projects, has been considered in the context of the Natura 2000 Sites potentially affected, in view of their Conservation Objectives.

Through an assessment of the aspects of the Ballynalacken Windfarm Project that could generate impacts to Natura 2000 sites, and taking into account the Zone of Influence of effects from the proposed Ballynalacken Windfarm Project, the following findings are reported:

1. The proposed Ballynalacken Windfarm Project is not directly connected with or necessary to, the management of a Natura 2000 Site;

2. Due to the size and scale of earthworks and groundworks, the import of construction materials, the levels of site activity required to develop the Project; the close proximity of the Ballynalacken Grid Connection and some Haul Route Works or Activities to the River Barrow and River Nore SAC; and the hydrological connectivity of the Project to the River Barrow and River Nore SAC and the River Nore SPA, it is considered that there is potential for significant effects to these Natura 2000 sites, and therefore the **River Barrow and River Nore SAC and the River Nore SPA are screened in for further evaluation at Stage II of the Appropriate Assessment process**.

In conclusion, the Screening evaluation for Stage I of the Appropriate Assessment process has determined that the proposed Ballynalacken Windfarm Project, has potential to cause significant effects to two Natura 2000 sites: **River Barrow and River Nore SAC** and **River Nore SPA, and therefore these two Natura 2000 sites are brought forward to Stage II of the AA process**.

# BALLYNALACKEN WINDFARM PROJECT
# APPROPRIATE ASSESSMENT REPORT 2025

## Appropriate Assessment Report 2025
## for the
## Proposed Ballynalacken Windfarm Project, Co. Kilkenny

## Stage 2: Natura Impact Statement

(March 2025)

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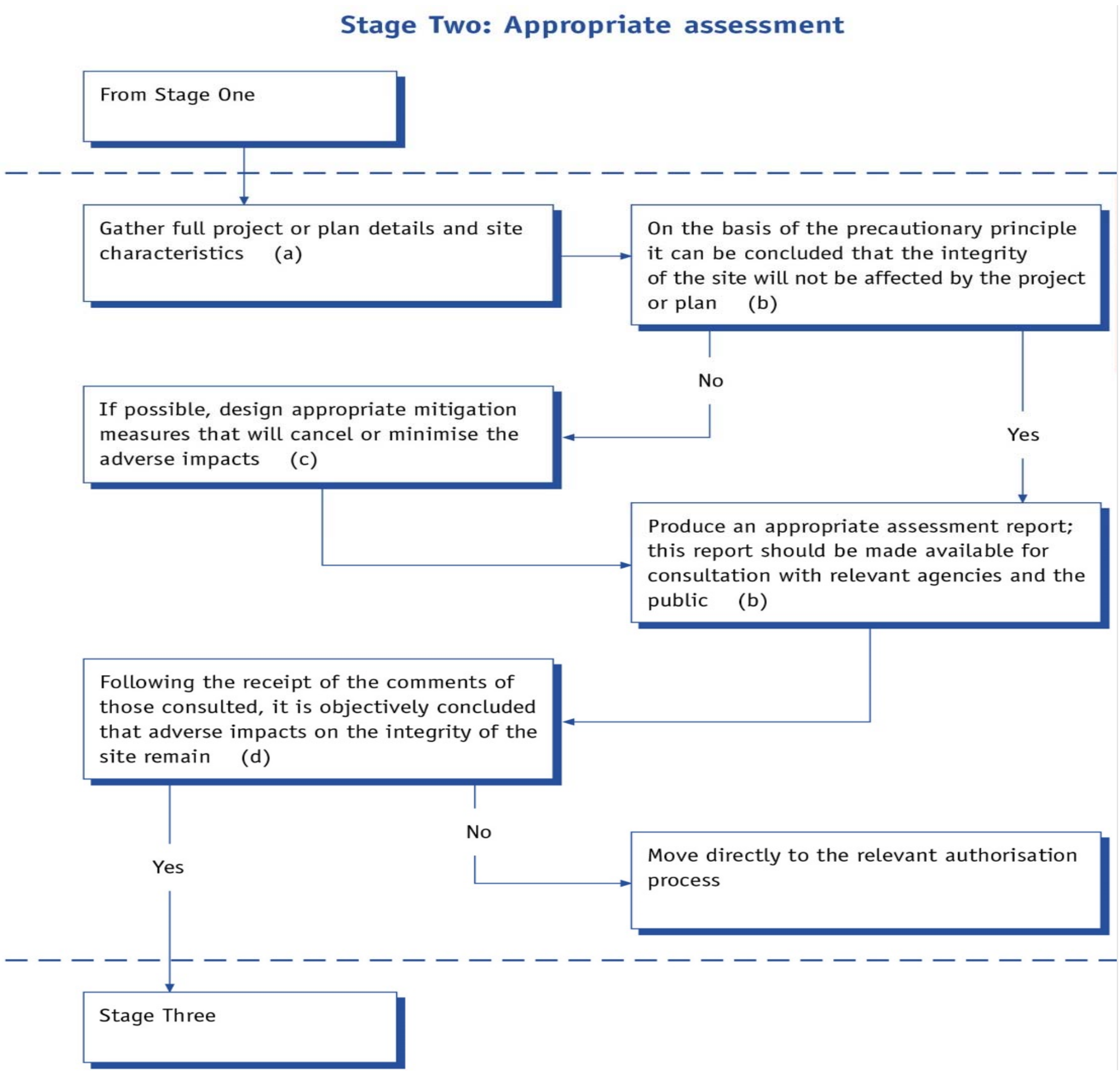
# 2 Stage II Natura Impact Statement

Section 1 of this AA Report comprised the Screening evaluation for Stage I of the Appropriate Assessment process. During the Screening, it was evaluated that the proposed Ballynalacken Windfarm Project, both alone and in-combination, has potential to cause significant adverse effects to two Natura 2000 sites: **River Barrow and River Nore SAC** and **River Nore SPA,** and therefore these two Natura 2000 sites were brought forward to Stage II of the Appropriate Assessment process.

## 2.1 Appropriate Assessment Process

The Appropriate Assessment process considers of the impact on the integrity of the Natura 2000 site from the project or plan, both alone and in combination with other projects or plans, with respect to the site's conservation objectives, and with regard to its structure and function. Additionally, where there are adverse effects, an assessment of the potential mitigation of those effects is carried out.

### 2.1.1 Stages of the Appropriate Assessment Process



## 2.2 Description of the proposed Ballynalacken Windfarm Project

The proposal is to build a 12-turbine windfarm and ancillary works to be called Ballynalacken Windfarm Project and to connect the windfarm by underground cable to the EirGrid Ballyragget Substation. The proposed 12-turbine Ballynalacken Windfarm Project will comprise the following elements:

| AA Nomenclature | Overview Description |
|---|---|
| Ballynalacken Windfarm | 12 No. Wind Turbines and associated works including foundations and hardstanding areas, windfarm roads, electrical control building and internal underground cabling connecting the wind turbines to the control building, to be located in the townlands of Byrnesgrove; Commons; Ballymartin; Ballynalacken; Ballyouskill and Loughill. |
| Internal Cable Link | Underground cabling through the townlands of Ballymartin and Tinnalintan which will connect the Windfarm Control Building to the Tinnalintan Substation. |
| Tinnalintan Substation | 110kV Electrical Substation in Tinnalintan townland and associated access road. |
| Ballynalacken Grid Connection | Underground Grid Connection from the Tinnalintan Substation to the existing EirGrid Ballyragget Substation through Tinnalintan, Coole and Moatpark townlands, and facilitating works in the EirGrid Substation. |
| Ancillary Works | Site entrances at the windfarm site and at the Tinnalintan Substation site, 1 no. met mast and associated access road, 1 no. telecoms relay pole, site drainage network, temporary construction compounds, temporary borrow pits, temporary works in private lands and along the public road corridor, public road widening works, landscaping and reinstatement works. |

A description of the size and design, the use of natural resources and the various life cycle phases of the Project are provided hereunder, and is based on the Description of the Development which is included as Chapter 5 in the EIA Report 2025 which accompanies the planning application.

### 2.2.1 Location of the Proposed Ballynalacken Windfarm Project

The proposed Ballynalacken Windfarm site is located entirely within County Kilkenny on elevated lands equidistant between the towns of Ballyragget (4.3km) and Castlecomer (4.2km) in County Kilkenny, and 3.2km from the village of Ballinakill in County Laois. The villages of Ballyouskill and Attanagh are located 3km and 3.9km respectively to the northwest of the windfarm.

The proposed Ballynalacken Windfarm site location is typical of Kilkenny rural countryside with lands enclosed by hedgerows. There are farmsteads and one-off housing located in the open countryside and generally the commercial, civic and community services are in the surrounding small towns and villages. Farming in the area is predominantly grassland supporting dairy and beef cattle and to a lesser extent sheep farming, with some commercial forestry on the higher ground.

Ballynalacken Windfarm site itself comprises agricultural grassland and commercial forestry, with the turbine sites evenly split between these two landuse types. The Internal Cable Link connecting the windfarm to the substation is located underground through agricultural lands, while the Ballynalacken Grid Connection is under private and public roads.

See AA Figure 1: Ballynalacken Windfarm Project Location on Discovery Mapping.
See AA Figure 3: Ballynalacken Windfarm Project on Aerial Mapping.

## 2.2.2 Size and Design of the Ballynalacken Windfarm Project

### 2.2.2.1 Wind Turbines and associated foundations and hardstanding areas

The proposed turbines will be 155m to tip height, with a rotor diameter of 117m and a hub height of 96.5m (except T4 which will have a tip height of 142.5m and a hub height of 84m).

The 12 No. wind turbines are proposed for the following locations;

- T1 in commercial forestry plantation in Byrnesgrove townland at 276m elevation;
- T2 in commercial forestry plantation in Byrnesgrove and Commons townland at 277m elevation;
- T3 in commercial forestry plantation in Commons townland at 280m elevation;
- T4 in commercial forestry plantation in Ballymartin townland at 279m elevation;
- T5 in commercial forestry plantation in Ballymartin townland at 293m elevation;
- T6 in agricultural grassland in Ballynalacken townland at 284m elevation;
- T7 in commercial forestry plantation in Ballynalacken townland at 296m elevation;
- T8 in agricultural grassland in Ballynalacken townland at 303m elevation;
- T9 in commercial forestry plantation in Ballynalacken townland at 301m elevation;
- T10 in agricultural grassland in Ballyoskill townland at 283m elevation;
- T11 in agricultural grassland in Ballyoskill townland at 277m elevation;
- T12 in agricultural grassland in Loughill townland at 229m elevation.

Each wind turbine will require a reinforced concrete foundation. The foundation will have a diameter of 20m and depth of 3.2m. Each wind turbine will also require a hardstand area adjacent to the foundation, to provide a safe, level working area around each turbine position and to accommodate the large cranes used in the assembly and erection of turbines. This area is designed primarily for the construction phase works but will also provide safe access for maintenance works (including component works) during operations. The construction phase hardstands will be 77m by 35m, with a total area of 2695m$^2$. Following the erection of the turbine, an area of 32m x 30m (960m$^2$) will be concealed from view at each hardstand area by covering the hardcore with a layer of topsoil.

See AA Figure 4.1: Ballynalacken Wind Turbines, Foundations and Hardstanding Areas

### 2.2.2.2 Windfarm Site Roads

In total, the whole Project will require the construction of 5,751m of new access roads and upgrading of 1,676m of existing private farm and forestry tracks. The new Windfarm Site Roads will be 4.5m in width and wider at bends. New roads will be constructed by layering aggregates to a depth of 0.5m thick. They will be constructed using 'excavate and fill' technique. The site roads will be constructed of crushed stone over a layer of geotextile material. The site roads will be capped with a layer of hardwearing limestone. Existing farm and forestry roadways will be widened and surfaced in the same manner as the new site roads. See AA Figure 4.2: Windfarm Site Roads.

### 2.2.2.3 Internal Windfarm Cabling

The Internal Windfarm Cabling will be 7,341m in length and will link the turbines together into a turbine 'string' and connect these strings to the Windfarm Control Building. All of this cabling is classed as Internal Windfarm Cabling. The trenches for the Internal Windfarm Cabling will be 1.25m deep while the width of the trench will vary between 0.6m wide for single cable string and 0.75m wide for a double cable string. See AA Figure 4.3: Internal Windfarm Cabling and Internal Cable Link

### 2.2.2.4 Windfarm Control Building

A hardcore compound (910m$^2$) containing a control building (20m x 10m) will be constructed at the windfarm site to gather and regulate the electricity from the wind turbine cable strings. The Control Building will contain electrical and communications equipment, along with a storage room, canteen and welfare facilities comprising a selfcontained toilet with an integrated rainwater harvesting system. The Windfarm Control Building will be located in a small agricultural field in Ballymartin townland, with access from the public road along an existing farm track.

#### 2.2.2.5 Internal Cable Link

The Windfarm Control Building will be connected to the Tinnalintan Substation by underground cabling 4km in length under the existing farm track, crossing the public road, through agricultural grassland, along the public road corridor, and under an existing farm track and under Tinnalintan Substation hardcore area in Ballymartin and Tinnalintan townlands. The Internal Cable Link trench will be 1.25m deep and 0.75m wide. See AA Figure 4.3.

At the existing road culvert, the cables will be installed in flat formation over the existing culvert in Ballymartin.

See AA Figure 4.14: Watercourse Crossing Works at W2 *(in public road over existing culvert)*

#### 2.2.2.6 Tinnalintan Substation

The Tinnalintan Substation is proposed for agricultural grassland in Tinnalintan townland at 84m elevation, 3km to the west of the windfarm site. This Substation will consist of a hardcore compound yard (7,500$m^2$) containing two control buildings – 1) Eirgrid control building (450$m^2$) and 2) an IPP Control Building (217 $m^2$), lightning protection monopoles, underground cabling and overhead wire and other electrical equipment and apparatus**.** See AA Figure 4.4: Tinnalintan Substation.

#### 2.2.2.7 Ballynalacken Grid Connection

The Ballynalacken Grid Connection will be 1961m in length, comprising underground cables and Joint Bays, connecting the Tinnalintan Substation to the national electricity system at the existing EirGrid Ballyragget Substation in Moatpark. The underground cabling will be installed in trenches under the substation compound, under the access road, under the public road pavement between Tinnalintan and the existing Eirgrid Ballyragget Substation compound in Moatpark, and under the Eirgrid Ballyragget Substation compound, as far as the GIS Substation within the compound. Facilitating works will also be required at the GIS Substation to connect the new grid connection.

The trench for the Ballynalacken Grid Connection will generally be 1.3m deep and 0.6m wide as the cables will be laid in trefoil formation for most of the route. Where a flat formation is used, and the cable trench will be 0.7m deep and 1.2m wide.

At the existing road bridge, the cables will be installed either (a) in flat formation over the existing road bridge at Moatpark/Coole, which will also require increasing the road pavement cover on this bridge and raising the height of the parapet walls which will involve masonry works; or (b) directional drilling under the existing bridge from the road corridor on either side of the bridge.

See AA Figure 4.5: Ballynalacken Grid Connection cabling works
AA Figure 4.15: Watercourse Crossing Works – Bridge at W3 Option 1 *(trenching in deck of bridge)*
AA Figure 4.16: Watercourse Crossing Works – Bridge at W3 Option 2 *(directional drilling)*

#### 2.2.2.8 Ancillary Works

**Site Entrances**: It is proposed that the Project works locations will be accessed from the public road network from 11 No. Site Entrances – 9 site entrances for the windfarm site, 1 site entrance for the met mast at Loughill, and 1 site entrance for the Tinnalintan Substation in Tinnalintan. Of the 11 No. Site Entrances, 8 No. are already existing entrances to farm or forestry lands. There will be requirement to cut back/remove roadside vegetation at these entrances in order to provide safe sightlines for road users. Temporary hardcore areas will be provided at some site entrances (Entrances 1, 4, 6, 7, 9) in order to facilitate the transport of turbine components onto the wind farm site.

**Met Mast**: proposed in agricultural grassland in Loughill townland at 278m elevation. The met mast will comprise a lattice tower, 30m in height with meteorological equipment attached, and associated cabinet at ground level. The met mast will be erected on a hardcore fenced compound ($20m^2$). Access to the met mast will be via an existing farm track and a short section of new access road.

**Telecoms Relay Pole**: a wooden telecom relay pole may be required to mitigate impacts to airborne telecommunication signals. This pole will be erected in agricultural grassland, and will be similar in size and design to a wooden telephone pole. A power supply will be provided by underground cable from the nearest wind turbine.

**Temporary Construction Compounds**; 2 no. are proposed at the wind farm site, with one compound proposed at substation in Tinnalintan. These compounds will be 30m by 20m and 87m X 12m and will contain site offices welfare facilities designated storage areas for fuels and oils and construction materials along with car parking for construction personnel.

**Temporary Borrow Pits:** in order to avoid the transport of large volumes of aggregates from quarries outside of this wind farm site, it is proposed to open 2 no. borrow pits at the wind farm site, one borrow pit in the vicinity of T5/T6 and the second borrow pit in vicinity of T9. These borrow pits will supply aggregate for the base up roads and hard standing areas at the wind farm site. It is expected that the only aggregate to be brought onto site is hardwearing rock, such as limestone, which will be used to cap the wind farm site roads and hard stand areas. Material excavated during construction which is unsuitable for use as base material for the site roads will be used to reinstate the borrow pits. Following the completion of civil works at the windfarm site, the borrow pit areas will be reinstated and returned to former use.

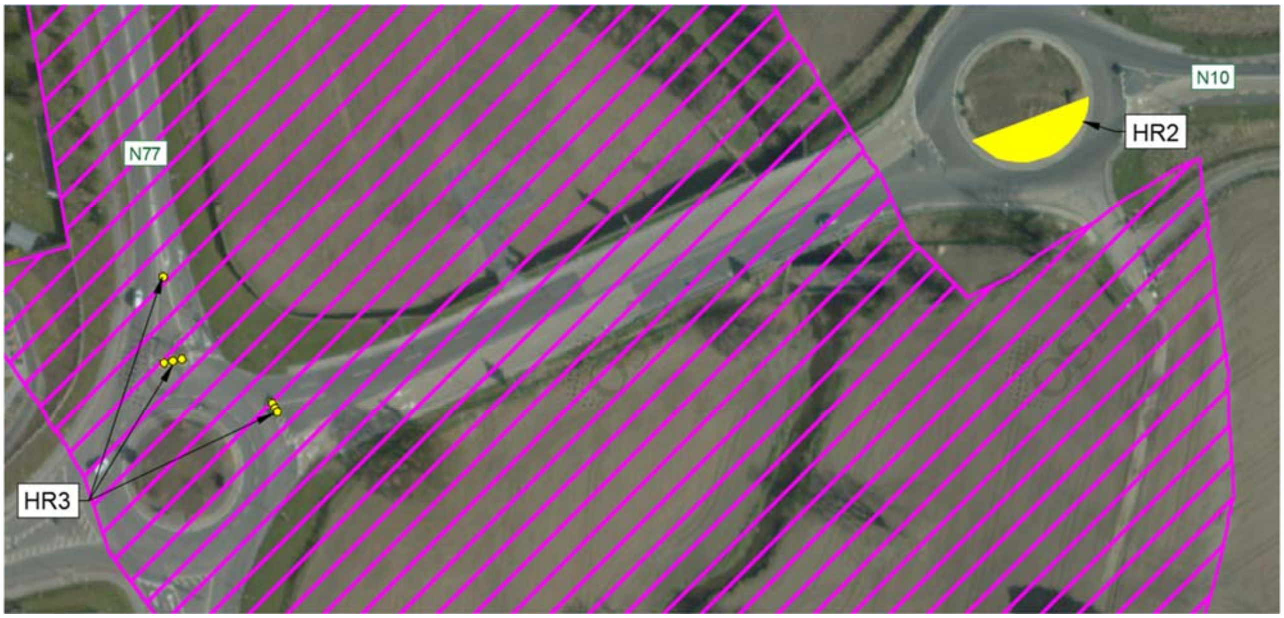
**Reinstatement/Landscaping Works**: following the completion of construction works, areas no longer required during the operational phase will be reinstated and any bare soils will be sown with grasses similar to those species in the surrounding agricultural lands. The temporarily widened areas at site entrances will be covered over with a layer of topsoil and reseeded with grass species, a proportion of the turbine hard standing areas will also be concealed from view using layer of topsoil which will be sown with a slow growing grass species as will any permanent soil storage areas at the windfarm site, and at Tinnalintan Substation. A parking/sitting area for local walkers who currently use Cromwells Road will be provided on part of the widened hardcore area at Site Entrance No.7. The felled areas around the turbines in forestry will be levelled and sown with grass species. Any hardcore along haul route works locations will be covered over with soil and reinstated with planting schemes/grass in accordance with the pre-works condition.

**Road Widening & Haul Route Works**: in order to facilitate the transportation of the large turbine components to the wind farm site, works are required at a number of locations along the public road network. This includes the widening of the local roads L5845, L5840 and the L5846 by widening 0.5 metres into the verges. Works will also be carried out at the junction of the L5845 with the L58451 (HR13), and at Ballymartin Crossroads (HR12) in order to provide adequate turning space for the component transport at these junctions. See AA Figure 3.

Temporary works along the public roads corridor will also be required remote from the wind farm site, and will include the provision of a 2000 $m^2$ hardcore area in an agricultural field in Damerstown (HR8 Blade Transfer Area) which will be used to transfer the turbine blades from a standard blade transport trailer to a blade-lifter type trailer which will facilitate the movement of the blades through Castlecomer town. See AA Figure 4.6: Blade Transfer Area at HR8.

In Castlecomer town some works will be required to temporarily remove street furniture and overhead lines (HR9) and to provide a hardcore area at a junction on the R694 in Castlecomer (HR10). Some tree trimming and hedgerow cutting (HR11) will be required along the R694 in order to provide sufficient clearances for the blades and the towers as they are transported along the Regional Road as far as the windfarm site entrance at Byrnesgrove (Site Entrance No. 1). See AA Figure 4.7: Turbine Component Haul Route from M9 Motorway (including Haul Route Works locations).

Temporary works and activities will also be required in the vicinity of Kilkenny City, (HR1 – HR7) to facilitate the transport of the turbine components through the M9 motorway Exist 8 and through the roundabouts along the N10 and the N77 around Kilkenny City. HR1 to HR7 will involve the removal of street furniture and signage with some temporary hardcore areas provided at roundabouts and verges. All works will be take place on the public road corridor. The haul route activities (street furniture removal) at HR3 will take place within the boundary of the River Barrow and River Nore SAC, while groundworks at the roundabouts at HR2 will take place ex-situ as illustrated below:




### 2.2.3 Use of Natural Resources, Emissions and Wastes

#### 2.2.3.1 Natural Resources

The the use of natural resources relates to the use of agricultural and forestry lands, the excavation of soils and bedrock, the removal of hedgerow, forestry and other vegetation cover. The supply of water for onsite personnel is also considered here under.

- Agricultural land: 24ha comprising permanent grasslands along with farm tracks will be required during the construction phase, this will reduce 12.4ha during the operational phase. Livestock proof fencing will be installed around the boundary of the works. See AA Figure 3.
- Forestry land: 21.35ha of commercial forestry plantation will be required during the construction phase, 19.9ha will be permanently felled, with the remaining land (1.65ha) returned to forestry use following construction.
- Agricultural Land & Biodiversity: 8.2ha of wet heath/wet grassland/scrub on agricultural lands will be secured for the lifetime of the windfarm and will be actively managed to protect this habitat. Conservation management will include the removal of encroaching scrub and low intensity grazing, under the supervision of the Site Ecologist.
- Biodiversity: Construction works will involve the removal of 12 no. trees and 1.5km of hedgerow, predominantly at the windfarm site. Tree pruning and hedgerow trimming will also be required along the Regional Road R694, with landscaping plants temporary removed at some roundabouts around Kilkenny City.
- Biodiversity: To offset the loss of hedgerows at the project site, 43 no. immature trees and 1.5 kilometres of new hedgerow will be planted at the windfarm site, and 4.1 kilometres of existing field boundaries will be enhanced through the planting of hedgerow species into the gaps in these existing boundaries.
- Soils & Bedrock: Based on trial hole investigations, ground conditions and Geological Survey Ireland mapping for the project site and taking into account the results of topographical surveys and the size and design of the turbine foundations, hardstanding areas, access roads and compound areas, the construction of the Ballynalacken Windfarm Project will involve the excavation of approximately 118,633$m^3$ of soils (made up of topsoil, subsoil

and rock) from construction works areas and from the borrow pits. 93% of these excavations will occur at the wind farm site, The remaining 7% will be excavated at the other elements of the Project – c.2.5% will occur along the Internal Cable Link Route, c.1.5% along the Ballynalacken Grid Connection, 2% at Tinnalintan Substation and 1% at Haul Route Works locations (mostly associated with HR8 Blade Transfer Area).

- Rock will also be imported (14,000$m^3$) from local quarries such as Cemex in Dunmore, this will mainly comprise of a hard wearing rock, such as limestone, to top dress (cap) the wind farm access roads, with aggregate also imported to backfill cable trenches in the public road and for works at the Tinnalintan Substation EirGrid , Ballyragget Substation, and at haul route works location.
- Water: There will be no requirement to use water from local surface water or groundwater sources, all water requirements will be imported during the construction phase, with a piped supply to the Tinnalintan Substation (from the local Irish Water network) provided for its operational phase. All waste waters will be contained and removed offsite by licenced waste operators.

#### 2.2.3.2 Emissions

Emissions during the construction phase will include greenhouse gases, noise and vibration and dust from construction works areas, from construction machinery and delivery vehicles, and from exposed soils. The construction phase emissions mainly relate to the windfarm site, where the majority of the construction works will occur.

Emissions during the operational phase mainly relate to noise emissions from the turbines - any noise or dust as a result of operational maintenance works or for turbine component replacement works will be negligible and infrequent, in addition EMF emissions from electrical cabling and plant and equipment will be substantially below the ICNIRP limits.

During decommissioning of the wind farm, the turbines will be powered down, dismantled and removed, there will be low levels of greenhouse gases, noise on vibration and dust emissions from the machinery, vehicles and from the works, and these emissions will mainly occur at the turbine locations.

It is noted, that the purpose of the project is to produce renewable energy from the wind resource, and this will result in a substantial saving of greenhouse gas emissions over the lifetime of the windfarm by avoiding the production of that electricity in a fossil fuel powered station.

#### 2.2.3.3 Wastes

The generation of waste mainly relates to the Construction Phase with much lesser volumes associated with the Operational and Decommissioning Phases.

Wastewater from welfare facilities and from concrete chute washouts (into Roadside Concrete Washout (RCW) units) will be contained in the storage tanks associated with the welfare facilities and in the RCW units. This wastewater will be regularly removed off site by a licenced operator for disposal at a licenced wastewater treatment facility.

General waste from materials such as pallets and packaging and other building materials and chemical waste may arise from waste oil or oily rags will be separated into recyclable, non-recyclable and chemical/hazardous waste and stored in a designated and secure area of the compounds and removed regularly by licenced waste contractors to appropriate licenced waste facilities.

Following the felling of forestry at the windfarm site, the waste brash and tree stumps will be baled and transported offsite to a licenced facility.

In addition, all excavations from the public road will be treated as waste and will be removed by a licenced waste operator to a licensed hazardous waste facility.

### 2.2.4 Life Cycle Phases of the Project

#### 2.2.4.1 Construction Phase

Duration: Once permitted, the wind farm will commence construction within 10 years. The construction stage is expected to take c.12 months to complete and it is planned to construct all elements of the capital Ballynalacken Windfarm Project concurrently using multiple specialist crews. The main civil and electrical works will take place at the wind farm site and will take approximately 10 months. The Internal Cable Link to Tinnalintan Substation will take approximately 5 weeks. The construction of Tinnalintan Substation will take approximately 2 months, and the grid connection will take place over 8 weeks. Commissioning of the project will take c.2 months and will take place after the main construction works are completed. Haul route works and activities will take one to five days at each location.

Personnel: It is expected that up to 120 workers will be involved in the construction phase, with over half of these personnel at the wind farm site, a quarter at the Tinnalintan Substation site, and the rest for works along the Internal Cable Link and Grid Connection routes and at the Eirgrid Ballyragget Substation.

The construction personnel will be organised into work crews, with 8 crews at the windfarm site during civil and electrical works, with 2 crews for turbine delivery and erection. The construction of Tinnalintan Substation will involve 2 crews - one for civil work and one for electrical work, while 3 - 4 crews will be used to construct the Internal Cable Link and Ballynalacken Grid Connection. The commissioning of the Project will involve 2 specialist crews. Normal construction hours will be between 0700 to 1900 hours Monday to Friday, and 0800 to 1630 hours on Saturdays.

Construction materials imported on to the Project site mainly relates to concrete and aggregate to the wind farm site (2550 loads). Surface dressing will also be delivered to road works locations, mainly along the Internal Cable Link and Ballynalacken Grid Connection route.

Haulage Routes: Deliveries of construction materials will use the national road network as far as Castlecomer (N78) or Ballyragget (N77) and then using the regional road R694 as far as Site Entrance No.1, and then the local roads to wind farm site entrances. Deliveries will also use the R432 as far as the local road in Tinnalintan. See AA Figure 4.8: Construction Materials Haulage Routes.

The boundary of the construction works area will be fenced with livestock proof fencing to protect the surrounding environmental features from construction works, machinery and personnel and to prevent ingress from livestock. The construction works area boundary is delineated on AA Figure 3: Ballynalacken Windfarm Project on Aerial Mapping.

Construction works and activities will comprise the following:

- **Windfarm Site:** site entrances, windfarm site roads, turbine foundations and hardstands, erection of turbines; underground internal windfarm cabling, windfarm control building and ancillary works, mainly in agricultural lands, forestry lands;
- **Internal Cable Link**: underground cabling and jointing chambers linking the Windfarm Control Building to the Tinnalintan Substation mainly under agricultural lands and under public road;
- **Tinnalintan Substation:** 110kV substation compound, buildings, electrical apparatus, site access road.
- **Ballynalacken Grid Connection** – underground cabling linking the Tinnalintan Substation to EirGrid Ballyragget Substation; under private road and under public road.

- **Works remote from the windfarm site:** Haul Route Works along the public road corridor (temporary removal of street furniture and provision of hardcore areas) and on adjacent lands (provision of hardcore Blade Transfer Area at HR8). See AA Figure 4.6 and AA Figure 4.7.

- The turbine components will be delivered from port via the motorway network as far as Junction 8 Kilkenny, and then along the N10 and the N78 as far as Castlecomer, turning onto the R694 as far as Site Entrance No.1 in Byrnesgrove, and then using the local roads to the other windfarm site entrances. See AA Figure 4.7.

#### 2.2.4.2 Operational Phase

Duration: Once constructed the Ballynalacken Windfarm is expected to have an operational duration of 35 years. Tinnalintan Substation and Ballynalacken Grid Connection are proposed to be permanent infrastructure and will form part of the national electricity system once commissioned.

Following the completion of construction works, the operational footprint of the windfarm will be fenced with livestock proof fencing. Mammal gates will be included at regular intervals in these fences. With the exception of some major maintenance works and bat buffer areas in agricultural lands, the operational phase maintenance activities will take place within this fenced boundary, which is identified on AA Figure 4.10: Operational Footprint & Operational/Decommissioning Works Areas.

Windfarm Maintenance: Works during the operational phase will mainly involve the routine maintenance of the turbines – i.e. monthly inspections and servicing/maintenance works of the turbines, which will take place at the turbine locations. The access road/drainage network will be regularly inspected, with maintenance carried out every 6 months. Routes of underground cables at the windfarm site and along the Internal Cable Link will be subject to 6 monthly visual inspections, through a walk over of the routes. Biodiversity activities during the operational phase will involve the maintenance of low grass swards in the bat buffer zones in felled-forestry areas, and the removal of encroaching shrub species from the bat buffer zones and the Biodiversity Protection Area. The met mast and the windfarm part of the Tinnalintan Substation will be inspected and maintained through 1-2 visits annually.

Routine maintenance will generally be small in scale carried out by one to two crews (2 to 6 personnel) in vans or 4-wheel drive vehicles. The use of larger machinery such as excavators for road/drainage maintenance will take place form hardcore areas, while a tractor will be used to mow grass in the bat buffer zones.

Major maintenance, as the wind farm ages component replacement will become more common and each gearbox and generator are likely to be changed at least once during the lifetime for turbine, blade replacement is less common perhaps one blade per turbine during the operational phase. Major maintenance will take place at the turbine hardstanding area and within the operational phase boundary fence. While the transport of gearboxes or generators will not require any haul route works, the transportation of replacement blades would require the haul route works and relevant site entrance works to be carried out once. Major maintenance will involve 10 personnel over a 4 – 5 day period.

Tinnalintan Substation & Ballynalacken Grid Connection: Maintenance will also be carried out by Eirgrid/ESBN on their parts of Tinnalintan Substation and on the Ballynalacken Grid Connection, with monthly inspections and annual maintenance expected at Tinnalintan Substation and of the equipment in the Eirgrid Ballyragget Substation GIS building. The grid connection will be inspected once per year or once per two years, these inspections will be via the joint bay chambers along the route. Replacement of cables is unlikely but if required, replacement will involve the removal of the road surface over the joint bay chambers, and the pulling out of the old cable and puling through of the new cable via the joint bays, and the reinstatement of the road surface once again.

Operational Materials: Minimal materials will be imported during the operation stage. The technical crews will bring all equipment and plant on-site including tools, spare/replacement parts or consumables (oils, greases etc).

Approximately 1 load of aggregate would be required annually to maintain the windfarm site roads, hardstands and drainage network.

Operational traffic routes: The traffic generated during the operational phase of the windfarm will be very low and will access the windfarm site from the R694, and then along the local roads to the site entrances. Access to the Tinnalintan Substation will be extremely low and will use the R432 as far as the local road in Tinnalintan.

#### 2.2.4.3 Changes to the Project / Decommissioning.

At the end of the permitted operational period for the windfarm, it will either be decommissioned or a new planning permission will be sought in order to continue operating. As noted above, both Tinnalintan Substation and the Ballynalacken Grid Connection will be permanently infrastructure and therefore will not be decommissioned at the end of the windfarm's operational period.

Duration & Personnel: Decommissioning would take between 3-4 months in total, with works for 1 week at each turbine for dismantling and 2 days for reinstatement of the foundation/hardstanding area. 16 no. personnel would be involved in the works, using 2 cranes, 3 excavators, front loaders, HGVs, tractors and trailers and cable pulling machines.

Decommissioning Activities: Works and activities to decommission the windfarm would take place predominantly from the hardcore windfarm footprint, and all works would take place within the Decommissioning Works Area Boundary which is the same as the operational phase boundary.

All the electrical plant and apparatus in the turbines and at the windfarm control building would be decommissioned. Operating fluids or lubricants in the turbines or at the control building would be drained off by trained specialist personnel with the aid of special machines. The fluids would be collected in special containers for recycling, usually by refining and reconditioning as base oil.

The turbines would be dismantled by crane and the component parts transported offsite. The subterranean concrete i.e. turbine foundations, would be left in situ because its removal would require extensive excavations and set and cured concrete is a stable material. Foundations have a cylindrical steel ring or bolt basket protruding from the foundations up to ground level, onto which the turbine tower was bolted. This ring or basket would be cut away and sent for recycling. The cables in the Internal Windfarm Cabling and the Internal Cable Link to the Tinnalintan Substation would be mechanically pulled from the underground ducts. The ducting itself which is a stable plastic material, would be left in the ground.

All turbine components, electrical plant, apparatus and cabling would be transported offsite to be reused, recycled or repurposed and for which there is an active circular economy market in Ireland and Europe.

During decommissioning it may be necessary to transport turbine components (potentially at their full size for reuse) from the site, therefore the transportation of the tower sections and blades may require (depending on the transport size) Haul Route Works and Activities along the haul route (i.e. HR1 – HR13, as required). Once all of the large loads have been transported off site, the haul route works locations would be permanently reinstated, street furniture would be reinstalled, hardcore areas would be covered over with the topsoil and reseeded with grass species and the road side boundary would be reinstated along its original boundary.

The new and widened site roads would be left in place if they are of use to the agricultural and forestry land owners at the site. The decommissioned windfarm control building and hardstanding area would remain in place for agricultural use.

The site would be restored after all decommissioning works have been completed. All turbine areas would be restored, this would involve covering the turbine foundation and hardstanding areas with topsoil stored in the adjacent storage berms, filling in adjacent drainage channels and reseeding the area with native grass species. All restored areas will be graded and landscaped sympathetically with the site contours. The works will be carried out in consultation with Kilkenny County Council and under the supervision of a suitably qualified engineer and a hydrologist. Re-vegetation of the site will be carried out under the supervision of a suitably qualified ecologist. However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013), it is "best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".

### 2.2.5 Vulnerability of the Project to Major Accidents, Natural Disasters and Climate Change

The vulnerability of the Project to major accidents, natural disasters and climate change was examined in the Environmental Impact Assessment (see Chapter 5, Section EIAR 5.11). Due to the separation distance to the nearest Seveso site (Grassland Fertilizers, c.16km from the windfarm), it is considered that there is no risk of major accidents affecting the Project. Due to the negligible volumes of dangerous substances (limited to oils, fuels, lubricants) which will be used at the Project site, it is also evaluated that the Ballynalacken Windfarm Project will not cause a major accident.

Climate change is increasing the likelihood of natural disasters such as flooding, land slippage or wildfires occurring. However due to the location of the Ballynalacken Windfarm, Tinnalintan Substation and the Ballynalacken Grid Connection outside of flood zones, and outside of areas of deep peat, with stable ground conditions throughout the site; and due to the underground nature of the cabling, the design of the turbines and the electrical equipment and apparatus, and the implementation of bat buffer zones around the turbines which will ensure that trees and scrub does not occur within this zone, it is evaluated in the EIAR that it is extremely unlikely that the Ballynalacken Windfarm Project would be affected by a natural disaster or climate change. Furthermore, the potential for the Ballynalacken Windfarm Project to increase the risk of flooding or landslip was examined in the EIAR (Chapter 7 Soils and Chapter 8 Water), and it was concluded that the wind farm site was not at risk of landslip due to the absence of deep peat at the windfarm infrastructure locations and that all proposed wind farm infrastructure is located above the mapped 1000-year flood level and therefore all infrastructure is located in Flood Zone C (Low Risk). Furthermore, the increase in hardcore areas at the windfarm and the construction of the windfarm drainage network would not increase surface water runoff or change drainage patterns or regimes, therefore, thee windfarm will not increase the risk of flooding in the downstream watercourses/catchment areas.

### 2.2.6 Aspects of the Projects that could generate impacts to the Natura 2000 sites

The aspects of the Ballynalacken Windfarm Project that could generate impacts on the River Barrow and River Nore SAC or on the River Nore SPA are described in the following sections.

#### 2.2.6.1 Landuse / Landcover Change

**Agricultural Lands;** Within the Construction Works Area, 24ha are located on agricultural lands. Once the proposed development is constructed, the requirement for agricultural lands will reduce from 24ha to 12.4ha; with 11.6ha of land returning to agricultural use by the landowner. The 12.4ha of lands will remain within the operational footprint of the Project, and mainly comprises hardstanding areas (6.7ha at the Ballynalacken Windfarm site, 1.3ha at Tinnalintan Substation), along with drainage features and berms. Livestock proof fencing will be erected along the boundary of the works areas. Following the decommissioning of the windfarm, all of the lands will return to the landowners for agricultural use.

**Forestry Lands:** comprises 21.35ha of the Construction Works Area, mainly commercial forestry plantation (20.7ha), and forestry roads (0.65ha). Forestry felling only relates to the Ballynalacken Windfarm site, where 20.7ha hectares will be felled to facilitate the construction of the Project. Of the 20.7ha felled, 19.9ha will remain permanently felled. Following felling, this 19.9ha will comprise windfarm hardstanding areas, bat buffer areas around the turbines, new windfarm site roads, drainage features and berms.

This forestry felling is hydrologically connected to the SAC and SPA, as per:

- Cloghnagh_010 catchment: majority of felling occurs in this catchment, also the closest forestry felling to the SAC, 5.5km upstream of the SAC, 17.4km upstream of the SPA.
- Castlecomer Stream catchment: closest forestry felling, 5.9km upstream of the SAC, 23.3km upstream of the SPA.
- Owveg catchment: closest forestry felling, 3.8km upstream of the SAC, 5.7km upstream of the SPA.

No forestry felling required for any other element of the Project.

See AA Figure 4.11: Landuse/Landcover Change and Vegetation Clearance/Works

**Replanting of Forestry Lands**: The felling required (19.9ha) for the construction of Ballynalacken Windfarm will not be replanted on the windfarm site but at an alternative site in Ireland. This site will be technically approved, under an afforestation licence issued by the Forest Service. At the time of the preparation of this EIAR, replanting of felled forestry is generally required to be completed within 1-2 years of the felling date. The Promoter of Ballynalacken Windfarm Project commits to securing these licensed afforestation lands in a location outside of the River Nore and River Barrow catchments in order to avoid cumulative impacts on water quality within the downstream River Barrow & River Nore SAC or within the River Nore SPA.

#### 2.2.6.2 Other Vegetation Clearance/Works

**Conservation management** of the Biodiversity Protection Area and the bat buffer zones will include the removal of encroaching scrub under the supervision of the Site Ecologist. In addition, the Biodiversity Protection Area will be subject to low intensity grazing, while the grass under the bat buffer zones in the forestry areas will be mown several times a year to ensure that a low grass sward is maintained.

**Hedgerow Removal**: 12 no. trees and 1.5km of hedgerow will be removed during the construction phase, mainly at the windfarm site.

**Hedgerow Planting**: To offset the loss of hedgerow, 1.5km of new hedgerows will be planted, which will included 43 no. new trees, and 4.1km of existing field boundaries will be enhanced through the planting of hedgerow species into any gaps along these existing boundaries.

**Invasive Species**: Only one incidence of invasive species was recorded, Cherry Laurel in a single patch at a junction of works between T3 and T4, within the Ballynalacken Windfarm Project construction works area boundary. The SAC and SPA are 5.8km and 17.7km downstream of this infestation. No other invasive species were observed or recorded within 50m of the project works

See AA Figure 4.11: Landuse/Landcover Change and Vegetation Clearance/Works

#### 2.2.6.3 Excavations and the Reuse and Storage of spoil during construction works

Based on trial hole investigations, ground conditions and Geological Survey Ireland mapping for the project site and taking into account the results of topographical surveys and the size and design of the turbine foundations, hardstanding areas, access roads and compound areas, the construction of the Ballynalacken Windfarm Project will involve the excavation of approximately 118,633m$^3$ of soils (made up of topsoil, subsoil and rock) from construction works areas and from the borrow pits. 93% of these excavations will occur at the windfarm site - 46% from the borrow pits and 47% from wind farm infrastructure areas (i.e. turbine hardstands, foundations, windfarm access roads, temporary compounds etc). The remaining 7% will be excavated at the other elements of the Project – c.2.5% will occur along the Internal Cable Link Route, c.1.5% along the Ballynalacken Grid Connection, 2% at Tinnalintan Substation and 1% at Haul Route Works locations (mostly associated with HR8 Blade Transfer Area).

See AA Figure 4.12: Location of Excavations and Soil Storage Berms at the Windfarm, Internal Cable Link, Tinnalintan Substation and Ballynalacken Grid Connection.

Based on the results of trial pit investigations, it is estimated that nearly three quarters of the rock excavated from the borrow pits, and under half of the rock, subsoil excavated from the windfarm infrastructure areas will be suitable for use as backfill at hardstand areas, windfarm site roads, to backfill cable trenches in agricultural lands and to reinstate construction works areas. Unsuitable rock and subsoil excavated from the borrow pits and windfarm footprint will be used to reinstate the borrow pits and the windfarm site, and will be stored in long term storage berms at the turbine locations. Topsoil will also be excavated during the groundworks, and will be used during site reinstatement at the end of the construction phase, with some topsoil being stored in berms at the turbine locations for reinstatement of the hardstand/foundation area following decommissioning.

Excavations will also arise from the cable trenches in agricultural lands, this soil will be temporarily stored beside the trench and used to backfill the trench following the installation of the Internal Windfarm Cabling and Internal Cable Link as appropriate.

All excavations from the public road corridor will be removed by a licensed waste operator to an appropriate licensed waste facility.

Connectivity of the above excavations to the River Barrow and River Nore SAC and to the River Nore SPA:

- Cloghnagh_010 catchment: closest windfarm excavations relate to Site Entrance No.1 and associated access road, c.4.2km upstream of the SAC, c.16.1km upstream of the SPA.
- Castlecomer Stream catchment: closest windfarm excavations relate to Borrow Pit No.2 and associated access road, c.6.9km upstream of the SAC, c.24.3km upstream of the SPA
- Owveg catchment: closest windfarm excavations relate to Turbine No.12 hardstand and foundation area, c.2.1km upstream of the SAC, c.4.1km upstream of the SPA
- Rathduff_15 stream: closest excavations at watercourse crossing W3 along the Ballynalacken Grid Connection (c.90m upstream of SAC, c.180m upstream of SPA). In relation to other elements of the Project, the Internal Cable Link also crosses over this watercourse at W2 (c.3.4km upstream of SAC, c.3.5km upstream of SPA).
- Nore_120 catchment: closest excavations relate to trenching works for the Ballynalacken Grid Connection on the R432. It is also noted that the Tinnalintan Substation site area drains into the main channel of the River Nore.
- Haul Route Works: HR8 Blade Transfer Area: c.380m upstream of SAC, c.11.9km upstream of SPA, HR2 and HR4: HR2 c.20m and HR4, c.60m upstream of SAC, HR2, 2.8km and HR4, c.2.2km upstream of SPA, HR7: c.1.8km upstream of SAC, c.2.3km upstream of SPA. See AA Figures 4.7 and 4.6.

#### 2.2.6.4 Watercourse Crossing Works

**Instream works have been avoided** through the use of a bottomless culvert design for the crossing at W1, and the alignment of cable routes along the public road with the cables installed in the road over the existing buried structures at W2 and W3 (option-a trenching in the deck of the bridge structure, or option-b by directional drilling under the existing structure at W3 (option-b).

W1 is located at the windfarm site and involves the crossing of a first order headwater stream in the Cloghnagh_010 sub-basin, which drains into the Dinin River c.9km downstream. The watercourse is narrow and shallow (1m wide and 0.25m deep) at the crossing point. No instream works are required for the W1 crossing. The footings for the new crossing structure, a bottomless culvert, will be excavated beside the bank of the watercourse. The bottomless culvert will then be lifted into place, and the footings backfilled to secure the culvert in place. The windfarm site road and cable ducting will then be installed above the new culvert. The River Barrow and River Nore SAC is c.5.8km downstream of W1 via the Cloghnagh_010 (the SAC boundary overlaps the Cloghnagh near its confluence with the Dinin). The River Nore SPA is c.17.6km downstream of W1.

W2 and W3 are both located on the Rathduff_15 which drains directly into the River Nore at Coole.

W2 is located along the Internal Cable Link route, and involves the crossing of the upper reaches (1st order) of the Rathduff_15, over an existing buried masonry culvert in the public road L58442. No instream works are required for the W2 cable crossing. Crossing works will involve the installation of the cables in flat formation in the road pavement over the culvert. The boundaries of the SAC and SPA are c.3.4km and c.3.5km downstream respectively from the W2 crossing works.

W3 is located along the Ballynalacken Grid Connection route, and involves the crossing of the lower reaches (2nd order) of the Rathduff_15, over an existing buried bridge in the public road R432. No instream works are required for the W3 cable crossing. Crossing works will involve the installation of the cables either (a) in flat formation in the road pavement over the bridge, this option also involves masonry stonework to increase the height of the parapet walls on the bridge; or (b) installation of the cables by directional drilling under the bridge from the road corridor on either side, with no works required to the bridge. The boundaries of the SAC and SPA are c.90m and c.180m downstream and c.80m and c.120m as the crow flies, respectively, from W3.

See AA Figure 4.13: Watercourse Crossing Works (W1) and Wet Drainage Channels at Windfarm site

See AA Figure 4.14: Watercourse Crossing Works at W2 *(in public road over existing culvert)*

See AA Figure 4.15: Watercourse Crossing Works at W3 Bridge – Option 1 *(trenching in deck of bridge).*

See AA Figure 4.16: Watercourse Crossing Works W3 Bridge – Option 2 *(directional drilling).*

#### 2.2.6.5 Wet Drainage channel works

Three wet drainage channels (D1, D2, D3) in the Cloghnagh_010 catchment and one wet drainage channel (D4) in the Owveg catchment will interact with the windfarm construction works. Works at wet drainage channels will involve the installation of a new bottomless crossing structure and minor realignment (50m) of the drain at D1, the extension of the existing crossing structure at D2, and the installation of a new bottomless crossing structure at D3 and D4. See AA Figure 4.13: Watercourse Crossing Works (W1) and Wet Drainage Channels at Windfarm site.

Within the Cloghnagh_010 catchment, the D1 wet drainage channel drains into the Cloghnagh_010 downstream of the W1 crossing, and D2 and D3 channels drain into the Ballymartin_15 stream which in turn drains into the Cloghnagh_010. The River Barrow and River Nore SAC is c.5.8km downstream of D1 (closest wet drainage works) via the Cloghnagh_010. The River Nore SPA is c.17.7km downstream of D1.

Within the Owveg catchment, the D4 wet drainage channel drains into the Kilcronan first order stream, which in turn drains into the Owveg River, which drains into the River Nore. The River Barrow and River Nore SAC is c.3.3km downstream of D4. The River Nore SPA is c.5.3km downstream of D4.

#### 2.2.6.6 Use/Presence of hydrocarbons during construction works

The construction plant and machinery and the delivery vehicles will contain oils and fuels. The presence of plant and machinery will occur at all construction works areas, mainly at turbine locations. See AA Figure 4.9: Construction Phase Works Area Boundaries.

Connectivity of plant and machinery using hydrocarbons to the River Barrow and River Nore SAC and to the River Nore SPA:

- Cloghnagh_010 catchment: closest connectivity at Site Entrance No.1, c.4.2km upstream of the SAC, c.16.1km upstream of the SPA.
- Castlecomer Stream catchment: closest connectivity at Borrow Pit No.2, c.6.9km upstream of the SAC, c.24.9km upstream of the SPA
- Owveg catchment: closest connectivity at Turbine No.12, c.2.1km upstream of the SAC, c.4.1km upstream of the SPA
- Rathduff_15 catchment: closest connectivity at W3 along the Ballynalacken Grid Connection (c.90m upstream of SAC, c.180m upstream of SPA). In relation to other elements of the Project, W2 on the Internal Cable Link (c.3.4km upstream of SAC, c.3.5km upstream of SPA).

- Nore_120 catchment: closest connectivity at trenching works for the Ballynalacken Grid Connection on the R432. It is also noted that the Tinnalintan Substation site area drains into the main channel of the River Nore.
- Haul Route Works: HR8 Blade Transfer Area: c.0.4km upstream of SAC, c.11.9km upstream of SPA, HR2 and HR4: HR2, c.19m and HR4, c.60m upstream of SAC, HR2 c.2.8km and HR4, c.2.2km upstream of SPA, HR7: c.1.8km upstream of SAC, c.2.3km upstream of SPA.

#### 2.2.6.7 Use/Presence of cementitious materials

In total, 7,910m$^3$ of concrete will be used for the Ballynalacken Windfarm Project, most of which (6,930m$^3$) will be used on site for the turbine foundations. The remaining concrete (980m$^3$) will be used for foundations at the Tinnalintan Substation, Windfarm Control Building and Met Mast; and to backfill the cable trenches where they occur in the public road.

Connectivity of the above excavations to the River Barrow and River Nore SAC and to the River Nore SPA:

- Cloghnagh_010 catchment: closest use of concrete relates to T1 foundation, c.5.6km upstream of the SAC, c.17.5km upstream of the SPA.
- Castlecomer Stream catchment: closest use of concrete relates to T8, c.7.4km upstream of the SAC, c.24.8km upstream of the SPA
- Owveg catchment: closest use of concrete relates to T12 foundation, c.2.1km upstream of the SAC, c.4.1km upstream of the SPA
- Rathduff_15 catchment: closest use of concrete relates to the Ballynalacken Grid Connection cable trench at W3, (c.90m upstream of SAC, c.180m upstream of SPA). In relation to other elements of the Project, concrete will also be used to backfill the Internal Cable Link cable trench in the public road at W2 (c.3.4km upstream of SAC, c.3.5km upstream of SPA).
- Nore_120 catchment: closest use of concrete relates to the Ballynalacken Grid Connection cable trench on the R432. It is also noted that the Tinnalintan Substation site area drains into the main channel of the River Nore.
- Haul Route Works: no requirement for concrete.

#### 2.2.6.8 Importation of materials onto the site

The Ballynalacken Windfarm Project will require 14,000m$^3$ (1170 loads) of imported rock for capping windfarm site roads, backfilling of cables trenches in the public road, construction of the Tinnalintan Substation compound, backfilling the trench within the Eirgrid substation compound, and construction of hardcore areas at haul route works locations. This rock will be imported from local quarries such as Cemex in Dunmore County Kilkenny, and will be delivered on a 'just-in-time' basis, directly to the works area. The construction material haulage routes are identified on AA Figure 4.8.

#### 2.2.6.9 Dust and Noise from Construction Works and moving/operating vehicles and machinery

Construction will involve the excavation of c. 118,633m$^3$ of soils, mainly (93%) at the windfarm site; the movement of excavated materials by HGV and dumper trucks within the site; and the haulage by HGV of construction materials onto the site (2550 loads in total, with 46% associated with the 12 turbine foundation concrete pour days). With the exception of excavations from the public road, all soils and rock will be used/stored on site.

According to the 2025 EIAR: Chapter 9 Air Quality, during dry and windy weather conditions, construction dust emissions will arise from construction activities such as excavations, earth moving and backfilling. Vehicles transporting potentially dusty material also have the potential to cause dust generation along the concentrated haul routes from the construction works areas. Dust impacts can occur up to 250m for the source, however, the greatest impacts will occur within the first 50m.

Noise will be emitted from certain construction activities such as excavations, rock extraction and rock breaking which may be used at construction works areas. Noise will also be emitted from heavy machinery, equipment and vehicles at works areas. The typical noise emission levels for the Ballynalacken Windfarm Project was evaluated by

Mike Simms of AWN Consulting for the EIA Report 2025, as per Section EIAR 10.2.3.1 of the EIAR Noise assessment, the construction phase noise levels are predicted to be:

**Table 2-1: Extract from EIAR Chapter 10 – Section EIAR 10.2.3.1 (construction phase noise)**

| Item | Activity/Notes | Plant Noise level at 10m Distance (dB $L_{Aeq,1hr}$) | Predicted Noise Level (dB $L_{Aeq,1hr}$) at distance (m) |
|---|---|---|---|
| | | | 535 m |
| HGV Movement | Removing spoil and transporting fill and other materials. | 79 | 37 |
| Tracked Excavator | Removing soil and rubble in preparation for foundation. | 77 | 35 |
| Excavator Mounted Rock Breaker | Rock Breaking. | 85 | 43 |
| Piling Operations | Piling Foundations (if required). | 89 | 47 |
| General Construction (Various) | All general activities plus deliveries of materials and plant | 84 | 42 |
| Dumper Truck | Moving fill | 76 | 34 |
| Mobile Telescopic Crane | Turbine construction | 77 | 35 |
| Dewatering Pumps | If required. | 80 | 38 |
| JCB | For services, drainage and landscaping. | 82 | 40 |
| Vibrating Rollers | Road surfacing. | 77 | 35 |

Background noise measurements by AWN for the EIAR (see EIAR section EIAR 10.2.2.3.3), demonstrated that in the area around the windfarm site, background noise levels during the day (i.e. when construction works would be carried out) ranged from 24dB at very low (3m/s) wind speeds to 44dB at stronger (8m/s) wind speeds.

As per Section EIAR 10.3.3 of the EIAR Noise and Vibration assessment, due to the limited extent of piling required (if any) and that no blasting is anticipated, the vibration level at 535m will be below the allowable TII values.

#### 2.2.6.10 Surface Water Runoff

Surface water run-off management of the proposed development will entail the collection, treatment and release of surface water run-off through the implementation of an integrated drainage system at the development site. This **integrated drainage system** will be implemented during construction through the Surface Water Management Plan which forms part of the Environmental Management Plan for the Project.

The implementation of the Surface Water Management Plan will involve the excavation and installation of permanent drainage channels around the turbine foundation and hardstanding areas, and around the new and upgraded Windfarm Site Roads, Windfarm Control Building, and around Tinnalintan Substation. Temporary drains will also be excavated and installed around the Temporary Construction Compounds and the Borrow Pits. Permanent concealed drains will be installed at the Site Entrances at the public road to prevent water runoff from construction/site areas flowing onto the road. No drainage will be required for the cabling works. The construction of the drainage network will also include the installation of check dams, swales, and silt fences in the drains, and the construction of level spreaders and settlement ponds alongside. Dirty water from the works areas will be directed through settlement ponds before being released to surrounding lands. The connectivity of settlement ponds to the SAC and SPA is as follows:

- Cloghnagh_010 catchment: c.5.5km upstream of the SAC, c.17.4km upstream of the SPA.
- Castlecomer Stream catchment: c.6.9km upstream of the SAC, c.24.3km upstream of the SPA
- Owveg catchment: c.2.1km upstream of the SAC, c.4.1km upstream of the SPA
- Nore_120 catchment: closest settlement pond at the Tinnalintan Substation site area which drains into the main channel of the River Nore, c.435m downslope.
- Haul Route Works: one settlement pond at HR8, c.0.4km upstream of the SAC.

Settlement ponds will be partially removed following the completion of the construction works. The drainage at temporary infrastructure areas, such as borrow pits or construction compounds will be removed at the end of the construction phase during reinstatement works. The rest of the drainage system will be left in place for the operational phase and during decommissioning of the windfarm, and will remain in place for at Tinnalintan Substation which will not be decommissioned with the windfarm.

#### 2.2.6.11 Increase in hardstanding areas / changes in drainage regimes

6.1ha of hardcore areas will be constructed at the windfarm site for turbine hardstands and along windfarm access roads, and 1.3ha of hardcore areas will be constructed at Tinnalintan Substation compound and the associated site access road. It is evaluated by Hydro Environmental Services (HES), authors of the EIAR Chapter 8 Water, that the emplacement of impermeable materials (as a worst-case scenario) would result in an average total site increase in surface water runoff of approximately 1,077$m^3$/month or 34.7$m^3$/day (see table below) over the development site. This represents a potential increase of only approximately 0.43% in the average daily/monthly volume of runoff from the site area in comparison to the baseline pre-development site runoff conditions.

Also, this calculation assumes that all hardstanding areas will be impermeable which is a conservative approach given that access tracks and crane hardstands will be constructed of aggregates which will facilitate the permeation/recharge of rainfall.

In relation to the impact of the site drainage network on existing drainage patterns or surface water flow paths, the design of the drainage network has been carried out by Hydro Environmental Services and has taken full account of the existing drainage regimes and surface water flow paths at the site. There will be no change to the existing drainage regimes as a result of the Project because the surface water drainage system. The drainage system forms part of the Project design, and drainage drawings can be found in the Drawings Pack which accompanies the planning application.

AA Figure 4.10: Operational Footprint & Operational/Decommissioning Works Areas

#### 2.2.6.12 Operational turbines

The proposed turbines will have a rotor diameter of 117m. Regarding hub heights, two hub heights are proposed – 84m for Turbine No. T4, and 96.5m for all other turbines, thus giving an uppermost tip height of 142.5m for T4, and 155m for all other turbines. Ground clearance will be 25.5m at T4 and 38m for all other turbines.

Emissions during the operational phase mainly relate to noise emissions from the turbines - any noise or dust as a result of operational maintenance works or for turbine component replacement works will be negligible and infrequent, due to the very low volume of vehicles and machinery using/working on site during the operational phase. In addition, EMF emissions from electrical cabling and plant and equipment will be substantially below the ICNIRP limits.

In relation to noise, the turbines have a noise rating of 106dB, and it is expected that a noise limit of 40dB during the day and 43dB during the night at the neighbouring residential properties will be conditioned under a grant of planning. Mitigation in the form of noise control modules to be fitted inside the turbines, is proposed in EIAR Chapter 10: Noise & Vibration, in order to ensure that noise emissions do not exceed permitted levels. The nearest dwelling is 535m from the turbines.

The turbines will rotate at 12rpm with a rotation period of 5.0s (EIAR Appendix 13.5).

#### 2.2.6.13 Noise, dust, presence/use of plant, machinery, vehicles during the operational and decommissioning phases

During the operational phase, the presence of HGVs and use of machinery such as excavators/JCBs will be negligible. Importation of materials will also be negligible – 1 load of aggregate per year to maintain site access roads. No concrete will be required. According to 2025 EIAR Chapter 9 Air Quality and Chapter 10 Noise, no perceptible impact on local ambient noise or dust levels are predicted.

The presence and use of plant, machinery and vehicles at the Project site during the operational phase and during decommissioning will mainly occur at the turbine locations at the windfarm site, with negligible levels of vehicles or machinery onsite during normal / routine operational activities, and relatively low levels of vehicles, plant and machinery during major maintenance operational works and during decommissioning. The reinstatement works will be more extensive during decommissioning, with the reinstatement of vegetative cover of the surface of the turbine foundations and hardstanding areas, using the soils stored on the hardstand during the operational phase.

The boundary of the operational and decommissioning works will take place within the same boundary, which is identified on AA Figure 4.10.

The connectivity of the wind turbines (where operational works and activities will predominantly take place) to the SAC and SPA is as follows:

- Cloghnagh_010 catchment: Turbine 1, c.5.6km upstream of the SAC, c.17.5km upstream of the SPA.
- Castlecomer Stream catchment: Turbine 8, c.7.4km upstream of the SAC, c.24.8km upstream of the SPA
- Owveg catchment: Turbine T12, c.2.1km upstream of the SAC, c.4.1km upstream of the SPA
- Rathduff_15 catchment: No turbines within this catchment.
- Nore_120: No turbines within this catchment.

The Tinnalintan Substation and Ballynalacken Grid Connection will be permanent assets, taken over by EirGrid upon their commissioning. These assets will not be decommissioned with the windfarm. Part of the Tinnalintan Substation will be operated by the windfarm owner during operation of the windfarm. Inspection and maintenance of Tinnalintan Substation will be carried out by both the windfarm operator and by EirGrid/ESBN, and will involve 6-monthly visits by 1 – 2 crews. In addition, the Ballynalacken Grid Connection equipment in the EirGrid Ballyragget Substation will be inspected and maintained annually, while the underground cabling will be inspected and tested every 1 to 2 years. Unplanned repairs along the Ballynalacken Grid Connection would be expected to happen infrequently, if at all, but would involve cutting the road surface from the top of the joint bay chambers and replacing cables using cable pulling machines. The road surface would be reinstated over the joint bay chambers following the completion of repairs. The closest joint bay is expected to be c.140m to the boundary of the SAC and c.175m to the boundary of the SPA (*as the crow flies*). Tinnalintan Substation compound is c.380m to the boundary of the SAC and c.395m to the boundary of the SPA.

### 2.2.7 Other Plans & Projects

Article 6(3) of the Habitats Directive requires that the Project is considered in-combination with the effects with other plans and projects. In-combination effects can arise when the spatial extent of effects from two or more projects or plans overlap, or could be sequential - where the spatial extents do not overlap.

Plans and projects that have been approved in the past five years are included in the in-combination provision, along with plans or projects which have been proposed (i.e., for which an application for approval or consent has been submitted) (EC, 2021).

In relation to cumulative impacts, there are a number of other projects or plans which could contribute to in-combination effects, as any or potentially (worst case) all of these projects and plans could be developed/operate during the same period as the Ballynalacken Windfarm. These plans and projects include:

**Table 2-2: Other plans and projects that are considered in combination with the Ballynalacken Windfarm Project**

| Other Project/ Activity | Status | Connectivity to the River Barrow & River Nore SAC<br>Connectivity to the River Nore SPA |
|---|---|---|
| **Plans** | | |
| Draft Ballyragget Masterplan (2024) *(identifies potential for a River Park to be developed)* | Potential future works /activities | SAC: 0m, SPA: 0m |
| Other Windfarms | | |
| Pinewood Windfarm | Consented | SAC: c.600m, SPA: c.4.6km |
| Cullenagh Windfarm | Consented | SAC: c.2.3km, SPA: c.9.1km |
| Other large wind projects within the wider Nore catchment area | | |
| Existing: Lisdowney, Gortahile, Lisheen III, Bruckana, Monaincha | Existing | Lisdowney - SAC: c.7.7km, SPA: c.7.7km<br>Gortahile – SAC: c.3.4km, SPA: c.28.5km<br>Lisheen III – SAC: c.21.1km, SPA: c.21.1km<br>Bruckana – SAC: c.21.1km, SPA: c.21.1km<br>Monaincha – SAC: c.12.6km, SPA: c.4.3km |
| Consented: Bilboa, White Hills | Consented | Bilboa - SAC: c.3.4km, SPA: c.28.5km<br>White Hills – SAC: c.3.7km, SPA: c.28km |
| Developments in the vicinity of the EirGrid Ballyragget Substation at Moatpark | | |
| Farranrory Wind Farm Grid Connection | Consented | SAC: 0m, SPA: 0m<br>*(includes HDD under main River Nore channel)* |
| Parksgrove and Ballyragget Solar Farms – grid connection | Consented | SAC: 0m, SPA: 0m<br>*(includes HDD under main River Nore channel)* |
| Battery Energy Storage Developments, Moatpark | Consented | SAC: c.2m, SPA: c.24m |
| Tirlán – Wastewater Treatment Plant, and Anaerobic Digesters | Existing<br>Consented | SAC: 0m, SPA: c.40m |
| Other Developments in the Vicinity of the Project | | |
| Laois-Kilkenny Grid Reinforcement Project<br>and extension of Ballyragget Substation Compound | Under Construction<br><br>Consented | SAC: c.275m, SPA: c.350m |
| Moatpark-Loan 38kV Overhead Line Telecom Masts, Ballyouskill | Existing | SPA: c.400m |

| **Other Project/ Activity** | **Status** | **Connectivity to the River Barrow & River Nore SAC Connectivity to the River Nore SPA** |
|---|---|---|
| **Plans** | | |
| Mixed Use Development, Castlecomer | Consented | SAC: c.220m, SPA: c.8.6km |
| Hebron House Development, Kilkenny | Consented | SAC: 0m, SPA: c.1.2km |
| Offsite and Secondary Projects | | |
| Offsite Project – Forestry Replant Lands (outside the cumulative geographical boundary) | Future activity | SAC: N/A – No connectivity<br>SPA: N/A – No connectivity |
| Secondary Project – Other Energy Projects connecting to Ballynalacken Substation | Future project, unknown | SAC: c.430m, SPA: c.520m<br>*Note*: It is unlikely that a secondary project would occur during the same time period as Ballynalacken. However, conservative approach taken, where cabling or overhead lines are connected into the Tinnalintan Substation during the Ballynalacken construction period. |
| | | |

## 2.3 Baseline information for the Natura 2000 sites and their QI/SCI habitats and species

Baseline information for the River Barrow and River Nore SAC and for the River Nore SPA is provided hereunder. First, an overview of the conservation objectives and measures established for the Natura 2000 sites are provided, and then a description of the QI habitats and QI/SCI species present, including their conservation status and trends, ecological requirements, the main threats and pressures on them and the results of desk and field surveys which were used to determine the known or potential locations of the QI and SCI habitats and species in relation to the proposed Ballynalacken Windfarm Project.

### 2.3.1 River Barrow and River Nore SAC [002162]

This site comprises stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties (NPWS, 2024). This SAC supports many habitats and species and is important for Irish ecology. The QI's present on the site have been discussed in more detail below.

See AA Figure 5: River Barrow & River Nore SAC

#### 2.3.1.1 Conservation Objectives and Measures

| | |
|---|---|
| Desmoulin's whorl snail (*Vertigo moulinsiana*) [1016] | |
| Objective: | To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 |
| Population size: adults | At least 5 adult snails in at least 50% of samples |
| Population density | Adult snails present in at least 60% of samples per site |
| Area of occupancy | Minimum of 1ha of suitable habitat per site |
| Habitat quality: vegetation | 90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011) |
| Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) |
| Nore freshwater pearl mussel (*Margaritifera durrovensis*) [1990] | |
| Objective: | To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution: | Maintain at 15.5km. See map 7 |
| Population size: adult mussels | Restore to 5,000 adult mussels |
| Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length |
| Population structure: adult 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 length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning |
| Water quality: Macroinvertebrates and phytobenthos (diatoms) | Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 |
| Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes 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 5cm depth in substrate |

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| Hydrological regime: flow variability | Restore appropriate hydrological regimes |
| Host fish: | Maintain sufficient juvenile salmonids to host glochidial larvae |
| Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] | |
| The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species. | |
| White-clawed Crayfish (*Austropotamobius pallipes*) [1092] | |
| Objective: | To maintain the favourable conservation condition of White-clawed Crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Distribution | No reduction from baseline. See map 7 |
| Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples |
| Negative indicator species | No alien crayfish species |
| Disease | No instances of disease |
| Water quality | At least Q3-4 at all sites sampled by EPA |
| Habitat quality: heterogeneity | No decline in heterogeneity or habitat quality |
| Sea Lamprey (*Petromyzon marinus*) [1095] | |
| Objective: | To restore the favourable conservation condition of Sea Lamprey in the River Barrow and River Nore SAC, 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/m² |
| 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 |
| Brook Lamprey (*Lampetra planeri*) [1096] | |
| Objective: | To restore the favourable conservation condition of Brook Lamprey in the River Barrow and River Nore SAC, which is 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/m² |
| 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 |
| River Lamprey (*Lampetra fluviatilis*) [1099] | |
| Objective: | To restore the favourable conservation condition of River Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary |
| Population structure of juveniles | At least three age/size groups of river/brook lamprey present |
| Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² |
| 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 |
| Twaite Shad (*Alosa fallax*) [1103] | |

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| Objective: | To restore the favourable conservation condition of Twaite Shad in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary |
| Population structure: age classes | More than one age class present |
| Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats |
| Water quality: oxygen levels | No lower than 5mg/l |
| Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plant) growth |
| Atlantic Salmon (*Salmo salar*) (only in fresh water) [1106] | |
| Objective: | To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC, 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 minutes sampling |
| Out-migrating smolt abundance | No significant decline |
| Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes |
| Water quality | At least Q4 at all sites sampled by EPA |
| Estuaries [1130] | |
| Objective: | To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC, 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. See map 2 |
| Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 |
| Community extent | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 |
| Mudflats and sandflats not covered by seawater at low tide [1140] | |
| Objective: | To maintain the favourable condition of Mudflats and sandfalts not covered by seawater at low tide in the River Barrow and River Nore SAC, 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. See map 3 |
| Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex, Sand to muddy fine sand community complex. See map 4 |
| *Salicornia* and other annuals colonizing mud and sand [1310] | |
| Objective: | To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the River Barrow and River Nore SAC, 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 the one sub-site mapped: Ringville – 0.03ha. See map 5 |
| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |

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| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 & Ryle, 2009). |
| Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] | |
| Objective: | To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 |
| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |
| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 & Ryle, 2009) |
| Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Otter (*Lutra lutra*) [1355] | |
| Objective: | To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC, 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 122.8ha above high-water mark (HWM) and 1136.0ha along riverbanks / around ponds |
| Extent of marine habitat | No significant decline. Area mapped and calculated as 857.7ha |
| Extent of freshwater (river) habitat | No significant decline. Area mapped and calculated as 616.6km |
| Extent of freshwater (lake) habitat | No significant decline. Area mapped and calculated as 2.6ha |
| Couching sites and holts | No significant decline |
| Fish biomass available | No significant decline |
| Mediterranean salt meadows (*Juncetalia maritimi*) [1410] | |
| Objective: | To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 |

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| Habitat distribution | No decline, subject to natural processes. See map 5 |
| Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions |
| Physical structure: flooding regime | Maintain natural tidal regime |
| Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession |
| Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 |
| 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 Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur |
| Killarney Fern (*Trichomanes speciosum*) [1421] | |
| Objective: | To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Distribution | No decline. Three locations are known, with three colonies of gametophyte and one sporophyte colony. See map 7 |
| Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds |
| Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations |
| Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations |
| Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations |
| Hydrological conditions: humidity | No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable |
| Light levels: shading | No changes due to anthropogenic impacts |
| Invasive species | Absent or under control |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | |
| Objective: | To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Habitat distribution | No decline, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes |
| Hydrological regime: river flow | Maintain appropriate hydrological regimes |
| Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation |
| Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments |
| Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits |
| Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments |
| Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition |

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| 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 |
| European dry heaths [4030] | |
| Objective: To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: | |
| Attribute | Target |
| Habitat distribution | No decline from current habitat distribution, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations |
| Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop |
| Vegetation structure: sub-shrub indicator species | Cover of characteristic sub- shrub indicator species at least 25%: gorse (*Ulex europaeus*) and where rocky outcrops occur bilberry (*Vaccinium myrtillus*) and woodrush (*Luzula sylvatica*). Some rock outcrops support English stonecrop (*Sedum anglicum*), sheep's bit (*Jasione montana*) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages |
| Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% |
| Vegetation structure: browsing | Long shoots of bilberry with signs of browsing collectively less than 33% |
| Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% |
| Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g., gorse and associated dry heath/ acid grassland flora |
| Vegetation structure: positive indicator species | Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora |
| Vegetation composition: bryophyte and non-crustose lichen species | Number of bryophyte or non- crustose lichen species present at least 2 |
| Vegetation composition: bracken (*Pteridium aquilinum*) | Cover of bracken less than 10% - however see 'Notes' |
| Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% |
| Vegetation composition: non-native species | Cover of non-native species less than 1%. |
| Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (*Orobanche rapum-genistae*) and the legally protected clustered clover (*Trifolium glomeratum*) |
| Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) |
| Vegetation structure: burning | No signs of burning within sensitive areas |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | |
| Objective: To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: | |
| Attribute | Target |
| Habitat distribution | No decline, subject to natural processes |
| Habitat area | Area stable or increasing, subject to natural processes |
| Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes |
| Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height |

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| Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% |
| Vegetation composition: typical species | At least 5 positive indicator species present |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) |
| *Petrifying springs with tufa formation (*Cratoneurion*) [7220] | |
| Objective: | To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in the River Barrow and River Nore SAC, 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. See map 6 for recorded location |
| Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes |
| Water quality | Maintain oligotrophic and calcareous conditions |
| Vegetation composition: typical species | Maintain typical species |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] | |
| Objective: | To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 |
| Habitat distribution | No decline. Surveyed locations shown on map 6 |
| Woodland size | Area stable of 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 |
| 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 |
| 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 sessile oak (*Quercus petraea*) and birch (*Betula pubescens*) |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control |
| *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] | |
| Objective: | To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets: |
| Attribute | Target |
| Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 |
| Habitat distribution | No decline. Surveyed locations shown on map 6 |
| Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size |

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| Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; sub canopy 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 |
| Woodland structure: dead wood | At least $30m^3$/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 ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control |

| | |
|---|---|
| Threats & Pressures:<br>High - Agricultural intensification<br>High - Dykes and flooding defence in inland water systems<br>High - Erosion<br>High - Modifying structures of inland water courses<br>High - Pollution to surface waters (limnic, terrestrial, marine & brackish)<br>Medium - Changes in abiotic conditions<br>Medium - Dredging/ removal of limnic sediments<br>Medium - Fishing and harvesting aquatic resources<br>Medium - Forest and Plantation management & use<br>Medium - Forestry activities not referred to above<br>Medium - Human-induced changes in hydraulic conditions<br>Medium - Intensive cattle grazing<br>Medium - Invasive non-native species | Medium - Peat extraction<br>Medium - Reduction in migration/ migration barriers<br>Medium - Use of fertilizers (forestry)<br>Medium - Water abstractions from surface waters<br>Low - Industrial or commercial areas<br>Low - Intensive fish farming, intensification<br>Low - Leisure fishing<br>Low - Netting<br>Low - Port areas<br>Low - Removal of hedges and copses or scrub<br>Low - Sand and gravel quarries<br>Activities, Management<br>Low - Forest replanting (native trees) |

#### 2.3.1.2 Aquatic QI Habitats & Species

##### 2.3.1.2.1 Freshwater Pearl Mussel (1029) and Nore Freshwater Pearl Mussel (1990)

Previously the River Nore Pearl Mussel (*Margaritifera durrovensis*) was reported separately; however, genetic research has since placed the Nore population within the *Margaritifera margaritifera* taxon (*M. m. durrovensis*) (NPWS, 2019). As a result, these species are treated together and the Conservation Objectives for the Nore Freshwater pearl mussel (1990) have been applied to the Freshwater Pearl Mussel (1029), herein.

The Freshwater Pearl Mussel (*Margaritifera margaritifera*) / Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) is a large, long-lived, bivalve mollusc found in clean, fast-flowing rivers. They are one of three Irish freshwater bivalves over 50mm. Individuals can grow to very large sizes relative to other freshwater molluscs, slowly building up thick calcareous shells in rivers with relatively soft water and low levels of calcium. Individual mussels can live for over a hundred years in Ireland.

Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel requires armoured substrate structures along riverbeds. Where river flow and sediment composition are altered, this can negatively affect population structure. Algae and diatom cover must ideally be very sparse and consists of species associated with high status environments. River flow velocity has been shown to affect juvenile habitat suitability where drainage work changes result in lower speeds increasing the presence and build-up of finer sediment. This finer sediment can impede oxygen flow to juvenile pearl mussel individuals prior to them latching to juvenile salmonids in gravels, impacting recruitment which is considered the primary cause for its 90% decline across Europe in the last 50 years. The fine sediment build up can also lead to recruitment of macrophytes which require fine sediment to root, this has effects on riverbed structure, river flow and oxygen levels. These factors are considered the primary indicators for monitoring Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel population structure and health in Stage 3 and Stage 4 surveys (Byrne *et al*. 2009; Moorkens & Killeen, 2009).

Conservation status: Their International Union for Conservation of Nature (IUCN) conservation status for Ireland and Europe is Critically Endangered. While the range of the species in Ireland is Favourable, the population, habitat and future prospects are described as Bad (NBDC, 2021).

<u>Threats and pressures</u> faced by this species include modification of hydrographic functioning, other human induced changes in hydrographic conditions, restructuring agricultural landholding, water abstractions from groundwater, diffuse pollution to surface waters due to agricultural and forestry activities and pollution to surface waters due to other sources not listed (NBDC, 2021).

<u>Species Distribution:</u>

*Desk Study Results:* The occurrence and type of the QI population within the SAC is reported as Present and Permanent. A high number of records for the critically endangered hard-water form of the freshwater pearl mussel (*Margaritifera margaritifera durrovensis*) were available for the River Nore (S47, EPA 2007). This sub-species is primarily confined to two areas upstream and downstream of Durrow, with known records spanning upstream of Ballyragget. Records stretch from Poorman's Bridge (S407859) (c.9km north of Durrow) to Lismaine Bridge (S442660) (c.5km south of Ballyragget), with most of the records found between Poorman's Bridge and the Tirlán Processing Plant (formerly Avonmore Creamery) which is c.2km north of Ballyragget (S440722) (NPWS, 2011a). The extant wild population of Nore freshwater pearl mussel is estimated as 300 adult individuals (Moorkens, 2009). For Nore pearl mussel distribution, please refer to DEHLG (2010) and map no. 7 within the conservation objectives document for the River Barrow and River Nore SAC (NPWS, 2011a).

*Field Study Results:* Targeted surveys were undertaken along the River Nore in August 2023 and April 2024 in order to establish if any populations of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel existing in the River Nore downstream of the Project site. Live **Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel was not recorded at any of the 32 sample points during the targeted surveys along the 15.6km stretch of the River Nore conducted**

**North and South of Ballyragget Town between the confluence of the Owveg and the confluence of the Dinin River**. The habitat condition was a majority of no suitability with High siltation overall with limited filamentous algae due to depths at multiple sample points. Four dead Margaritifera shells were identified during the survey. These were located upstream of the Owveg confluence (Section 1a), upstream of the Old Bridge at Ballyragget (Section 8), Lismaine Bridge (section 20) and in the vicinity of Inchmore Castle (section 22). The few areas of low/poor suitability offered little in suitable habitat area for Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel.

eDNA sampling during aquatic surveys ex-situ the SAC yielded positive results at one location, B8 (Castlecomer Stream), showing a 9/12 qPCR record. This location does not form part of the previously known distribution of this species along the watercourses in this area of Co. Kilkenny. It is noted that eDNA sampling along the downstream Dinin River, the Owveg and along the Cloghnagh stream yielded no positive results for this species.

In April 2024, Castlecomer Stream underwent targeted pearl mussel surveys along 9 sample sections in order to identify the location of the population indicated by the positive eDNA record in 2023. Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel was not recorded during these surveys and no suitable habitat was observed along this watercourse. The positive eDNA result was determined to be false positive as a result of salmonids carrying traces of pearl mussel from other locations within the River Nore. As a result, Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel was determined to not be present within any watercourses that have hydrological or hydrogeological connectivity to the proposed Ballynalacken Windfarm Project between the windfarm/cabling works locations and the main channel of the River Nore.

Vulnerability to potential impacts: As filter feeders Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel are particularly sensitive to changes in water quality. Other impacts to stream hydrology, riverbed substrate, channel structure and riparian management and the presence, or otherwise, of fish host stocks can all contribute to the vulnerability of this species.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.2 White-clawed Crayfish (1092)

The White-clawed Crayfish (*Austropotamobius pallipes*) is the only crayfish currently known to occur in Irish freshwater. It is the largest freshwater arthropod found in Ireland.

The species prefers relatively cool temperatures and adequate dissolved oxygen and lime, although tolerating significant fluctuations in these parameters. Habitat heterogeneity is important; juveniles live among submerged tree roots, gravel or macrophytes, while larger Crayfish must have stones to hide under, or an earthen bank in which to burrow. The species is omnivorous, with juveniles more reliant than adults on animal foods (NPWS, 2019).

Conservation Status: The IUCN conservation status of this species in Ireland has not been evaluated. However, their global IUCN conservation status is Endangered (NBDC, 2021). The Overall Status of the species is Bad with a deteriorating trend. This represents a genuine decline since the last reporting period and is mainly due to bad Future prospects for the species due to the presence of the Crayfish Plague organism across six catchments (NPWS, 2019).

Threats and pressures faced by this species include the introduction of invasive alien species and the introduction of disease, specifically White-Clawed Crayfish faces an existential threat from twin impacts of non-indigenous Crayfish species (NICS) and Crayfish Plague which is a water-borne disease specific to freshwater Crayfish caused by the oomycete *Aphanomyces astaci*. NICS impact the White-clawed Crayfish through direct predation and competition but also act as carriers of Crayfish Plague (NPWS, 2019). An outbreak of the highly infectious Crayfish Plague (*Aphanomyces astaci*) - a pathogen which causes 100% mortality in White-clawed Crayfish populations - was confirmed on the River Nore in Kilkenny in 2019 and may have impacted populations throughout the Nore catchment. Crayfish plague was tested for within three sites (A4, B8 & B9). Castlecomer stream (B8) tested positive for crayfish plague in 2023.

Species Distribution:

*Desk Study Results:* Records for White-clawed Crayfish were available for the wider survey area, being located on the River Nore and several tributaries upstream and downstream of Ballyragget, including the Owveg River (also known as the Owenbeg River). A low number of records were also available for the Dinin River, as far upstream at Castlecomer (including the Castlecomer Stream tributary). These records spanned from 1987 to 2005. However, additional records were available on the Owveg from 2010 (NBDC data). Of the watercourses surveyed as part of the aquatic survey at the proposed Ballynalacken Windfarm, only the Owveg River (Nore tributary) and Castlecomer Stream (Dinin tributary) were known to support white-clawed crayfish (all records pre-2001).

*Field Study Results:* The Dinin River and Owveg yielded positive eDNA results for this species at B9 and A4 (Positive 1/12 and 4/12 respectively). Crayfish plague was tested for within three sites (A4, B8 & B9). Castlecomer stream (B8) tested positive for crayfish plague in 2023 but yielded a 0/12 result for White-clawed Crayfish. However, Crayfish remains were identified in Otter spraint recorded at sites on the Kilcronan stream, Loughill (A2).

<u>Vulnerability to potential impacts</u>: Sediment run-off can affect this species, however its primary sensitivities are to Crayfish plague and increased temperature ranges impacting breeding success.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.3 Sea Lamprey (1095)

The life cycle of the Sea Lamprey (*Petromyzon marinus*) contains both a marine phase and a freshwater phase. Adult Sea Lamprey living as external parasites on host fish or marine mammals at sea grow in length from 60 to 100cm before migrating in spring into freshwater to excavate redds or spawning nests in gravelled areas of large rivers. Upriver migration occurs at a time of falling water levels and substantial spawning activity has been recorded in gravelled areas downstream of large weirs in the major Irish rivers. Substantial areas of gravel suitable for spawning have been recorded in SAC main stem rivers but low utilisation of these areas by spawning Sea Lamprey has been recorded, both up- and downstream of barriers to migration (NPWS, 2019).

This species requires healthy beds for spawning and egg laying, this is composed of redds that require high oxygen flow with steady current flow, fine sediment eddies along river banks for burrowing to protect from predators before migrating downstream into more coastal and intertidal waters as they mature (Kelly & King, 2001).

Conservation Status, Threats & Pressures: Their IUCN conservation status for Ireland is Near Threatened. While their habitat status is described as Favourable, their range, population and future prospects are deemed Bad, resulting in the overall status as remaining as Bad (NPWS, 2019).

<u>Threats and pressures</u> faced by this species include barriers to upstream migration as these limit access to spawning beds and juvenile habitat, canalisation, bait digging/collection and pollution to surface waters (NPWS, 2019).

<u>Species Distribution:</u>

*Desk Study Results:* Historical Sea Lamprey records are available for the Nore at Ballyragget (1968 and 1972) in grid square S47.

*Field Study Results:* A low density of *Lampetra* sp. were recorded at the Owveg River (A3), Castlecomer Stream (B5 & B8) and a moderate density of *Lampetra* sp. in the River Nore (A5) and Loughill river (C5) during aquatic surveys undertaken in September 2021 and July/August 2023. A moderate density population was recorded on the Loughill stream, where 15 per $m^2$ of targeted larval habitat were present. This density compares favourably with lamprey surveys undertaken on other Irish river catchments (e.g., O'Connor, 2004, 2006, 2007; King, 2006) and greatly exceeds the favourable conservation target of 2 per $m^2$ for *Lampetra* sp. within the River Barrow and River Nore SAC (002162) (NPWS, 2011), located c.1km downstream of the survey site.

The River Nore (A5) site surveyed in 2021 yielded results in line with the conservation objective target (34 ammocoetes per $m^2$). A low density was recorded on the Castlecomer Stream at B5 & B8 (6 ammocoetes and 0.5 ammocoetes per $m^2$ respectively), with a single *Lampetra* sp. transformer recorded on the Owveg River (A3).

Vulnerability to potential impacts: Sea Lamprey larval stage is sensitive to sediment build up affecting spawning redds and burrowing habitat prior to metamorphosis and harming the recruitment rate of larvae making it to adults.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.4 Brook Lamprey (1096)

The Brook Lamprey (*Lampetra planeri*) is the smallest of the three Lampreys recorded in Ireland, typically reaching no more than 15-18cm in length. Unlike the Sea Lamprey and the River Lamprey, the Brook Lamprey is non-parasitic and non-migratory as an adult, living its entire life in freshwater. Adults spawn in spring, excavating shallow nests in relatively small-sized gravels in areas of reduced flow. After hatching, the larvae ('ammocoetes') drift or swim downstream to areas of riverbed or margins with fine silt deposits. They burrow into this substrate and live as filter feeders over a period of years before transforming into young adult fish. The young adults overwinter before migrating short distances upstream to gravelled areas where they spawn. The adult fish die after spawning (NPWS, 2019).

This species requires healthy beds for spawning and egg laying, this is composed of redds that require high oxygen flow with steady current flow, fine sediment eddies along river banks for burrowing to protect from predators. This is the only Lampetra sp. designated for the SAC that does not migrate to the intertidal and coastal sections of the SAC. As such, this species requires healthy areas of vegetation for adults to shelter from predators

Conservation Status, Threats and Pressures: The species has an IUCN status of Least Concern for Ireland. Lamprey surveys in Ireland have necessarily focused on ammocoete abundances and to a lesser extent upon observations of adult spawning events. Distribution records can only be definitively assigned to one species or the other where adult records exist. For Brook Lamprey in Ireland there are extensive areas of suitable habitat and no significant pressures impacting this species. The Overall Status is therefore assessed as Favourable (NPWS, 2019).

Species Distribution:
*Desk Study Results:* Brook Lamprey presence is known from the River Nore upstream of Ballyragget (grid square S47).

*Field Study Results:* A low density of *Lampetra* sp. were recorded at the Owveg River (A3), Castlecomer Stream (B5 & B8) and a moderate density of *Lampetra* sp. in the River Nore (A5) and Loughill river (C5) during aquatic surveys undertaken in September 2021 and July/August 2023. A moderate density population was recorded on the Loughill stream, where 15 per $m^2$ of targeted larval habitat were present. This density compares favourably with lamprey surveys undertaken on other Irish river catchments (e.g., O'Connor, 2004, 2006, 2007; King, 2006) and greatly exceeds the favourable conservation target of 2 per $m^2$ for *Lampetra* sp. within the River Barrow and River Nore SAC (002162) (NPWS, 2011), located c.1km downstream of the survey site.

The River Nore (A5) site surveyed in 2021 yielded results in line with the conservation objective target (34 ammocoetes per $m^2$). A low density was recorded on the Castlecomer Stream at B5 & B8 (6 ammocoetes and 0.5 ammocoetes per $m^2$ respectively), with a single *Lampetra* sp. transformer recorded on the Owveg River (A3).

Vulnerability to potential impacts: Brook Lamprey larval stage is sensitive to sediment build up affecting spawning redds and burrowing habitat prior to metamorphosis and harming the recruitment rate of larvae making it to adults.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.5 River Lamprey (1099)

The River Lamprey (*Lampetra fluviatilis*) breeds in freshwater rivers and streams. Adults spawn in spring, excavating shallow nests in riverine sections comprising fine gravels and small stones. After hatching, the larvae or 'ammocoetes' drift or swim downstream to areas of riverbed or margins with fine silt deposits. They burrow into this bed material where they live as filter feeders over a period of years before transforming into young adult fish and migrating downriver to estuarine and marine habitats. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters. They can grow up to 25-30cm at maturity, at which stage they return to freshwater habitats to spawn. The adult fish die after spawning (NPWS, 2019).

This species requires healthy beds for spawning and egg laying, this is composed of redds that require high oxygen flow with steady current flow, fine sediment eddies along river banks for burrowing to protect from predators before migrating downstream into more coastal and intertidal waters as they mature.

Conservation status, Threats and Pressures: River lamprey IUCN conservation status for Ireland is Least Concern. The inability to distinguish between River Lamprey and Brook Lamprey (*Lampetra planeri*) larvae, and the challenges associated with sampling for adult River Lamprey, means that an evaluation of their actual range and population size cannot be undertaken. The Overall Status for River Lamprey is therefore assessed as Unknown (NPWS, 2019).

<u>Species Distribution</u>:
*Desk Study Results:* River lamprey records are limited to the southern reaches of the River Barrow and River Nore SAC, significantly downstream of Kilkenny Town.
*Field Study Results:* A low density of *Lampetra* sp. were recorded at the Owveg River (A3), Castlecomer Stream (B5 & B8) and a moderate density of *Lampetra* sp. in the River Nore (A5) and Loughill river (C5) during aquatic surveys undertaken in September 2021 and July/August 2023. A moderate density population was recorded on the Loughill stream, where 15 per $m^2$ of targeted larval habitat were present. This density compares favourably with lamprey surveys undertaken on other Irish river catchments (e.g., O'Connor, 2004, 2006, 2007; King, 2006) and greatly exceeds the favourable conservation target of 2 per $m^2$ for *Lampetra* sp. within the River Barrow and River Nore SAC (002162) (NPWS, 2011), located c.1km downstream of the survey site.

The River Nore (A5) site surveyed in 2021 yielded results in line with the conservation objective target (34 ammocoetes per $m^2$). A low density was recorded on the Castlecomer Stream at B5 & B8 (6 ammocoetes and 0.5 ammocoetes per $m^2$ respectively), with a single *Lampetra* sp. transformer recorded on the Owveg River (A3).

<u>Vulnerability to potential impacts</u>: River Lamprey larval stage is sensitive to sediment build up affecting spawning reds and burrowing habitat prior to metamorphosis and harming the recruitment rate of larvae making it to adults.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.6 Twaite Shad (1103)

The Twaite Shad (*Alosa fallax*) spends most of its life in estuaries and coastal waters but returns upriver to spawn in late May/early June. The fertilised eggs hatch after a short period and juveniles can reach up to 100mm at the end of the first year. Limited knowledge indicates that Irish twaite shad may live in estuarine waters for at least two full years prior to going to sea. Migrating adults have been identified in four rivers in the south / south-east of Ireland (NPWS, 2019).

This species spends most of its time offshore, only returning to estuarine habitats or to freshwater depositing rivers to mate. 'Medium-energy systems with erosive channels seem to be favoured, and shad do not generally utilise rivers that are heavily modified or less than 10 m wide.' They spawn usually above shallow gravel substrates near deeper pools. Spawning takes place in flowing water over stones and gravel, among which the eggs sink. Once the eggs hatch, the young Twaite Shat move downstream using the current to the upper estuary where it is quieter which allows them to feed and grow (Maitland PS & Hatton-Ellis TW,2003; King and Roche, 2008).

Conservation Status, Threats and Pressures: Twaite Shad IUCN conservation status is described as Vulnerable in Ireland. The range of the Twaite Shad is Bad while the population, habitat and future prospects are Inadequate in Ireland (NBDC, 2021). Threats and pressures to this species include the introduction of invasive alien species, fishing and harvesting aquatic resources and reduced fecundity/ genetic depression in animals (inbreeding) (NBDC, 2021).

Species Distribution:

*Desk Study Results:* Twaite shad has been recorded along the southern most reaches of the River Barrow and River Nore SAC, but not near Ballyragget, Castlecomer or Kilkenny City.

*Field Study Results:* The species was also **not observed** during aquatic surveys undertaken in September 2021 or July/August 2023 (EIAR Appendix 13.6).

Vulnerability to potential impacts: Twaite Shad is sensitive to changes in water quality, overfishing and migratory route obstructions as these limit access to spawning beds and juvenile habitat.

#### 2.3.1.2.7 Atlantic Salmon (1106)

The Atlantic Salmon (*Salmo salar*) is indigenous to the North Atlantic, extending in an arc from northern Portugal in the east to the north-eastern United States in the west. The Irish population generally comprises fish that spend usually two years as sub-adults in freshwater before going to sea as smolts. The majority of fish spend one winter at sea before returning to their natal rivers, mainly during the summer, as grilse. Smaller numbers spend two winters at sea, returning mainly in spring, hence “spring” Salmon. A small proportion of the adult population returns to the sea postspawning and can return to spawn again (NPWS, 2019).

Atlantic Salmon require coarse gravel beds for spawning. Spawning occurs in freshwater rivers and streams, in shallow fast-flowing areas with riffles, and moderate depths (Jonsson & Jonsson, 2011). Access to these habitats is crucial to Atlantic Salmons life cycle, but it may be impacted by damming or poor water quality. Juvenile Salmon require habitats with adequate shelter such as submerged aquatic vegetation, boulders or debris, and stable water currents (Hutchings, 2003). This kind of habitat provides food resources in the form of insect larvae, worms, and small crustaceans for the Salmon, and shelter from predators.

Conservation status, threats and pressures: They have an IUCN conservation status of Vulnerable in Ireland and Europe. There is considered to be sufficient habitat in Ireland to support a viable salmon population. Freshwater quality in Ireland continues to remain a concern but ongoing pressures linked with habitat quality are not considered to be compromising the viability of the species. The Overall Status is assessed as Inadequate, the same as the last assessment. Although a short-term negative trend is reported for this species, the trend has reversed in the last 5 years. Therefore, an overall stable trend is reported (NPWS, 2019). Threats and pressures faced by this species include exploitation at sea in commercial fisheries, interceptory fisheries in coastal waters, aquaculture and predation. In addition, the negative influence of climate change on food prey structure and abundance has increasingly been attributed to the declines observed in stocks at sea (NPWS, 2019). Within river systems, variation in individual stock abundance can be influenced by a variety of factors, notably alterations in physical habitat, water quality, environmental factors, predation, and angling and commercial fisheries exploitation pressure (NPWS, 2019).

Species Distribution:

*Desk Study Results:* Salmonids have been recorded throughout the OS grid squares that overlap with River Barrow and River Nore SAC.

*Field Study Results:* Atlantic salmon were recorded from seven sites downstream of the Ballynalacken Windfarm - on the River Nore (A5), Castlecomer Stream (B4, B5 & B8) and the Dinin River (B9). These sites supported parr of 0+ and ≥1+ size classes. Two sites on the Owveg River (A3, A4) recorded Atlantic Salmon. The presence and suitability for these species (at A3, A4, A5 and B9) was of a high enough level to be designated of international importance. A number of sites were of local importance (High value) for these species (B4, B5, B8).

Atlantic Salmon were recorded at Owveg River Loughill Bridge (A3). The site supported very high densities of juvenile Atlantic Salmon and was an excellent-quality salmonid nursery, with good-quality spawning habitat and some localised but very good quality holding areas associated with bank undercuts and vegetation overhangs.

Castlecomer Stream, Skehana (B4) supported a moderate density of Atlantic Salmon parr. The site was evidently a valuable salmonid nursery. Salmonid spawning habitat, whilst present and of good quality, was localised.

Castlecomer Stream, North Bridge, Castlecomer (B5 & B8) also returned sightings of juvenile Atlantic Salmon. The site was a valuable salmonid nursery habitat, supporting relatively high densities of juvenile Atlantic Salmon. Adults were not recorded, with no deeper holding habitat present in vicinity of the bridge. Salmonid spawning habitat was present, but the quality was reduced given siltation and cover of floc.

<u>Vulnerability to potential impacts</u>: Atlantic salmon require clean and oxygenated gravel beds for spawning, as well as suitable habitats with shelter and food sources for juvenile salmon. Should the proposed development lead to sedimentation, pollution, or riverbed alteration, these habitats could be subject to degradation which subsequently would cause salmon mortality and population decline. Additionally, sedimentation can smother eggs and reduce the availability of food for young salmon, resulting in high juvenile mortality. Sedimentation can also clog the gills of adult and juvenile salmon which would also have detrimental effects on salmon populations. Run-off from the project may reduce water quality and pollute the freshwater habitat which could cause eutrophication.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.2.8 Estuaries (1130)

Estuaries are the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. They are coastal inlets where there is generally a significant freshwater influence (NPWS, 2019). Estuaries are an extremely diverse and dynamic habitat and play a major role in maintaining the health of coastal ecosystems (NPWS, 2019). Estuarine dynamics are influenced by freshwater inputs (from the River Barrow and River Nore) and tidal movements.

<u>Conservation status, threats and pressures</u>: The range of this marine habitat is stable in both the short-term and long-term (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical/marine region concerned is experiencing a stable trend in the short-term and long-term (NPWS, 2019). Threats and pressures on this habitat type include residential or recreational activities and structures generating marine pollution; agricultural activities generating marine pollution; and marine aquaculture generating marine pollution (NPWS, 2019).

<u>Habitat Distribution:</u>

*Desk Study Results:* Estuaries (1130) is a QI habitat in the River Barrow and River Nore SAC. The habitat is mapped in the supporting Conservations Objectives document (NPWS, 2011a) and is located approx. 51.5km hydrologically downstream from the proposed Ballynalacken Windfarm Project. The inner boundary of the estuary is taken to be at New Ross and the outer boundary occurs between Creadon Head and Broomhill Point (NPWS, 2011b).

*Field Study Results:* Estuaries habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

<u>Vulnerability to potential impacts</u>: These habitats are susceptible to direct losses as a result of developments, marine pollution from agricultural, domestic and industrial sources, marine aquaculture. The introduction and spread of invasive species also has the potential to impact on this habitat through colonisation and changing flow pattern.

See AA Figure 5.2: Baseline Information mapping for QI habitats – Estuaries.

### 2.3.1.2.9 Mudflats and sandflats not covered by seawater at low tide (1140)

Mudflats and sandflats not covered by seawater at low tide are comprised of the international section of the coastline where sands and muds dominate. They are dynamic ecosystems, dependent on the balance of natural accretion and erosion. The only vascular plant species associated with this habitat is *Zostera noltei*.

Mudflats are composed of fine particles like clay and silt, while sandflats are made of coarser sand particles. The sediment texture can vary based on tidal conditions, freshwater inflow, and sediment deposition from upstream rivers like the Barrow and Nore. This habitat is a tough and sensitive environment to the species that live in it due to the constantly changing conditions. At low tide, they are exposed, and at high tide, they are submerged.

Conservation status, threats and pressures: The range of this habitat type is 23,800km² nationally and is stable both in the short-term and long-term (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical/marine region concerned is 646km² and is experiencing a stable trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this marine habitat include residential or recreational activities and structures generating marine pollution; agricultural activities generating marine pollution; and marine aquaculture generating marine pollution (NPWS, 2019).

<u>Habitat Distribution:</u>

*Desk Study Results:* The habitat is mapped in the supporting Conservations Objectives document (NPWS, 2011a) and is located approx. 70.7km hydrologically downstream from the proposed Ballynalacken Windfarm. Expanses of sandflat occur from Creadon Head to Passage East on the western shore and from Black Point to Duncannon Fort on the eastern shore (NPWS, 2011b). Mudflat is present as a narrow band on the western shore and on the eastern shore broad areas occur at Shelbourne Bay and Fishertown Flats, thereafter it continues north as a narrow band (NPWS, 2011b).

*Field Study Results:* Mudflats and sandflats not covered by seawater at low tide was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

<u>Vulnerability to potential impacts</u>: These habitats are susceptible to direct losses as a result of developments, marine pollution from agricultural, domestic and industrial sources, marine aquaculture. The introduction and spread of invasive species also has the potential to impact on this habitat by colonising the habitat and changing flow pattern.

See AA Figure 5.3: Baseline Information mapping for QI habitats - Mudflats and sandflats not covered by seawater at low tide.

### 2.3.1.2.10 *Salicornia* and other annuals colonizing mud and sand (1310)

Salicornia and other annuals colonizing mud and sand is a pioneer saltmarsh community that may occur on muddy sediment seaward of established saltmarsh, or form patches within other saltmarsh communities where the elevation is suitable and there is regular tidal influence (NPWS, 2019).

*Salicornia* are adapted to high salinity and are typically pioneer species that colonize disturbed or newly exposed areas of mudflats and sandflats. These habitats form at the upper tidal zone where the sediments are exposed at low tide and have a relatively low sediment deposition during high tide (EC, 2013).

Conservation status, threats and pressures: The range of this habitat is 15,200km² nationally and is stable in both the short-term and long-term trends (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical/marine region concerned is 1.16km² (at a minimum) and is experiencing a stable trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this habitat type include the spread of invasive alien species and intensive.

Habitat Distribution:

*Desk Study Results:* The habitat is mapped in the supporting Conservations Objectives document (NPWS, 2011a) and is located approx. 76.5km hydrologically downstream from the Proposed Ballynalacken Windfarm Project.

*Field Study Results:* Salicornia and other annuals colonizing mud and sand was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

Vulnerability to potential impacts: These habitats are susceptible to direct losses as a result of developments, marine pollution from agricultural, domestic and industrial sources, marine aquaculture. The introduction and spread of invasive species also has the potential to impact this habitat by colonising the habitat and changing flow patterns.

See AA Figure 5.4: Baseline Information mapping for QI habitats – Saltmarsh Habitats.

#### 2.3.1.2.11 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)

Atlantic salt meadows generally occupy the widest part of the saltmarsh gradient. They contain a distinctive topography with an intricate network of creeks and salt pans occurring on the medium to large-sized saltmarshes. Atlantic salt meadows contain several distinctive zones that are related to elevation and submergence frequency (NPWS, 2019).

These habitats comprise grasses that are hardy and can withstand fluctuating salinities. Many variables are important for this type of habitat to thrive. This includes a brackish and saline habitat, tidal processes that maintain soil moisture and bring nutrients to the area (O'Connor, 2011).

Conservation Status, threats and pressures: The range of this habitat is 25,900km² and is stable in both the short-term and long-term trends (NPWS, 2019). However, the area covered by the habitat type within the range in the biogeographical/marine region concerned is 27.19km² and is experiencing a decreasing trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this coastal habitat type include the spread of invasive alien species; intensive grazing or overgrazing by livestock; sports, tourism and leisure activities; modification of hydrological flow or physical alternation of water bodies for agriculture; and modification of coastline, estuary and coastal conditions for development (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* The habitat is mapped in the supporting Conservations Objectives document (NPWS, 2011a) and is located approx. 76km hydrologically downstream from the Proposed Ballynalacken Windfarm Project.

*Field Study Results:* Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) were **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

Vulnerability to potential impacts: These habitats are susceptible to direct losses as a result of developments, marine pollution from agricultural, domestic and industrial sources, marine aquaculture. The introduction and spread of invasive species also has the potential to impact this habitat by colonising the habitat and changing flow patterns.

See AA Figure 5.4: Baseline Information mapping for QI habitats – Saltmarsh Habitats.

#### 2.3.1.2.12 Mediterranean salt meadows (*Juncetalia maritimi*) (1410)

Mediterranean salt meadows occupy the upper zone of saltmarshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline; however, they are not as extensive as Atlantic salt meadows (NPWS, 2019). This habitat is more sensitive to changes in salinity than Atlantic salt meadows as well as fluctuating water levels hindering vegetation specialised to brackish type habitats (Sertić Perić et al., 2024).

Conservation status, threats and pressures: The range of this coastal habitat is stable in both the short-term and long-term trends (NPWS, 2019). However, the area covered by the habitat type within the range in the biogeographical/marine region concerned is experiencing a decreasing trend in the short-term and long-term

(NPWS, 2019). Threats and pressures associated with this habitat include intensive grazing or overgrazing by livestock; modification of hydrological flow or physical alternation of water bodies for agriculture; and agricultural activities not referred to above (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* The habitat is mapped in the supporting Conservations Objectives document (NPWS, 2011a) and is located approx. 76.5km hydrologically downstream from the Proposed Ballynalacken Windfarm Project.

*Field Study Results:* Mediterranean salt meadows (*Juncetalia maritimi*) (1410) were **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

Vulnerability to potential impacts: These habitats are susceptible to direct losses as a result of developments, marine pollution from agricultural, domestic and industrial sources, marine aquaculture. The introduction and spread of invasive species also has the potential to impact this habitat by colonising the habitat and changing flow patterns.

See AA Figure 5.4: Baseline Information mapping for QI habitats – Saltmarsh Habitats.

#### 2.3.1.2.13 Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260)

This annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the highest riverine conservation interest is associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers (NPWS, 2019).

This habitat is dependent on oligotrophic conditions, constant water flow which provided high oxygenation. *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation requires stable water conditions that allows them to remain submerged and well oxygenated.

Conservation status, threats and pressures: The range of this habitat is 82,200km² and is stable in the short-term trend (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical region concerned is 234km² and is experiencing a stable trend in the short-term (NPWS, 2019). Threats and pressures associated with this habitat type include agricultural activities, forestry activities and discharge of urban waste generating diffuse pollution to surface or ground waters; agricultural activities generating point source pollution to surface or ground waters; modification of hydrological flow; physical alteration of water bodies; and abstraction from groundwater, surface water or mixed water (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) is a QI habitat of the River Barrow and River Nore SAC. The full distribution and extent of this habitat and its sub-types in the River Barrow and River Nore SAC is unknown (NPWS, 2011a).

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys or aquatic surveys.

Vulnerability to potential impacts: This habitat is susceptible to changes in water quality (pollution and siltation), changes to hydrological flows reducing and/or changing vegetations ability to colonise an/or maintain itself and physical changes to the watercourses, including changes to substate.

#### 2.3.1.2.14 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)

Three distinct communities can be associated with this habitat type in Ireland. In the lowlands, the habitat occurs as a community of watercourses, particularly unmanaged edges of slow-moving rivers and the margins of lakes. In the uplands, the habitat occurs as a community of ungrazed or lightly grazed cliff ledges. In the lowlands, the habitat also possibly occurs as a nitrophilous tall herb community of woodland borders, referred to as the saum community (NPWs, 2019).

These habitats are highly sensitive to hydrological changes and require high levels of soil moisture and stable water tables to sustain the growth of the species. The habitat chemistry is sensitive to changes in nutrient levels and therefore, low levels of pollution is important for this habitat community.

Conservation Status, threats and pressures: The range of this habitat is 19,100km² and is decreasing in the short-term and long-term trends (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical region concerned is 1.004km² at a minimum and is experiencing a decreasing trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this habitat include intensive grazing or overgrazing by livestock; drainage for use as agricultural land; and the spread of invasive alien species (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* The full distribution and extent of this habitat in the River Barrow and River Nore SAC is unknown, although it is considered to occur in association with some riverside woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river (NPWs, 2011a).

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys or aquatic surveys.

Vulnerability to potential impacts: These habitats are susceptible to direct losses as a result of developments, or riparian management. They are also highly sensitive to hydrological and nutrient changes through pollution. Agricultural pressures through intensive overgrazing also has the potential to affect changes to this habitat. The introduction and spread of invasive species has the potential to impact this habitat by colonising the habitat and changing the plant species composition.

#### 2.3.1.2.15 Petrifying springs with tufa formation (7220)*

Petrifying springs are lime-rich water sources which deposit tufa (or travertine). The emerging spring water is rich in carbon dioxide and dissolved calcium carbonate. On contact with the atmosphere, carbon dioxide is outgassed, and calcium carbonate is deposited as tufa. The resulting ecological conditions, with high pH and constant inundation by water and deposition of precipitated calcium carbonate, constitute a challenging environment for plants and animals to colonise, and the communities associated with petrifying springs are therefore highly specialised (NPWS, 2019).

Conservation Status, threats and pressures: The range of this habitat is 18,900km² and is stable in the short-term trend (NPWS, 2019). The area covered by the habitat type within the range in the biogeographical region concerned is between 0.1379km² and 0.1549km² and is experiencing a stable trend in the short-term (NPWS, 2019). Threats and pressures associated with this habitat include abandonment of grassland management; extensive grazing or undergrazing by livestock; roads, paths, railroads and related infrastructure; drainage; mixed source pollution to surface and ground waters; and sports, tourism and leisure activities (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* Known locations of this habitat type in the River Barrow and River Nore SAC are mapped in the related Conservation Objectives document (NPWS, 2011a) and are located approx. 39km hydrologically downstream from the Proposed Ballynalacken Windfarm Project site. However, the full extant and distribution of this habitat within this Natura 2000 site is unknown; further areas are likely to occur within the site (NPWS, 2011a).

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys or aquatic surveys.

Vulnerability to t potential impacts: These habitats are susceptible to direct losses as a result of developments, or riparian management. They are also highly sensitive to hydrological and nutrient changes through pollution.

Agricultural pressures through undergrazing or overgrazing also has the potential to affect changes to this habitat. The introduction and spread of invasive species has the potential to impact this habitat.

See AA Figure 5.5: Baseline Information mapping for QI habitats - Old Oak Woodlands, Alluvial Forests & Petrifying Springs.

##### 2.3.1.2.16 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)*

Alluvial woodland is a priority Annex I habitat. A number of variants of this habitat exist – the most common found in Ireland include forests of *Fraxinus excelsior* and *Alnus glutinosa* of temperate and Boreal Europe lowland and hill watercourses. All types occur on heavy soils which are periodically inundated by the annual rise of river levels, but which are otherwise well-drained and aerated during low water (NPWS, 2019).

Alluvial forests require wet, periodically flooded conditions with moderate to low nutrient levels. These conditions are produced along the riverbanks and flood plains of the River Barrow and River Nore SAC.

Conservation Status, threats and pressures: The range of this habitat is 61,000km² and is stable in the short-term and long-term trends (NPWS, 2019). However, the area covered by the habitat type within the range in the biogeographical region concerned is between 19.64km² at a minimum and is experiencing decreasing trends in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this habitat include the spread of invasive alien species; clear-cutting; and plant and animal diseases, pathogens and pests (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* Known locations of this habitat type in the River Barrow and River Nore SAC are mapped in the related Conservation Objectives document (NPWS, 2011a). The closest mapped site of this habitat is located approx. 7.4km hydrologically upstream from the Proposed Ballynalacken Windfarm Project site, with a further mapped location 10km upstream. The closest mapped site of this habitat (hydrologically downstream) is located approx. 21.5km from the Proposed Ballynalacken Windfarm Project site. However, the full extant and distribution of the habitat within this Natura 2000 site is unknown; further areas may be present within the SAC site (NPWS, 2011a).

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys or aquatic surveys.

Vulnerability to potential impacts: These habitats are susceptible to the spread of invasive alien species, clear-cut felling and plant and animal diseases, pathogens and pests.

See AA Figure 5.5: Baseline Information mapping for QI habitats - Old Oak Woodlands, Alluvial Forests & Petrifying Springs.

#### 2.3.1.3 Terrestrial Habitats & Plant Species

##### 2.3.1.3.1 European dry heaths (4030)

European dry heaths comprise vegetation dominated by ericaceous dwarf shrubs and usually occurs on well-drained, nutrient-poor and acidic mineral soils or shallow peats (typically <50cm deep) on sloping ground. *Calluna vulgaris* is usually the main species but *Erica cinerea, Ulex gallii* and *Vaccinium myrtillus* may also be important components (NPWS, 2019).

Conservation Status, threats and pressures: The range of this habitat is 66,600km² and is stable in the short-term trend (NPWS, 2019). However, the area covered by the habitat type within the range in the biogeographical region concerned is 1,230.01km² (at a minimum) and is experiencing a decreasing trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this terrestrial habitat include intensive grazing or overgrazing by livestock; burning for agriculture; conversion to forest; and wind, wave and tidal power, including infrastructure (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* The full distribution and extent of this habitat in the River Barrow and River Nore SAC is unknown (NPWS, 2011a). However, it is indicated as occurring on the steep, free-draining river valley sides especially the Barrow and tributaries on the foothills of the Blackstairs Mountains (NPWS, 2011a). The Blackstairs Mountains are located approx. 38.9km to the southeast of the Proposed Ballynalacken Windfarm Project site.

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

Vulnerability to potential impacts: This habitat is susceptible to the spread of invasive species, intensive grazing or overgrazing by livestock, burning for agriculture, forestry plantation and windfarm developments.

#### 2.3.1.3.2 Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0)

Old sessile oak woods is defined in the interpretation manual of EU habitats as "acidophilous *Quercus petraea* woods, with low-branched trees, with many ferns, mosses, lichens and evergreen bushes." Three indicative species are listed: *Quercus petraea, Ilex aquifolium* and *Blechnum* ssp. However, in Ireland, the interpretation of this habitat type is wider – it also includes woods with *Quercus x rosacea* and *Quercus robur* (NPWS, 2019).

Conservation status, threats and pressures: The range of this habitat is 40,300km² and is stable in the short-term and the long-term trends (NPWS, 2019). However, the area covered by the habitat type within the range in the biogeographical region concerned is 60.08km² (at a minimum) and is experiencing a decreasing trend in the short-term and long-term (NPWS, 2019). Threats and pressures associated with this habitat type include the spread of invasive alien species; intensive grazing or overgrazing by livestock; and clear-cutting (NPWS, 2019).

Habitat Distribution:

*Desk Study Results:* Within this SAC, 13 sites of Old sessile oak woods were surveyed and mapped in the related conservation interests' documents (NPWS, 2011a). The closest site containing the habitat is located approx. 39.2km hydrologically downstream from the Proposed Ballynalacken Windfarm Project site. However, further unsurveyed areas may be present within the Natura 2000 site (NPWS, 2011a).

*Field Study Results:* This habitat was **not recorded** within the Proposed Ballynalacken Windfarm Project site during habitat surveys.

Vulnerability to potential impacts: This habitat is susceptible to the spread of invasive species, intensive grazing or overgrazing by livestock and forestry plantation.

See AA Figure 5.5: Baseline Information mapping for QI habitats - Old Oak Woodlands, Alluvial Forests & Petrifying Springs.

#### 2.3.1.3.3 Killarney Fern (1421)

The perennial Killarney Fern sporophyte is a medium to small fern with translucent membranous fronds that are light green when young and a deep-dark green when they mature. Fronds often hang from vertical rock surfaces but are also known to occur on damp woodland floors. Frond length is reported to range from 20 - 45 cm (Ní Dhúill *et al.*, 2015). Killarney Fern have a very restricted ecological niche.

Conservation status, threats and pressures: The surface area range of the Killarney Fern is 7000km² which has been described as a Favourable reference range (NPWS, 2013). The population size is recorded at 177 colonies, with the largest population in Ireland occurring in Co. Waterford (NPWS, 2013). Threats and pressures associated with the Killarney Fern include grazing, outdoor sports and leisure activities and recreational activities; fire and fire suppression; and invasive alien species (NPWS, 2013).

Habitat Distribution:

*Desk Study Results:* The location of Killarney Fern within the SAC is mapped in the related Conservation Objectives and is located approx. 50km from the Proposed Ballynalacken Windfarm Project site. Killarney Fern sightings were not recorded within the NBDC Grid Squares within which the proposed Ballynalacken Windfarm is located.

*Field Study Results:* Killarney Fern was **not recorded** during habitat surveys within the Proposed Ballynalacken Windfarm Project site.

Vulnerability to potential impacts: This species is susceptible to direct losses as a result of developments, or riparian management. It is also sensitive to agricultural pressures through grazing and recreational pressures and the spread of invasive species.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

#### 2.3.1.4 Otter (1355)

The territories of Otters can stretch for many kilometres; the total length of the home range depends on the availability of food. The smallest territories are thought to occur at coastal sites, where territories may be as small as 2km. The longest territories occur in upland streams where an individual may have to range more than 20km to find sufficient food. Territorial marking typically occurs by means of sprainting or anal secretions. These marks are left mostly at features such as bridge footings, boulders, grass tussocks and stream confluences.

An individual Otter may utilise a number of resting sites within its territory; these can be hidden refuges above ground (couches), or under-ground chambers (holts). Holts tends to be natural crevices, associated with the roots of trees growing along river and lake banks. These natural recesses provide the Otter with a holt that has multiple entrances from which the Otter can escape if disturbed. Couches occur frequently in dense vegetation and may be associated with frequently used runs and slides into the water. The rearing of cubs occurs within 'natal holts', which are not marked by spraint. Although capable of breeding at any time of the year, a peak in breeding occurs during the summer and early autumn.

Otters that live in rivers and lakes tend to be completely nocturnal, described as being crepuscular – activity peaks at dusk and dawn. Otters are principally piscivorous (fish eating), relying predominantly on salmonids (salmon and trout), but also eel and small fish species such as stickleback. However, Otters are not limited to fish and feed opportunistically on a range of prey when available: frogs are frequently eaten by Otters, and the remains of invertebrates (crayfish), birds and small mammals have also been found in spraints (Reid *et al*. 2013).

Conservation status, threats and pressures: Ireland remains a stronghold for the European Otter – the most recent distribution data show that the Otter is widespread throughout Ireland in a wide variety of habitat types (NPWS, 2019). It is considered stable across Ireland based on the most recent Article 17 Reporting (NPWS, 2019c). The overall status of Otter is considered to be favourable – population, range, habitat and future prospects are all considered favourable (BiodiversityIreland.ie, 2021). The main threats to the Otter include pollution – particularly organic pollution resulting in fish kills; and accidental deaths (e.g., collision with road traffic) (NPWS, 2019a). Disturbance to riverbank habitat also negatively impacts Otters.

Species Distribution:

*Desk Study Results:* There are six records for Otter sightings in the National Biodiversity Data Centre's 10km square grid references (S47) within which the Proposed Ballynalacken Windfarm Project is located. The last recorded sighting from this record is from 09/10/2015. In relation to the whole project, there are 53 records for Otter sightings in the National Biodiversity Data Centre's 10km square grid references (S47, S46, S55, S56 and S57) within which the works associated with the Ballynalacken Windfarm Project are located. The last recorded sighting from this record is from 11/01/23.

*Field Study Results:* The results of camera trap deployments in the Study Area returned no sightings of Otters, however secondary evidence was recorded during mammal and aquatic surveys; during the aquatic survey in September 2021, a couch and spraint, two regular spraint sites and crayfish remains were recorded during at the

Kilcronan stream in Loughill c1.6km to the north of T12. These records were located just before the stream feeds into the River Barrow and River Nore SAC; during a mammal survey in December 2021, an Otter spraint was recorded within the Biodiversity Protection Area c.248m to the west of the windfarm access road between T9 and T10; during a mammal survey in January 2022 (two spraints were recorded to the west of the L5840 local road - one in a field 201m to the southwest of T12, while another was recorded in a field 292m to the northwest of T12.

Three watercourses were chosen for the Otter surveys based on their crossing with a project element (Cloghnagh (EPA Code: 15C04), Rathduff_15 (EPA Code: 15R24) two locations). Based on the secondary evidence recorded, additional Otter surveys were carried out in March 2025 upstream and downstream of the crossing point of a wet drainage channel close to the Biodiversity Protection Area at D4 and along the Kilcronan stream c.320m to the east of T12. **Otter Transects yielded no sightings along these watercourses from crossings W1, W2 or W3**, **or from D4 or in the vicinity of T12**.

Vulnerability to potential impacts:

The main threats to the Otter include pollution – particularly organic pollution resulting in fish kills and accidental deaths (e.g., collision with road traffic). Disturbance and loss of riverbank habitat also negatively impacts Otters and fencing can prevent individuals commuting between waterbodies.

See AA Figure 5.6: Baseline Information mapping for Otter.

#### 2.3.1.5 Desmoulins Whorl Snail (1016)

Desmoulin's Whorl Snail (*Vertigo moulinsiana*) is the largest of all the Vertigo species, growing to between 2.2 and 2.7mm in height. All whorl snails favour damp or wet habitats, where they live mostly in moss, leaves and decaying vegetation. They feed on bacterial films and decaying vegetation. *V. moulinsiana* lives on living and dead stems and leaves of tall wetland plants.

It has a requirement for tall, structured vegetation containing tall riparian grasses and sedges, particularly reed sweet-grass (*Glyceria maxima*), common reed (*Phragmites australis*), greater pond-sedge (*Carex riparia*) and great fen-sedge (*Cladium mariscus*).

Conservation status, threats and pressures: Desmoulin's Whorl Snail is protected by the Habitats Directive [92/42/EEC] Annex II. Their overall status in Ireland is described as Inadequate and deteriorating – their range, population, habitat and future prospects are described as Inadequate (NPWS, 2019). The species' IUCN conservation status is assessed as Endangered in Ireland and Vulnerable in Europe (NBDC, 2021). Threats and pressures faced by this species include natural succession resulting in species composition change and drying out of the habitat, dredging / removal of limnic sediments and management of aquatic and bank vegetation for drainage purposes (NPWS, 2019).

Species Distribution:

*Desk Study Results:* Two known sites: (a) Borris Bridge, Co. Carlow S711503, c. 40km south-east of the Ballynalacken Windfarm Project, present on River Barrow therefore hydrologically isolated; (b) Boston Bridge, Kilnaseer S338774, Co. Laois, c. 16km upstream of, and therefore hydrologically unaffected by the Ballynalacken Windfarm Project. Six records for the species were recorded in grid square S47 and dated 03/09/1998.

*Field Study Results:* Desmoulin's Whorl Snail was **not observed** during aquatic surveys undertaken in the Proposed Ballynalacken Windfarm Project.

Vulnerability to potential impacts: This species is vulnerable to changes in management regimes resulting in changes to habitat structure and humidity levels. This species is also susceptible to direct losses as a result of developments, or other pressures and the spread of invasive species.

See AA Figure 5.1: Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern.

### 2.3.2 River Nore SPA [004233]

The River Nore SPA is a long, linear site that includes the following river sections: the River Nore from the bridge at Townparks, (north-west of Borris in Ossory) to Coolnamuck (approximately 3 km south of Inistioge) in Co. Kilkenny; the Delour River from its junction with the River Nore to Derrynaseera bridge (west of Castletown) in Co. Laois; the Erkina River from its junction with the River Nore at Durrow Mills to Boston Bridge in Co. Laois; a 1.5 km stretch of the River Goul upstream of its junction with the Erkina River; the Kings River from its junction with the River Nore to a bridge at Mill Island, Co. Kilkenny. The site includes the river channel and marginal vegetation. (NPWS, 2011)

The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species: Kingfisher.

See AA Figure 6: River Nore SPA

#### 2.3.2.1 Conservation Objectives and Measures

| **Kingfisher** (*Alcedo atthis)* [A229] | |
|---|---|
| Objective: | To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. |
| Attribute | Target |
| Population size | No significant decline in the long term |
| Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing |
| Spatial distribution of territories | No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation |
| Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target |
| Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target |
| Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status |
| Barriers to connectivity | No significant increase |
| Disturbance to breeding sites | Disturbance occurs at levels that do not significantly impact upon breeding Kingfisher |
| Threats & Pressures:<br>Medium: Port Areas<br>Medium: Landfill, land reclamation and drying out, general | |

#### 2.3.2.2 Kingfisher (A229)

Kingfisher is found throughout Ireland (NBDC, 2021). Kingfisher favour slow flowing rivers and streams with abundant fish prey items and suitable nesting habitat in the form of vertical sandy banks. They breed in tunnels dug in vertical banks along streams and rivers. Kingfisher use plunge-diving methods to catch various species of small fish (Stickleback, Minnow and Chub) in the river habitats in which they are found and can often be seen perching over the water in search of prey. This species is measured by the number of suitable nesting habitats along the designated sites with the river Nore hosting the highest abundance of active nests per kilometre among 5 sites identified in Cummins *et al*. (2010).

Conservation status, threats and pressures: It is on the Amber BOCCI List in Ireland and is included on the European Red List due to recent declines in breeding populations (BTO, 2021). The population short-term trend in Ireland over the period of 1991 to 2010 has been a slight decline (Cummins *et al*. 2010). The long-term trend (1980 – 2010) is also one of decline in specific designated sites but majority of the national population has remained unchanged (Cummins *et al*. 2010). Pressures and threats to this species include pollution to surface waters, invasive alien species and human induced changes in hydraulic conditions (Cummins *et al.* 2010).

Species Distribution:

Desk Study Results: Kingfisher are known to occur within the River Nore SPA which is located 4.9km to the east of the closest turbines in the Proposed Ballynalacken Windfarm Project. There are existing records (NBDC, 2021) for Kingfisher for 10km Irish Grid squares within which the Proposed Ballynalacken Windfarm Project is located (S36, S37, S46 and S47).

Field Study Results: Kingfisher were **not observed** during ecological surveys undertaken in Ballynalacken Windfarm, or during water crossing surveys undertaken in April and May 2022. Survey work carried out in April and May 2022 noted that the Rathduff_15 stream (EPA Code: 15R24), adjacent to the River Nore SPA was of Low suitability, while Intermediate suitability habitat was available along the main River Nore channel within the boundary of the SPA.

Vulnerability to potential impacts: This species is vulnerable to pollution affecting surface waters and hence prey (fish), invasive alien species and riparian management affecting potential suitable nesting habitat and human induced changes in hydraulic conditions as well as disturbance

See AA Figure 6.1: Baseline Information mapping – Kingfisher.

## 2.4 Implications of the Project on the River Barrow and River Nore SAC [002162]

An examination of the potential for the Proposed Ballynalacken Windfarm to adversely affect the conservation objectives of the River Barrow and River Nore SAC has been carried out, and the attributes for each of the QIs of the SAC were assessed individually in relation to the likelihood and magnitude of the following effects: Direct Loss (via physical removal, sedimentation); Degradation (via reductions in Water Quality); Disturbance and Displacement; and Other Indirect Effects (via the Spread of Invasive Species).

The evaluation was based on the nature, scale and location of the Project, including the aspects of the Project which have potential to give rise to adverse impacts on the Natura 2000 sites screened-in as a result of Stage I of this Appropriate Assessment, and on the ecological requirements of the Qualifying Interest habitats or species, their vulnerability to the potential project impacts, and their locational context, i.e. the known locations of QI habitats along with the potential for the occurrence of existing unknown or future habitat establishment for QI habitats within the SAC, and the known locations of QI species along with the known and potential locations of suitable habitats for these species both within and ex-situ the SAC. The Project has been examined in the absence of mitigation measures and the evaluation took into consideration the various elements of the Project, both individually and in-combination as a whole project, and also evaluated the potential for in-combination effects with other plans and projects.

The evaluation is presented in AA Appendices 3A to 3D [3A Direct Loss, 3B Degradation, 3C Disturbance, and 3D Spread of Invasive Species. The findings of this evaluation, along with the reasonings and conclusions on the likely impacts, in relation to each of the QI habitats and species of the SAC is presented in the subsections 2.4.1.1 to 2.4.1.7 below.

### 2.4.1 Implications of the Project on the Qualifying Interest habitats and species

#### 2.4.1.1 QIs: Estuaries (1130); Mudflats and Sandflats not covered by seawater at low tide (1140); *Salicornia* and other annuals colonising mud and sand (1310); Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330); Mediterranean salt meadows (*Juncetalia maritimi*) (1410)

It is evaluated that there will be:

1. No direct loss, degradation or fragmentation as a result of physical removal or sediment deposition
2. No degradation or fragmentation as a result of sediment deposition or from accidental fuel/concrete/drill fluid spillages/leaks or residues from forestry felling;
3. No indirect loss, degradation, fragmentation of QI habitat as a result of the spread of invasive species;

due to:

- No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC;
- No records/evidence of these QI habitats within the Project site boundary;
- the separation distance of the nearest Project impact source to nearest known/potential locations of habitats via hydrological pathways (53.3km downstream of W3 [Start of transitional waterbody New Ross Port (IE_SE_100_0200)]).
- Any change to sediment would be significantly below even a negligible extent compared to levels of sedimentation that forms part of normal tidal processes at these QI habitat locations.

In summary, it is evaluated that there is **no likelihood for the Project to adversely affect the conservation objectives for Estuaries (1130); Mudflats and Sandflats not covered by seawater at low tide (1140); *Salicornia* and other annuals colonising mud and sand (1310); Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330); Mediterranean salt meadows (*Juncetalia maritimi*) (1410).**

#### 2.4.1.2 QIs: European dry heaths (4030); Petrifying springs with tufa formation (*Cratoneurion*) (7220); Killarney Fern (1421)

It is evaluated that there will be:

(i) No direct loss, degradation or fragmentation as a result of physical removal or sediment deposition;
(ii) No degradation or fragmentation as a result of sediment deposition or from accidental fuel/concrete/drill fluid spillages/leaks or residues from forestry felling;
(iii) No indirect loss, degradation, fragmentation of QI habitat as a result of the spread of invasive species;

due to

- No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC;
- No records/evidence of these QI habitat/species within the Project site boundary;
- The separation distance of the Project to known/potential QI habitat/ species locations.
- The negligible extent of sediment deposition that could result in a worst case scenario from the Project during its Construction, Operational and Decommissioning phases.

In summary, it is evaluated that there is **no likelihood for the Project to adversely affect the conservation objectives for European dry heaths (4030); Petrifying springs with tufa formation (*Cratoneurion*) (7220); or Killarney Fern (1421).**

#### 2.4.1.3 QI: Desmoulin's whorl snail (1016)

It is evaluated that there will be:

(i) No direct loss due to physical contact (mortality);
(ii) No direct loss of suitable habitat, within or ex-situ the SAC, as a result of physical removal;
(iii) No degradation, loss or fragmentation of suitable habitat, within or ex-situ the SAC;
(iv) No indirect loss, degradation, fragmentation of suitable habitat as a result of the spread of invasive species, within or ex-situ the SAC;

due to

- No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC;
- No records/evidence of these QI species within the Project site boundary;
- the separation distance of the Project to known/potential QI species populations or suitable habitat (Neither area provided in the sites Conservation Objective are located downstream or in proximity to the Project).

In summary, it is evaluated that there is **no likelihood for the Project to adversely affect the conservation objectives for Desmoulin's whorl snail (1016).**

#### 2.4.1.4 QIs: Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260); Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)*; and Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0)

Due to their ecological requirements, distribution and vulnerability to the potential project effects, it is evaluated that there is potential for these QI habitats to be affected by the development of the Project, and they are examined below in relation to direct loss, disturbance, degradation, and the spread of invasive species.

**Direct Loss due to physical removal**: it is evaluated that there is **no likelihood of direct loss** or fragmentation of these QI habitats due to

(i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, and

(ii) furthermore Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*), or Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles were not recorded within the Project site boundary.

**Direct Loss due to sedimentation**: it is evaluated that there is **no likelihood of direct loss** or fragmentation upon known locations of the QI habitats due to

(i) no known locations of Hydrophilious tall herb fringe communities and the absence of records of these QI habitats within the Project site or at aquatic survey locations (which included a 15km stretch of the River Nore);

(ii) Water courses of plain to montane levels is present downstream of the grid connection crossings at W2 and W3 within the Nore_130 Waterbody (Ballyragget N77 bridge). This habitat is located more than 2km downstream of these crossings. Given the unlikely risk of sedimentation expected to occur at these crossing points and the short-term nature of the works related to this impact source, no likelihood of direct loss or fragmentation is expected to occur.

(iii) the distance from known/potential locations of Old sessile oak woods and Alluvial forests and/or lack of hydrological or other pathways from potential Project impacts to the known locations and the absence of records of these QI habitats within the Project site or at aquatic survey locations (which included a 15km stretch of the River Nore.

While it is acknowledged that these QI habitats may become established in the future in sections of the SAC closer to the Project site, **no direct loss or fragmentation of unknown/future locations of the QI habitats within the SAC are likely to occur** due to

(i) the majority (93%) of excavations are associated with the windfarm site. The location of the windfarm across four separate catchments and the separation distance to the boundary of the SAC reduces the magnitude of sedimentation effects to downstream sections of the SAC;

(ii) although the grid connection along the public road is located close to the SAC boundary (c.90m at W3), the linear and minor nature of these works, which will be carried out within the road corridor and either in the deck of the bridge or by directional drilling under the bridge and watercourse, the absence of instream works, the limited volume of excavations with excavations removed from the works area as standard practice during road works and any sediment released during works over the bridge, or in the unlikely scenario of a breach of the bed during direction drilling works, would involve negligible volumes being released and any increased sedimentation would be localised and of very low magnitude;

(iii) the linear nature and location of the Internal Cable Link route, the absence of instream works and the separation between works at the existing culvert crossing of the upper reaches of the Rathduff_15 stream and the SAC boundary (3.5km);

(iv) the negligible volumes of soils excavated at haul route works locations;

(v) the negligible volumes of excavations/movement of soils during the operational and decommissioning phases.

**Degradation due to reductions in water quality**: Sources of effects to water quality mainly relates to sediment laden runoff from construction works areas and soil storage areas. Concrete spills or washout waste water, spills or leaks of oils or fuels from site plant, machinery, vehicles or during refuelling, and the potential for nutrient runoff from brash in felling areas also have potential to reduce water quality in downstream water bodies. These sources of water quality degradation mainly relate to the windfarm site where 93% of the excavations will take place, the majority of the concrete will be used, and the majority of plant/machinery and vehicles will be present. Though, unlikely to occur, a breach of the watercourse bed during directional drilling works at W3 (crossing option b), would result in the release of a small volume of sediment and drilling fluid, Bentonite, being released. Bentonite is a non-toxic drilling fluid, and any volumes of sediment released would be negligible and localised.

In relation to degradation of Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-*Batrachion* vegetation, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*), or Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, it is evaluated that, though unlikely to occur, the various elements of the Ballynalacken Windfarm Project may cause Very Low to Low magnitude effects. However, it was evaluated that **there will be no adverse effects these four QI habitats within the SAC** due to:

(i) the majority of excavations (93%), and the majority of concrete, presence and use of oil and fuels, and all of the forestry felling are associated with the windfarm site. The location of the windfarm across four separate catchments and the separation distance of the windfarm site to the boundary of the SAC reduces the magnitude (Low) of water quality effects to downstream sections of the SAC;

(ii) although the grid connection along the public road is located close to the SAC boundary (c.90m at W3), the magnitude of effects is evaluated as Very Low to Low, and no adverse impacts are expected to occur to the QI attributes due to the linear and minor nature of these works, which will be carried out within the road corridor, the absence of instream works; the limited volume of excavations and concrete associated with the watercourse crossing works, with excavations removed from the works area as standard practice during road works, and concrete limited to the trench in the public road; and any sediment released during works over the W3 bridge, or in the unlikely scenario of a breach of the bed during direction drilling works at W3, would result in negligible volumes being released and any increased sedimentation would be localised and of very low magnitude; and due to the non-toxic nature of the Bentonite which will be used as the drilling fluid during directional drilling works;

(iii) the linear nature and location of the Internal Cable Link route, the absence of instream works and the separation between works at the existing culvert crossing of the upper reaches of the Rathduff_15 stream and the SAC boundary (3.5km);

(iv) the negligible volumes of soils excavated, and machinery present, at haul route works locations;

(v) the negligible volumes of excavations/movement of soils and operation of machinery during the operational and decommissioning phases;

(vi) the adaptability of the QI habitats to periodic increases in sediment in the water as part of normal cyclical changes (e.g. during flooding and periods of wet weather); and

(vii) the magnitude of changes to water quality in downstream waterbodies as a result of the unmitigated Project will not be sufficient to affect the conservation objectives to maintain or restore the QI habitats.

Fragmentation is possible as a result of the degradation through reductions in areas suitable to host habitats. Although this result is unlikely to occur to any significant magnitude or scale given the scope of the potential sources and the duration for such impacts to occur.

When the whole project is considered in-combination with other plans and projects in the area, it was evaluated that although there is potential for low magnitude combined effects, the magnitude of changes to water quality in downstream waterbodies as a result of the unmitigated Project in combination with other plans and projects would not be sufficient to affect the conservation objectives to maintain or restore the QI habitats.

**Other Indirect effects due to Spread of Invasive Species**: Surveys of habitats at the Project site and during aquatic surveys outside of the Project site, recorded one infestation of an invasive plant species – an infestation of Cherry Laurel was recorded in forestry at the windfarm site. This infestation will be removed prior to the commencement of construction works. Outside of the windfarm site, both Cherry Laurel and Japanese Knotweed has been recorded on the National Biodiversity Database in the S47 10km square.

While the highest risk is associated with the construction phase; this risk also relates to the operational and decommissioning phases. The main construction works at the windfarm, cable routes and Tinnalintan substation are located within the S47 10km square, with works along the Ballynalacken Grid Connection in close proximity to the boundary of the SAC. Due to the presence of Cherry Laurel on the windfarm site (1 location), in addition to NBDC records of Japanese Knotweed being recorded in the wider area, the importation of materials and movement of machinery/vehicles onto the construction sites, with importation of hedging materials to the windfarm site and to the Tinnalintan Substation site, and groundworks, vegetation clearing, movement of machinery, vehicles and works occurring in close proximity to 1 watercourse (W1) at the windfarm site, 1 watercourse along the Internal Cable Link (W2) and along the Ballynalacken Grid Connection (W3), and works in wet drainage channels at the windfarm site, that there is a risk, albeit unlikely to occur, that the existing Cherry Laurel could spread or that invasive species could inadvertently be brought onto the construction works areas in loads/on machinery or vehicles and then spread, to the SAC via connected watercourses.

**Therefore, it is evaluated that although unlikely, the spread of invasive species into downstream water bodies, should it occur, has the potential to cause Low to Medium magnitude effects which could result in adverse effects on the conservation objectives** for Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion* albae), or Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles.

There is also potential for cumulative high magnitude impacts with other plans and projects in the Nore catchment, due to the potential for spread of invasive species from multiple construction sites.

Fragmentation is possible as a result of invasive species impacts through encroachment of habitat locations and reduction in area suitable to host habitats. Although this result is unlikely to occur to any significant magnitude or scale given the scope of the potential sources and the duration for such impacts to occur. However, under a precautionary principle where spread of invasive species were to occur, fragmentation would also result in potential adverse effects.

**Therefore, mitigation measures will be required to avoid and prevent the spread of invasive species.**

#### 2.4.1.5 QIs: Freshwater Pearl Mussel (1029) and Nore Freshwater Pearl Mussel (1990)

Previously the Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) was reported separately to the Freshwater Pearl Mussel; however, genetic research has since placed the Nore population within the *Margaritifera margaritifera* taxon (*M. m. durrovensis*) (NPWS, 2019). No specific conservation objectives are provided for the Freshwater Pearl Mussel (1029), as such, both of these QIs are evaluated together below in relation to direct loss, disturbance, degradation, and the spread of invasive species.

Works affiliated with the project pose limited risk to impact Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel due to the absence of instream works with connectivity to known distribution areas of this QI species, the absence of live individuals from previously recorded locations for this QI species indicating a dissolution distance of over 13km from the closest potential contaminant source associated with the Project to the nearest potential location of this species, and the short term, low magnitude nature of any potential contribution to sediment run-off to the River Nore.

Despite the limited risk to this species, under the precautionary principle, strictly being related to worst-case scenarios, this species is considered vulnerable to Project potential impacts related to Degradation (via water runoff) and Spread of Invasive Species

**Direct Loss due to mortality/physical contact or due to physical loss of suitable habitat**: it is evaluated that, due to the reasons outlined below **direct loss will not occur to Freshwater Pearl Mussel or Nore Freshwater Pearl Mussel**:

- (iii) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, and
- (iv) Based on field study results - Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel is not expected to occur directly downstream of the Project or its related works. However, this QI is likely to be present within the River Nore which will not undergo any physical loss of habitat as a result of the Project;
- (v) there is no suitable habitat within the Project site;
- (vi) aquatic surveys recorded no evidence of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel in the Castlecomer Stream, Dinin River, Cloghnagh, Rathduff_15 or Owveg River;
- (vii) targeted surveys along the River Nore did not find any live Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel or suitable habitat along a 15.6km stretch (from upstream of the confluence of the Owveg River to downstream of the confluence of the Dinin River);
- (viii) In addition, the targeted surveys along the River Nore found that the habitat condition was a majority of no suitability with High siltation overall with limited filamentous algae due to depths at multiple sample points. The few areas of low/poor suitability offered little in suitable habitat area for Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel;

Therefore, Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel **will not be adversely affected as a result of the Ballynalacken Windfarm Project works**.

**Disturbance/Displacement due to watercourse crossing works or works in close proximity, or due to loss of suitable habitat**: it is evaluated that, due to the reasons outlined below, there is **no likelihood of disturbance or displacement** of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel:

- (i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, and
- (ii) Freshwater Pearl Mussel/ Nore Freshwater Pearl Mussel is not expected to occur directly downstream of the Project or its related works. While this QI is likely to be present within the River Nore – no works or physical loss of habitat will occur within the River Nore / SAC as a result of the Project;
- (iii) The watercourse/drain crossing works or works in close proximity to watercourses relate to the construction phase of the windfarm, internal cable link and grid connection only. No watercourse crossing works or works in close proximity will be required during operation or decommissioning.
- (iv) the Rathduff_15 is dry part of the year and therefore there is no potential for Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel to be present in close proximity to the cable crossing works at W2 or W3;
- (v) there is no suitable habitat within the Project site;
- (vi) aquatic surveys recorded no evidence of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel in the Castlecomer Stream, Dinin River, Cloghnagh, Rathduff_15 or Owveg;
- (vii) targeted surveys along the River Nore did not find any live Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel, or suitable habitat along a 15.6km stretch (from upstream of the confluence of the Owveg River to downstream of the confluence of the Dinin River);
- (viii) In addition, the targeted surveys along the River Nore found that the habitat condition was a majority of no suitability with High siltation overall with limited filamentous algae due to depths at multiple

sample points. The few areas of low/poor suitability offered little in suitable habitat area for Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel;

**Degradation of suitable habitat**: Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel is vulnerable to changes in water quality, particularly changes to nutrient levels and activities affecting sediment build up along river beds. Project sources of effects to water quality mainly relates to sediment laden runoff from construction works areas and soil storage areas. Concrete spills or washout waste water, spills or leaks of oils or fuels from site plant, machinery, vehicles or during refuelling, and the potential for nutrient runoff from brash in felling areas also have potential to reduce water quality in downstream water bodies. These sources of water quality degradation are associated with the construction phase (as sources will be negligible during operation and decommissioning), and also mainly relate to the windfarm site where 93% of the excavations will take place, the majority of the concrete will be used, and the majority of plant/machinery and vehicles will be present. It is noted that there are no instream works in natural watercourses at the windfarm site, although works will take place in a number of wet drainage channels (D1, D2). The construction of the windfarm will involve works to install bottomless culverts and access roads in close proximity to one natural watercourse (W1 on Cloghnagh stream) and three wet drainage channels (D1, D3 in the Cloghnagh catchment, and D4 in the Owveg catchment). It is evaluated that, although **unlikely to occur**, that taking a precautionary approach, it is considered that the construction of the windfarm has potential to result in sediment and/or contaminant-laden run-off being released to suitable habitats within downstream watercourses as a result of ground excavations, storage of overburden, watercourse/drain crossing works, forestry felling and use of machinery and vehicles particularly if construction works are carried out during periods of heavy or prolonged rainfall.

The Ballynalacken Grid Connection is located close to the SAC and will involve the crossing of the non-perennial Rathduff_15 stream at an existing road bridge on the regional road (W3, c.90m from the SAC). Works at W3 will involve trenching works in the public road pavement, and at the bridge either (a) trenching works in the bridge deck and masonry works to raise the parapet walls, or (b) directional drilling under the bridge from the public road corridor with no works to the bridge required. A second crossing is associated with the Rathduff_15 – where the Internal Cable Link crosses over an existing culvert in the local public road (W2 – 3.5km upstream of the SAC). Construction works will involve trenching over the culvert, no instream /structure works will be required at W2. It is evaluated that, although **unlikely to occur**, that taking a precautionary approach, it is considered that the construction of the Ballynalacken Grid Connection and Internal Cable Link has potential to result in sediment/contaminant-laden run-off, and although unlikely to occur – release/spillage of drilling fluid Bentonite/sediment during drilling work W3,being released to suitable habitats as a result of works along the public road and at the W3 bridge crossing and W2 culvert crossing, particularly if these works are carried out during periods of heavy or prolonged rainfall, or when the Rathduff_15 is in its 'flowing' state.

Due to the location of the Tinnalintan Substation in grassland fields and the separation distance to watercourses, the construction and operation of this element of the Project will not cause degradation of water quality in the SAC. The haul route works remote from the main construction works areas are all located downstream of the known / mapped locations of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel in the SAC, and therefore have no likelihood of causing adverse effects.

Although no Intermediate/Moderate or High suitable habitat or live Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel were recorded downstream of the Project (as far as the confluence of the River Nore with the Dinin River), and individually the Project elements are not likely to adversely affect the conservation objectives for Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel, taking into account the Project as a whole, and in combination with other plans and projects, and taking into account the existing impacts to Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel identified during surveys, that, **there is potential for the unmitigated whole Project to contribute to**

**further degradation or deterioration of habitat of downstream waterbodies** (particularly during periods of heavy or prolonged rainfall) and therefore **there is potential for Short term Very Low-Medium magnitude adverse effects to conservation objective attributes as a result of construction works associated with the whole Ballynalacken Windfarm Project and other plans and projects**.

**Therefore, mitigation measures will be required to prevent the Ballynalacken Windfarm Project causing degradation or deterioration of Freshwater Pearl Mussel/Nore Freshwater Pearl Mussel habitat.**

**Other Indirect effects due to Spread of Invasive Species**: As described in Section 2.4.1.4 above, there is a risk that invasive species could be inadvertently spread by groundworks, vegetation clearing works and movement of machinery, vehicles and materials onto the Project site locations, and that this risk is increased when the other projects and plans in the catchment are taken into consideration. It is evaluated that **the spread of invasive species into downstream water bodies, should it occur, has the potential to cause Medium to High magnitude effects which could result in adverse effects on the conservation objectives for the Nore Freshwater Pearl Mussel/Freshwater Pearl Mussel**. **Therefore, mitigation measures will be required to avoid the spread of invasive species.**

#### 2.4.1.6 QIs: Atlantic Salmon (1106), Twaite Shad (1103), Sea Lamprey (1095), Brook Lamprey (1096), River Lamprey (1099), White Clawed Crayfish (1092)

Due to their ecological requirements, distribution and vulnerability to the potential project effects, it is evaluated that these QI species have potential to be affected by the development of the Project and are examined below in relation to direct loss, disturbance, degradation, and the spread of invasive species.

Works affiliated with the project pose limited risk to impact White-clawed Crayfish due to the absence of instream works with connectivity to known distribution areas of this QI species and the short term, low magnitude nature of any potential contribution to sediment run-off to the River Nore.

Despite the vulnerability of this species strictly being related to worst-case scenarios, under the precautionary principle, this species is considered vulnerable to Project potential impacts related to Degradation (via water runoff and Spread of Invasive Species

**Direct Loss due to mortality/physical contact or due to physical loss of suitable habitat**: it is evaluated that, due to the location of the Project outside the boundary of the SAC, with no instream works in natural watercourses and therefore no loss, diversion or physical removal of watercourses, that there is **no likelihood of direct loss** of Atlantic Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey or White Clayed Crayfish as a result of the development of the Project.

**Disturbance/Displacement due to watercourse/drain crossing works or loss of suitable habitat**: the construction works in close proximity to the source of the Cloghnagh_010 (at W1), and in wet drainage channels D1 to D4, and forestry felling which will take place in the vicinity of W1, D1, D2 and D3 has the potential to affect QI species should they be present. However, such impacts are at worst of brief, **Very Low magnitude** for these species and **Unlikely** to occur as these QI species are unlikely to be present in close proximity to construction works areas. Any potential impacts as a result of the construction of the windfarm would be brief/temporary and very short-term. As such, these impacts are assessed as having **No adverse effects on the attributes for these species**.

Due to the non-perennial nature of the Rathduff_15 stream, these QI species are not expected to be present at the watercourse crossing locations (W2, W3), and even in worst case scenario where there is flow in the watercourse at the time of the construction works and QI species are also present within the Rathduff_15 stream, the works will take place on the pubic road and therefore any disturbance or displacement will be of **brief/temporary duration and of Very Low magnitude**, and are assessed as having **No adverse effects on the attributes for these species**.

No works in close proximity to watercourses is associated with Tinnalintan Substation, or haul route works HR1, HR4 to HR13, and therefore **no likelihood of disturbance/displacement effects**. HR2 and HR3 will occur close to the Pococke River, however these minor works will take place within the road corridor, are not likely to increase the current levels of traffic, noise and disturbance at these locations.

**Degradation of suitable habitat**: While there are no instream works proposed in natural watercourses, there is potential for degradation of suitable habitat as a result of sediment release from excavated areas and spoil storage areas, contaminant release from potential fuel/oil spills, nutrient runoff from felled areas, and although unlikely to occur – the release of Bentonite drilling fluid and sediment during drilling works at W3 (crossing option b).

The risk of sediment/contaminant/nutrient-laden runoff relates to the construction phase of the Project, as sources of this impact during the operation and decommissioning phases will be negligible and will not result in adverse degradation effects to these QI species. The majority of the construction works, and all of the forestry felling, will take place at the windfarm, which is spread out over four different sub-catchments of the River Nore – this reduces the magnitude of water quality degradation effects in an individual sub-catchment. Works will take place in two wet drainage channels (D1, D2) in the Cloghnagh catchment, with works to install bottomless culverts/extend the existing culvert and to construct access roads taking place over a headwater stream of the Cloghnagh (W1) and at wet drainage channels (D1, D2, D3) in this same catchment. Works to install a bottomless culverts and to construct a windfarm access road over a wet drainage channel will also occur at D4 which drains into the Kilcronan stream, which flows into the Owveg river. Although the sources of impact from windfarm construction are significantly upstream of where the Cloghnagh joins this SAC, and also significantly upstream of the SAC in the Castlecomer Stream, Owveg and Nore_120 sub-catchments It is evaluated that, although **unlikely to occur**, that taking a precautionary approach, it is considered that the construction of the windfarm has potential to result in sediment/contaminant-laden run-off being released to downstream habitats both within and ex-situ the SAC, particularly if these works are carried out during periods of heavy or prolonged rainfall.

The Ballynalacken Grid Connection works, including works at the watercourse crossing location W3, are located close to the main channel of the River Nore, however the potential for degradation effects is reduced by the location of the grid connection works along the public road corridor, and the nature of the works which will predominately comprise trenching works in the road pavement (which includes the removal of excavations as standard works practices), the linear nature of trenching works, and the minor nature of the additional works required for the W3 crossing at the bridge (whether trenching in the deck of the bridge with works to parapet walls, or directional drilling underneath the bridge and watercourse). However, applying a precautionary principle, due to the proximity of the works to the River Nore, and particularly the location of the crossing works over/under the Rathduff_15 stream at W3, these works are considered to pose a potential **adverse effect** to Atlantic Salmon (1106), Twaite Shad (1103), Sea Lamprey (1095), Brook Lamprey (1096), River Lamprey (1099), White Clawed Crayfish (1092), particularly if these works are carried out during periods of heavy or prolonged rainfall, or if works at W3 were to take place when the Rathduff_15 had flow in it at the time of the works.

A second crossing is associated with the Rathduff_15 – where the Internal Cable Link crosses over an existing culvert in the local public road (W2 – 3.5km upstream of the SAC). Construction works will involve trenching over the culvert, no instream /structure works will be required at W2. Overall, it is evaluated that, although **unlikely to occur**, that taking a precautionary approach, that the construction of the Ballynalacken Grid Connection and Internal Cable Link has potential to result in localised **adverse effects of Low-Medium magnitude on attributes of these aquatic QI species** from sediment/contaminant laden run-off being released to downstream habitats, particularly if the combined works are carried out during periods of heavy or prolonged rainfall.

No works in close proximity to watercourses are associated with Tinnalintan Substation, or haul route works HR1, HR4 to HR13, and therefore **degradation adverse effects are unlikely** to occur. Haul route works HR2 and HR3 will occur close to the Pococke River, however these minor works will take place within the road corridor, are not likely to result in degradation effects to suitable habitats based on the absence surface pathways to facilitate sediment run-off events into the Pococke River.

When the various elements of the Project are considered all together, it is evaluated that the whole Project has potential to cause the Degradation of suitable habitat within and ex-situ the SAC and has potential to affect the conservation objectives of Atlantic Salmon; White Clawed Crayfish, Twaite Shad, and Lamprey species. It is also considered that the adverse effects to Water Quality, Habitat Quality, Spawning habitat and Juvenile habitat attributes could prevent the achievement of Distribution and Population structures. It is noted that given the abundance of Atlantic Salmon recorded during surveys, any impact via degradation in habitat quality as a result of construction works, **assessed as Low- Medium magnitude**, is not expected to affect abundance of Adult spawning fish, Salmon fry and out-migrating smolt based on the temporary nature of any such effects.

There is also potential for cumulative impacts with other plans and projects in the Nore catchment, due to the release of sediment and contaminants from multiple construction phases.

In summary, there is potential for adverse impact to the conservation objectives for Atlantic Salmon, White Clayed Crawfish, Twaite Shad, Sea Lamprey, River Lamprey and Brook Lamprey as a result of Degradation of suitable habitat, and **therefore, mitigation measures will be required to prevent the reduction in downstream water quality as a release/escape of sediment, nutrients or contaminates from works areas.**

**Other Indirect effects due to Spread of Invasive Species**: As described in Section 2.4.1.4 above, there is a risk that invasive species could be inadvertently spread by groundworks/earthworks, vegetation clearance and movement of machinery, vehicles and materials onto the Project site locations, and that this risk is increased when the other projects and plans in the catchment are taken into consideration. It is evaluated that **the spread of invasive species into downstream water bodies, should it occur, has the potential to cause High magnitude effects which could result in adverse effects on the conservation objectives** for Atlantic Salmon; Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey and White Clawed Crayfish. **Therefore, mitigation measures will be required to avoid the spread of invasive species.**

#### 2.4.1.7 QI: Otter (1355)

Due to its ecological requirements, distribution and vulnerability to the potential project effects, it is evaluated that this QI species has potential to be affected by the development of the Project and is examined below in relation to direct loss, disturbance, degradation, and the spread of invasive species.

**Direct Loss due to mortality**: Although no couching site or holts were identified within 300m of the construction works boundary and Otter was not recorded within the Project construction works areas or within 300m of watercourse crossing points; and not recorded during camera trap deployments, Otter do occur in the wider local area and there is potential for Otter to utilise habitats within and adjacent to the Ballynalacken Windfarm Project site. The nearest aquatic habitat with Otter presence was recorded within the Kilcronan stream, 1.6km North from the closest Project element. Spraints were also recorded within the Biodiversity Protection Area and also across (west) the L5840 local road at the northern end of the windfarm site, 201m West and 292m Northwest, respectively, of T12, and therefore the presence of operating plant and machinery, HGVs and other vehicles during the construction phase results in the potential for direct mortality of animals should they be hit by moving traffic. However, due to Otter generally being absent from the windfarm site, with no sightings or secondary evidence recorded at Tinnalintan Substation, along the cable routes, the limited value of terrestrial habitats at the windfarm site and the unsuitability of the habitats at haul route works locations, it is considered that the number of individuals potentially affected will be **Very Low to Low** magnitude, isolated to a small section of the windfarm site and will have **No effect on the conservation objective attribute for Distribution** (no significant decline).

**Direct Loss due to physical landcover change:** The construction of hardstanding areas (roads, hardstands, compounds) and facilitating works (temporary landcover change at junctions, construction compounds, bat buffer zones) within the construction works area boundary could lead to temporary and permanent loss of suitable habitat ex-situ of the SAC. While most of the locations of landcover change relate to low-suitability improved agricultural grassland and coniferous forestry, there will be some removal of higher value habitats such as riparian habitat at watercourse/drain crossings or adjacent areas of cover in forestry and also as a result of hedgerow removal. These losses mainly relate to the windfarm site, though it is noted that there will be some hedgerow removal associated with the Internal Cable Link. Due to the habitats effected being of low suitability for Otter, the wider area having more suitable habitat that will be undisturbed by the Project and absence of Otter presence within the red line boundary of the Project, it is evaluated that the loss of suitable ex-situ habitat will not adversely affect the conservation objective attribute (Distribution). Due to the location of the Ballynalacken Grid Connection and Haul Route Works along/immediately adjacent to the public road corridor, no direct loss of suitable habitat is expected to occur. When in-combination effects are considered, it is evaluated that there is potential for in-combination effects in the scenario where the other plans and projects take place during the same period as the construction of the Ballynalacken Windfarm Project. However, such impacts are at worst of temporary duration and **Very Low to Low magnitude** and **not likely to affect the conservation objective attribute for Distribution** (no significant decline).

**Disturbance / Displacement**: Otters do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the Summer/early Autumn period). When Otters are not breeding, records suggest that Otters are less sensitive to human disturbance (Chanin, 2013).

The potential to cause disturbance of Otter is greatest during the construction phase of the Project, as sources of this impact (noise and visual intrusion) during the operation and decommissioning phases will be negligible and will not result in adverse disturbance effects to Otter. As evidence of Otter was recorded within 300 of the windfarm site (spraints), and no couching sites or holts were recorded within 300m of the windfarm construction works area boundary, it is considered that a Low number of Otter could be disturbed / displaced by the construction works, the use of plant/machinery, movement of vehicles, noise and the presence of personnel, which has potential to result in a temporary **Very Low to Medium magnitude loss of terrestrial habitat through avoidance (displacement) within the windfarm site**. Due to any displacement being limited to the short term construction works and temporary instances of operational maintenance works and strictly ex-situ of the SAC with the wider environment surrounding the project site being of higher suitability for Otter, it is evaluated that the conservation objective attribute (distribution, extent of terrestrial habitat and couching and holt sites) will not be adversely affected.

Construction works away from the windfarm site will take place in agricultural lands or along/adjacent to public roads and will not result in significant disturbance or displacement. The alternative crossing works related to the W3 crossing (i.e. trenching in deck with parapet wall works or directional drilling under the bridge and watercourse) will take place within 300m of the River Nore. However, it is evaluated that these works will not increase disturbance factors to Otter as the works will be brief (1-2 weeks), reversible in nature with completion of the works, and neither crossing method will involve instream works. In addition, no holts or couching sites were recorded along the Rathduff_15 stream and no other evidence of Otter was recorded during surveys. Given the brief duration (1-2 weeks) of the W3 crossing works and the location of personnel and machinery on the road corridor, and the absence of otter in proximity to the works, it is considered that the grid connection works are **unlikely** to disturb or displace Otter.

Given the separation distance to other projects and plans from the windfarm site, and the abundance of suitable habitat in the surrounding area, **it is considered that any of the unlikely in-combination effects will be negligible in a worst-case scenario.**

During the operational phase, noise from the wind turbines are **unlikely** to displace Otter. The presence of works and personnel during the operational and decommissionings phases will mainly take place at the turbines and at substations, and therefore away from watercourses and wet drainage channels and any disturbance or displacement will be brief and unlikely to affect conservation objectives for this QI species.

There is potential for the new fences erected around the footprint of the windfarm to result in operational phase disturbance or fragmentation of Otter, however the use of bottomless culverts will reduce the magnitude of effects, and it is evaluated that operational ex-situ displacement impact would be permanent but of Low magnitude due to the wider environment remaining unaffected for Otters to commute between watercourses and the areas affected being entirely ex-situ of the SAC site. As such, these impacts will not adversely affect the attribute (**Distribution**).

Overall, it is considered that there is potential to adversely affect the a**ttributes relating to Distribution and Extent of Terrestrial habitats** ex-situ of the SAC site under the precautionary principle. **Therefore, mitigation measures will be implemented to minimise the significance of the unlikely negligible effect to No effect**.

**Degradation of suitable habitat due to reductions in water quality**: Reductions in water quality can affect habitat quality and prey item availability for Otter. Increases in sediment within suitable habitat downstream of the windfarm site could also cause a direct loss of suitable otter couching sites, and of freshwater habitats, which could impact on species distribution. However, Otter hunt a wide variety of prey, and significant reductions in downstream water quality, including sedimentation, are not expected to occur as a result of runoff from the Project construction site as any such run-off is not expected to exceed negligible levels from any of the watercourse crossings and therefore it is evaluated that any effects on prey item species availability are **low and unlikely** to affect couching sites potentially located within the Kilcronan or Owveg waterbodies. Therefore, secondary effects on local Otter populations are unlikely to occur.

**Other Indirect effects due to Spread of Invasive Species**: As described in Section 2.4.1.4 above, there is a risk that invasive species could be inadvertently spread by groundworks, vegetation clearance, movement of machinery, vehicles and materials onto the and around the Project site, and that this risk is increased when the other projects and plans in the catchment are taken into consideration. It is evaluated that **the spread of invasive species into terrestrial habitats and in downstream water bodies, should it occur, has the potential to cause Medium magnitude effects which could result in adverse effects to the following attributes with potential permanent changes:** Distribution, Extent of terrestrial habitat, Extent of Freshwater habitat (river), Couching Sites and Holts.

**Therefore, mitigation measures will be required to avoid the spread of invasive species.**

### 2.4.1.8 Summary of the Implications of the unmitigated Project on the River Barrow and River Nore SAC

Following the impact assessment of likely and potential adverse effects as a result of the Proposed Ballynalacken Windfarm Project – both alone and in combination, in the absence of appropriate mitigation measures, a number of QI species and habitat attributes are vulnerable to adverse effects, as summarised in the table hereunder.

| **Qualifying Interest** | **Is the Project likely, or does it have potential, to adversely affect the conservation objectives.** | | | |
|---|---|---|---|---|
| | **Direct Loss** | **Degradation** | **Disturbance/ Displacement** | **Spread of Invasive Species** |
| Estuaries (1130);<br>Mudflats and Sandflats not covered by seawater at low tide (1140);<br>*Salicornia* and other annuals colonising mud and sand (1310);<br>Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330);<br>Mediterranean salt meadows (*Juncetalia maritimi*) (1410)<br>European dry heaths (4030);<br>Petrifying springs with tufa formation (*Cratoneurion*) (7220);<br>Killarney Fern (1421)<br>Desmoulin's whorl snail (1016) | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. |
| Water courses of plain to montane levels with *Ranunculion fluitantis and Callitricho-Batrachion* vegetation (3260);<br>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | Yes - the spread of invasive species into downstream water bodies, should it occur, has the potential to cause High magnitude effects which could result in adverse effects on the conservation objectives. The highest risk is associated with the construction phase, however this risk also relates to the operational and decommissioning phases. |

| **Qualifying Interest** | **Is the Project likely, or does it have potential, to adversely affect the conservation objectives.** | | | |
|---|---|---|---|---|
| | **Direct Loss** | **Degradation** | **Disturbance/ Displacement** | **Spread of Invasive Species** |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)*;<br><br>Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) | | | | |
| Freshwater Pearl Mussel (1029) / Nore Freshwater Pearl Mussel (1990) | No likelihood for the Project to adversely affect the conservation objectives. | Yes - there is potential for the unmitigated whole Project to contribute to further degradation or deterioration of habitat of downstream waterbodies during the construction phase (particularly during periods of heavy or prolonged rainfall) and therefore there is potential for Short term Very Low-Medium magnitude adverse effects to conservation objective attributes as a result of construction works associated with the whole Ballynalacken Windfarm Project and other plans and projects | No likelihood for the Project to adversely affect the conservation objectives. | Yes - the spread of invasive species into downstream water bodies, should it occur, has the potential to cause High magnitude effects which could result in adverse effects on the conservation objectives for the Nore Freshwater Pearl Mussel/Freshwater Pearl Mussel. The highest risk is associated with the construction phase, however this risk also relates to the operational and decommissioning phases. |
| Atlantic Salmon (1106),<br><br>Twaite Shad (1103),<br><br>Sea Lamprey (1095),<br><br>Brook Lamprey (1096),<br><br>River Lamprey (1099),<br><br>White Clawed Crayfish (1092) | No likelihood for the Project to adversely affect the conservation objectives. | Yes - there is potential for the unmitigated whole Project to contribute to further degradation or deterioration of habitat of downstream waterbodies during the construction phase (particularly during periods of heavy or prolonged rainfall) within and ex-situ the SAC. There is also potential for other projects and plans to cause in-combination effects. | No likely/no likelihood for the Project to adversely affect the conservation objectives. | Yes - the spread of invasive species into downstream water bodies, should it occur, has the potential to cause High magnitude effects which could result in adverse effects on the conservation objectives for Atlantic Salmon; Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey and White Clawed Crayfish. The highest risk is associated with the construction phase, however this risk |

| Qualifying Interest | Is the Project likely, or does it have potential, to adversely affect the conservation objectives. | | | |
|---|---|---|---|---|
| | **Direct Loss** | **Degradation** | **Disturbance/ Displacement** | **Spread of Invasive Species** |
| | | | | also relates to the operational and decommissioning phases. |
| Otter (1355) | No likely adverse effect to the conservation objective Distribution | No likely adverse effect to the conservation objectives | Yes - there is potential for operational boundary fences to adversely affect the attributes relating to Distribution and Extent of Terrestrial habitats ex-situ of the SAC site under the precautionary principle. | Yes - the spread of invasive species into terrestrial habitats and in downstream water bodies, should it occur, has the potential to cause Medium magnitude effects which could result in adverse effects to the following attributes with potential permanent changes: Distribution, Extent of terrestrial habitat, Extent of Freshwater habitat (river), Couching Sites and Holts. The highest risk is associated with the construction phase, however this risk also relates to the operational and decommissioning phases. |
| | | | | |

#### 2.4.1.9 Requirement for Mitigation Measures

The potential for adverse impacts on the integrity of the River Barrow and River Nore SAC cannot be ruled out in relation to

(i) degradation of habitats due to the release of sediment/contaminant-laden runoff from construction works areas (construction phase);
(ii) displacement of otter (operational phase)
(iii) the risk of spread of invasive species (all phases).

Mitigation measures are proposed for the Ballynalacken Windfarm Project in order to remove, pre-empt or reduce the impacts identified in the appropriate assessment evaluation to a level where they will no longer affect the integrity of the SAC site.

These mitigation measures are presented in Section 2.4.2 hereunder.

## 2.4.2 Mitigation Measures for the River Barrow and River Nore SAC

Mitigation measures are proposed for the Ballynalacken Windfarm Project in order to remove, pre-empt or reduce the impacts identified in the appropriate assessment to a level where they will no longer affect the integrity of the River Barrow and River Nore SAC.

### 2.4.2.1 Sediment/Contaminant-laden Runoff Measures

The following measures will be implemented during the construction phase, through the Environmental Management Plan and under the supervision of the Environmental Clerk of Works, who will be responsible for monitoring the implementation and effectiveness of the mitigation and monitoring measures.

The residual effect of the Project on the integrity of the SAC follows the table.

| ID | Description of the Measure | Effectiveness of the measure |
|---|---|---|
| Design | Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones) | This design measure minimised the extent of works in close proximity to sensitive hydrology features. |
| Design | Avoidance of areas of peat | No works will take place within peatland habitats. This measure will prevent any underground water pathways being damaged or contaminated via peaty soil into watercourses with connectivity to the designated sites considered. |
| Design | No temporary storage of overburden in the Owveg_Nore_040 Catchment | This measure will mimimse the possibility of sediment run-off entering the same catchment as the area of the SAC hosting the known distribution of FPM and the River Nore SPA. |
| Design | Construction and installation of the site drainage network | This is an accepted design measure to ensure the drainage of surface water runoff from construction, operational and decommissioning works flow to areas part of the sediment catch netting and other measures design to prevent any sediment run-off offsite into WFD waterbodies of local importance or higher within the wider receiving environment. |
| Design | Implementation of the Surface Water Management Plan | The SWMP will implement mitigation principles described in the EIAR designed to ensure that work is carried out with minimal impact on the water environment. |
| Design | At D1, the existing wet drainage channel will be permanently diverted for a short distance so that it is at least 25m away from the turbine foundation, an interceptor drain will be constructed between the works area and the diverted section of the watercourse. | This drain is an existing forestry drain of negligible flow. The installation of hardstand and other cement works require this drain be rerouted around the hardstand. This will minimise the extent of construction dust being flushed by rain into the drain and by extension downstream into the |

| | | |
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| | | Cloghnagh_010 stream. This will allow the drain to flow without interaction with the new permanent artificial surfaces. |
| SM02 | Confirmatory surface water quality monitoring will be carried out prior to the commencement of construction works at the water quality monitoring locations to determine the current status of surface water quality in downstream watercourses. This monitoring will include laboratory analysis of water samples which will be carried out by an independent and appropriately certified laboratory. The monitoring of water quality parameters and collection of samples will be undertaken by the Environmental Clerk of Works, who will be appropriately trained on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan. Records will be kept of biological and chemical monitoring undertaken carried out prior to the commencement of construction works. | Pre-construction monitoring prior to any works commencing near surface water locations will allow works and plans to be the most accurate to avoid and prevent contaminant or sediment release that could contribute impacts to the designated sites downstream of the Ballynalacken Windfarm Project. |
| SM11 | The construction Method Statements to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Environmental Manger prior to the commencement of construction works. | Following the refinement, design and implementation of mitigation measures, minimal sediment or contaminants will enter downslope watercourses, habitats will be maintained through restoration and the construction and design of new culverts will ensure free passage of fish and aquatic species. Therefore, any potential negative impacts on downstream waterbodies, aquatic habitats or species will be Negligible. |
| SM12 | All construction works will be monitored for compliance with the Environmental Management Plan by the project Environmental Management Team which will include an Environmental Clerk of Works, the Project Ecologist and specialists such as a hydrologist, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager. | This measure is the key compliance measure to ensure all mitigation measures are employed properly and appropriately. In addition, the presence of a ECoW and ecologist will facilitate the Project Manager to be alerted to any emergent changes during the construction phases (i.e. changes in soil integrity surrounding work area, weather changes impact timing of works at watercourses and drains) |
| SM14 | A suitably qualified engineer will supervise all windfarm site excavations and construction works. | This will ensure that all such works are undertaken in accordance with best practise and in such a way as to minimise the potential for pollution (aquatic and air quality) and minimise disturbance. |
| SM15 | The windfarm drainage network will be inspected regularly during the construction phase under the following schedule: Daily visual inspections by the Contractor of silt fencing and settlement ponds; Weekly inspections by the Contractor of the drainage network; Monthly site inspections of the | Regular inspections of drainage network will facilitate the monitoring of any unforeseen sediment build up and allow construction crew to amend actions to prevent further build up and ensure drainage network is flowing neatly and cleanly in line with the intended pathways. |

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| | drainage network by the Project hydrologist during construction phase and for a period of 6 months following construction; Event based inspections by the Contractor as follows: >10 mm/hr (i.e. high intensity localised rainfall event); or >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day); or, rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).<br>All inspections will include all elements of the drainage systems to ensure that the systems are operating correctly. Inspections will examine the functioning of the various elements of the drainage system, and if evidence of sedimentation or scouring and any changes in the drainage water including discolouration, odour, oily sheen or the presence of litter, then the required corrective maintenance or actions will be identified and will be implemented immediately the Contractor. | |
| SM16 | Surface water quality monitoring of watercourses downstream of the works will be carried out at regular intervals by the Environmental Management team during the construction phase. This monitoring will be carried out at the water quality monitoring locations to check that the pre-construction downstream water quality status is maintained. The monitoring of water quality parameters and collection of samples will be undertaken by the Environmental Management team, who will be appropriately trained on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used. Laboratory analysis of water samples will also be undertaken as part of the monitoring programme by an independent and appropriately certified laboratory. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan.<br>If monitoring identifies sediment or contaminant polluted waters, then the Environmental Clerk of Works will have a 'stop-works' authority to temporarily stop construction works at the Project site in order to establish the cause of the pollution, and if caused by the Project, then the Contractor will implement the necessary actions and measures to resolve the cause of the pollution. In addition, a mobile 'Siltbuster' or similar equivalent specialist treatment system will be used at the windfarm site within the Owveg River catchment and can be mobilised on-site (wind farm site) at short notice for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. | Regular inspections will facilitate the monitoring of any unforeseen sediment build up and allow construction crew to amend actions to prevent further build up and ensure the surface water network is flowing neatly and cleanly in line with the intended pathways. |

| | | |
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| | Records will be kept of biological and chemical monitoring undertaken before, during and after the works. Records will also be kept of inspections of proposed surface water mitigation measures. These records will be made available upon request to any authorised person as defined under the Local Government (Water Pollution) Acts. | |
| SM20 | The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site. | This is a best practice measure to ensure all ecological receptors and sensitivities are considered for all works proposed and to ensure all targeted mitigation measures to prevent adverse effects on QI and SCI receptors are adhered to and implemented in full. |
| MM01 | The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences. | This measure will prevent any expansion of construction works impacts beyond the established Construction Works Area Boundary. This is an accepted measure to prevent works expanding beyond the consented areas for machinery and human activity where the pathways and potential impacts were not considered for additional adverse effects.<br><br>This measure will ensure that the only adverse effects needing mitigation are the ones considered within the relevant works area boundaries provided for the development. |
| MM02 | Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings | This measure will prevent any expansion of construction works impacts beyond the established Construction works Area Boundary. This is an accepted measure to prevent works expanding beyond the consented areas for machinery and human activity where the pathways and potential impacts were not considered for additional adverse effects.<br><br>This measure will ensure that the only adverse effects needing mitigation are the ones considered within the relevant works area boundaries provided for the development. |
| MM03 | Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged. If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer. | Carrying out reinstatement works during very wet weather can result in sediment run off occurring in potential significant levels. All efforts should be to conduct work in weather and conditions that limit or reduce any such run-off potential. This measure will ensure even unlikely worst-case scenario effects are of negligible to no effect on the integrity of the SACs QIs. |
| MM05 | During windfarm construction works, excavations will be backfilled as soon as is possible. | Backfilling is a recommended and accepted measure to prevent any substantial change to the receiving environment at landscape level. |
| MM06 | During windfarm construction works, excavated material will be removed for temporary or permanent storage at designated berms and with the exception of T3 and Borrow Pit No.2, will be placed more than 50m away from any watercourse or wet drainage feature. Temporary silt control methods such as silt fencing will be placed around all overburden storage | This measure will remove any potential for excavated sediment to experience surface run-off should a rain event occur before backfilling of excavations takes place. Silt control and vegetative buffers are key measures to avoid the potential for any adverse effects from both likely and unlikely impacts. |

| | | |
|---|---|---|
| | areas and the existing vegetative between the berms and watercourse / drainage features will be left in place. | |
| MM07 | All storage berms will be graded and sealed following emplacement. Topsoil and subsoil will be stockpiled separately. The upper vegetative layer (where still present) of excavated soil will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the stored spoil within the storage areas. Re-seeding will also be carried out in these areas. Measures such as interceptor ditches around the bases of these areas, sediment traps, covering of berms will also be incorporated to prevent runoff of suspended solids, dust and soil erosion. | This measure will minimise the potential for mobilisation of silts, sediments and/or dust through the establishment of vegetation. |
| MM08 | Along the cable route on the public road, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the Waste Management Plan. The excavated material will be covered during transportation to prevent spillages and reduce dust. | Public road excavations will include concrete/Tarmac type material with other contaminant material likely present. Removing is material, removes the source of impact. The covering of this material in transit will prevent any dropping/spiling of material that would be considered to have a likely harmful effect on the receiving environment due to the carcinogenic nature of these materials. |
| MM09 | All excavations which are unsuitable for use as construction/reinstatement material which arise within the catchment of the Owveg River (T9, T10, T11 and T12 and associated Windfarm Site Roads) will not be stored within the catchment, instead these arisings will be transported to the temporary deposition area at Borrow Pit No.2 and at Turbine T7 (both located outside of the Owveg River catchment). In addition, a Siltbuster or other suitable treatment train will be used to remove fine silt particles from site runoff in this catchment. The Siltbuster will be set up at works locations and used during groundworks and earthmoving activities. | This measure will prevent any possibility of sediment run-off from temporary soil storage areas from entering the same catchment as the area of the SAC via the Kilcronan steam which is within the catchment. |
| MM10 | At the windfarm site, at works locations within 50m of watercourses or existing drainage features there will be additional mitigation measures deployed including double silt fencing prior to the commencement of the works, temporary drain blocking in existing drains, placement of silt trapping arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting. Works will not take place within this zone during prolonged heavy or exceptional rainfall events. | These measures are additional and precautionary to avoid even a negligible event of sediment run-off resulting from windfarm site affiliated works near D1, D2, D3, D4 or W1. |
| MM11 | Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided. | This measure will prevent any works taking place near watercourses during periods which are more likely to cause significant run-off, particularly associated with excavation works or transport of excavation material to storage locations. |

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| MM12 | Windfarm site roads and hardstanding areas are designed to have a permanent surface water drainage network in place. Temporary works areas, including the borrow pits and temporary compounds will have a temporary surface water drainage network in place during works. The drainage infrastructure will not be installed during heavy or prolonged rainfall events or when the soil is waterlogged. The site drainage network will ensure that all surface water runoff from upgraded roads and new road surfaces (including hardstand areas) will be captured and treated prior to discharge/release. Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains; The site drainage network will include check dams and settlement ponds which will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas. Water will be released to surrounding vegetation at regular intervals via buffered outfall weirs, which also form part of the drainage network. | These measures will avoid even a negligible event of sediment run-off resulting from the use of site roads and operation of borrow pits via surface runoff by capturing and treating water before it can interact with drains or watercourses downstream of the works. |
| MM13 | It is proposed that bedrock won from the on-site borrow pits during the construction phase (i.e. sandstones) will only be used to construct the sub-base layer of proposed upgraded and new access roads and hardstand areas. Once installed the sub-base layer will be overlain by a capping layer of clean high-grade bedrock, such as limestone, which will be sourced from local quarries. This will be ongoing during the operational phase as during road maintenance. | This measure will ensure the long term integrity of the project artificial surfaces and minimise any dust/sediment runoff throughout the life cycle of the project. |
| MM14 | At the windfarm site, where dewatering of excavations is required, no freshly pumped water will be permitted to enter the existing drainage network directly or be pumped out onto adjacent habitat. Rather, all pumped water will be treated prior to discharge using an infiltration trench or settlement pond or suitable water treatment train such as a Siltbuster, as appropriate. | These measures will avoid even a negligible event of sediment run-off resulting from the site via surface runoff by capturing and treating water before it can interact with drains or watercourses downstream of the works. |
| MM15 | Along the cable routes, where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be discharged via a silt bag. | These measures will avoid even a negligible event of sediment run-off resulting from cable route works via surface runoff by capturing and treating water before it can interact with drains or watercourses downstream of the works. |
| MM17 | New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning. | These measures will prevent the need for any instream/dam and overpump works to install culverts at the windfarm, and will avoid any changes to the existing structure and depths of the drains and stream . |

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| MM18 | In-stream works will not be undertaken without isolation of flow within the watercourse. A pre-works survey will be carried out by the Project Ecologist and any fish, if present, within the isolated section will be removed using electrofishing and transferred immediately downstream of the crossing point and placed back in the water. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods. | These measures will prevent the mobilsation of sediments as a result of any in-stream construction activities. |
| MM19 | At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer. | These measures will ensure that existing flow characteristics of watercourses will be reinstated and hydrological regimes downstream of the proposed operations will be unaffacted. |
| MM20 | Only precast concrete culverts will be used for new watercourse crossing structures on the windfarm site. Only precast concrete chambers will be used at Joint Bay locations. | This measure is to avoid setting of wet cement in close proximity to watercourses where the integrity of the cement culvert could be compromised prior to or during installation. |
| SM18 | The plant and machinery will be regularly inspected for leaks and maintained in good working order for the duration of the works. | This measure is a key measure to ensure any accidental spills/leaks of hydrocarbons are caught immediately. This measure is majorly effective in removing the likelihood for machinery to be a source of habitat degradation impacts. |
| SM19 | Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage. | This measure is a key measure to ensure any accidental spills/leaks of hydrocarbons are caught immediately. This measure is majorly effective in removing the likelihood for storage areas to be a source of habitat degradation impacts. |
| MM21 | <u>Concrete control procedures</u> will be implemented and will include the following:<br>• No batching of concrete will take place on site, all concrete will be ready-mixed and delivered to site just-in-time;<br>• Dry granular cement will be used in the grid connection cable trench, and for internal cable trenches where they occur within the public road corridor;<br>• The pouring of concrete will be scheduled for dry days. If a sudden rainfall event should occur, then plastic covers will be ready and available at the pour site to cover the concrete. | This measure is to avoid wet cement being flushed out to watercourses where the integrity of the cement could be compromised prior to or during installation of hardstands and other foundations or flow into watercourses with connectivity to the SAC. |

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| | • The pour site will be kept free of standing water;<br>• A designated trained operator experienced in working with concrete will be employed during the concrete pouring phase;<br>• Run-off from wind turbine foundation concrete pours will not be permitted to flow over adjacent lands or enter drainage channels. The run-off will be contained within the foundation area and pumped into a skip to settle out; settled solids will be appropriately disposed of off-site.<br>• Concrete trucks will be washed out at the supplier's facilities and not on site. The only concrete washing that will occur on site is the hand washing of the chutes at the rear of the trucks. Washing of chutes will only take place at the designated area and into a Roadside Concrete Washout unit. For the cabling sites along the public road, the rear chutes will be washed out at the works locations into the cable trench.<br>• No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed | |
| MM22 | <u>Fuel/Oil control procedures</u> will be implemented and will include the following:<br>• On site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double axel custom-built refuelling trailer, will be refuelled off-site, and will be towed around the site by a 4x4 jeep to where machinery is located. The 4x4 jeep will carry fuel absorbent material and pads in the event of any accidental spillage. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.<br>• In addition, spill response apparatus including spill-kits and fuel absorbent mats will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment and in the implementation of the Emergency Response Plan, as contained in the Environmental Management Plan.<br>• The fuel bowser will be parked on a level area, away from main traffic activity, in a designated part of the construction compounds when not in use. Taps, nozzles or valves associated with mobile fuel bowser will be fitted with a lock system. Only designated trained and competent operatives will be authorised to refuel plant on site. A Permit to Fuel system will be put in place. | This measure is a key measure to control the use/handling of fuels and oils, and to ensure any accidental spills/leaks of hydrocarbons are caught immediately . This measure is majorly effective in removing the likelihood for refuelling or use of oils/fuels on the construction site to be a source of habitat degradation impacts. |

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| MM23 | There will be no refuelling of vehicles or plant permitted within 100m of a watercourse or wet drainage channel or local spring/well. | This measure is a key measure to ensure any accidental spills/leaks of hydrocarbons are caught immediately and prior to any works adjacent to or within 100m of a surface water pathway. This measure is majorly effective in removing the likelihood for refuelling activities to be a source of habitat degradation impacts. |
| MM24 | All fuels or oils, required during construction, will be stored in a designated, bunded, locked storage area within the temporary compounds. All fuel storage areas will be bunded appropriately to 110% of the volume of oils/fuels each area contains for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area. Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage. Safety data sheets for all chemicals used will be kept on-site. An emergency response plan for the construction phase to deal with accidental spillages is contained within the Environmental Management Plan. | This measure reduces the risk to water quality through isolation and containment of potential contaminative materials and by ensuring any accidental spills/leaks of hydrocarbons are caught immediately. This measure is highly effective in removing the likelihood for accidental spillage to be a source of water quality and habitat degradation impact. |
| MM25 | Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourse/drainage features and at an existing hard-core surface. Drip trays and fuel traps will be used under and around parked plant and machinery to contain any leaks. | This measure reduces the risk to water quality through separation distance, and by ensuring any accidental spills/leaks of hydrocarbons are caught immediately. This measure is majorly effective in removing the likelihood for machinery to be a source of habitat degradation impacts. |
| MM26 | All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (2000) and the 'Forestry and Water Quality Guidelines '(2000). Measures will include the protection of the riparian zones, installation of buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented. All excess felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses. | These measures are accepted methods of catching and preventing the runoff of excess phosphate levels downstream via surface water pathways. These measures remove the likelihood and even in a worst case scenario reduce any potential adverse effect to negligible to any Annex I habitat or Annex II within the SAC or ex-situ. |
| MM27 | In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016). | This measure is an accepted means to ensure the drains are as dry as possible at the time of works, removing any downstream likelihood for the low magnitude impact to actually occur. Removing its likelihood. and therefore removing the adverse effect from occurring as a result for the project. |
| MM28 | Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather. | This measure is an accepted means to ensure the watercourse isas dry as possible at the time of works, removing any downstream likelihood for the low magnitude impact to actually occur. |

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| | | Removing its likelihood and therefore removing the adverse effect from occurring as a result for the project. |
| MM71 | The horizontal directional drilling works at W3 will be carried out when the Rathduff_15 is in its dry state, to ensure that the works are carried out under a dry stream bed. The drilling works will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized watertight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures;<br>• In the event of break-out occurring in the stream bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures;<br>• In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point;<br>and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the Ballynalacken Grid Connection Environmental Management Plan. | These measures are accepted best practice to prevent and manage any breach to a riverbed during direction drilling works. Given the timing of the works will be at a period when this stream is dry, these measures are unlikely to be needed but will be sufficient to mitigate any potential breach or contamination event. |

#### 2.4.2.2 Spread of Invasive Species Measures

The following measures will be implemented to reduce the risk of spreading invasive species during all phases of the Project. These measure will be implemented through the Environmental Management Plan and under the supervision of the Environmental Clerk of Works during the construction phase, and under the supervision of the Asset Manager during the operational and decommissioning phases. The Environmental Clerk of Works and Asset Manager will be responsible for monitoring the implementation and effectiveness of the mitigation and monitoring measures.

The residual effect of the Project on the integrity of the SAC follows the table.

| ID | Description of the Measure | Effectiveness of the measure |
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| SM03 | No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however pre-construction surveys of the Construction Works Areas plus 7m will be carried out in order to determine if any new infestations have been established in the interim period. These pre-construction confirmatory surveys for invasive species will be carried out by the Project Ecologist to accurately determine the extent of new invasive species infestations. Mapping, showing the most up to date distribution and extent of each infestation, will be distributed to the Environmental Clerk of Works and to the Project Engineer. | These pre-construction surveys will confirm the identified locations of invasive species have not expanded or changed between the time of submission for planning and the commencement of of construction works. |
| SM20 | The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site. | This measure is the key compliance measure to ensure all mitigation measures are employed properly and appropriately. In addition, the presence of a ECoW and ecologist will facilitate the Project Manager to be alerted to any emergent changes during the construction phases (i.e. appearance of new invasive plant species locations) |
| SM21 | No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however should a new infestation of invasive species be established in the interim period, any excavation works in close proximity (7m) to the new infestation location will be carried out under the direct supervision of an ecologist with prior experience of this type of work. | These are best practice measures related to managing invasive species that change their locations, or related to new infestations which have established, between the time of surveying for invasive plant species and the commencement of construction works. |
| SM22 | Visual inspections will be carried out by the Contractor on all machinery and equipment (particularly for machinery and equipment which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for | This is the accepted practice to ensure machinery and personnel do not inadvertently cause the transportation of invasive species either within the construction area sites or across the wider receiving environment. |

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| | removal to the waste storage area in the temporary construction compound at the Ballynalacken site. | |
| MM02 | Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings | This is the accepted practice to ensure machinery and personnel do not inadvertently cause the transportation of invasive species either within the construction area sites or across the wider receiving environment |
| MM29 | The infestation of Cherry Laurel will be removed prior to the commencement of construction works. Any plant material and stems and roots treated with herbicide and any remains disposed of via biohazard best practice with regards to managing invasive plant species in accordance with Maguire *et al. (*2008). | This biosecurity measure is in line with best practice for construction works to prevent the expansion and/or spread of invasive plant material. |
| MM30 | No Japanese Knotweed was recorded within the Construction Works Area Boundary during pre-planning surveys, however, should a new infestation of Japanese knotweed within 7m of works, then the infestation will be covered with high density polyethylene grass carpet terram prior to any works commencing at the location. The covering of any new infestations will only be carried out under the direct supervision of an ecologist with prior experience of this type of work, and the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species. | This biosecurity measure is in line with best practice for construction works to prevent the expansion and/or spread of invasive plant material. |
| OMM06 | Prior to works along cable routes or public road works for turbine component transportation, the works locations will be surveyed for invasive plant species. Should a new infestation be identified, then the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species. | This biosecurity measure is in line with best practice for operation works to prevent the expansion and/or spread of invasive plant material. |
| DMM02 | Before any reopening/re-widening of site entrances, haul route works locations or turbine hardstands to accommodate the removal of large turbine components, the works locations will be surveyed for invasive plant species infestations and should any be present within 7m of the works, then the works within 7m of the infestation will be under the direct supervision of an ecologist with prior experience of invasive species. | This biosecurity measure is in line with best practice for decommissioning works to prevent the expansion and/or spread of invasive plant material. |

#### 2.4.2.3 Displacement of Otter due to Fencing Measures

The following measures will be implemented during the construction and operational phase, through the Environmental Management Plan and under the supervision of the Environmental Clerk of Works (construction phase) and Asset Manager (operational phase), who will be responsible for monitoring the implementation and effectiveness of the mitigation and monitoring measures.

The residual effect of the Project on the integrity of the SAC follows the table.

| ID | Description of the Measure | Effectiveness of the measure |
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| Design | Otter friendly/mammal gates will be installed along points of fencing once any invasive works related to construction phase are completed to facilitate Otter commuting between the watercourses and drains on the windfarm site during the operational phase of the project. | This measure is not supposed to prevent any impact given this effect was determined unlikely to occur or pose greater than a negligible adverse effect on Otter conservation objectives in worst case scenario. This measure is an accepted measure to facilitate mammal commutes between suitable habitats remain possible over the duration of the construction and operational phases. |

### 2.4.3 Residual Effects on the Integrity of the Natura 2000 sites

Given the unlikelihood of sediment run-off to occur, the mitigation measures provided above are appropriate and comprehensive to prevent any such effects from resulting in even a negligible magnitude adverse effect on receptors listed as QIs of the River Barrow and Nore SAC.

The spread of invasive species is a common and increasing impact source from developments across Ireland. In the absence of mitigation, this impact almost always poses low to high magnitude adverse effects on sensitive receptors. The measures provided above are accepted best practice to manage and prevent this impact from occurring. As such, these measures remove any potential for invasive species spread within the boundaries of the SAC or within watercourses/habitats in use by QI species ex-situ of the SAC.

Following the implementation of the mitigation measures, based on the accepted best practice standards and our experience of supervising and reviewing the implementation and operation of such measures, it can be concluded that the Proposed Ballynalacken Windfarm Project will not result in adverse effects on the integrity of the River Barrow and River Nore SAC, in circumstances where no reasonable scientific doubt remains.

Following the implementation of the mitigation measures, including the timing of works at W3, which are based on the accepted best practice standards and considering the effectiveness of these measures, there will be no residual effects related to cumulative interactions that pose risk for adverse effects. As such, it can be concluded that the Proposed Ballynalacken Windfarm Project will not result in cumulative adverse effects with other plans or projects on the integrity of the River Barrow and River Nore SAC, in circumstances where no reasonable scientific doubt remains.

## 2.5 Implications of the Project on the River Nore SPA [004233]I

The River Nore SPA is designated for the protection of Kingfisher (A229).

An examination of the potential for the Proposed Ballynalacken Windfarm to adversely affect the conservation objectives of the River Nore SPA has been carried out and is included as AA Appendix 4 to this Report.

The findings of this evaluation in relation to the sole Special Conservation Interest (SCI) species, Kingfisher, is presented in the subsections below. The potential for Direct Loss (via direct contact/mortality or through physical removal); Disturbance and Displacement; Degradation (via reductions in Water Quality); and Other Indirect Effects (via the Spread of Invasive Species) has been examined in relation to conservation attributes and targets for the SCI. Each phase of the life cycle of the Project has been considered.

The evaluation is based on the nature, scale and location of the Project, including the aspects of the Project which have potential to give rise to adverse impacts on the Natura 2000 site; and on the ecological requirements of the Special Conservation Interest species, its vulnerability to the potential project impacts, and its locational context, i.e. the known locations of the SCI species along with the known and potential locations of suitable habitats for this species both within and ex-situ the SPA. The Project is examined in the absence of mitigation measures and the evaluation includes an examination of the likelihood and magnitude of effects in relation to the various elements of the Project, both individually and in-combination as a whole project, and evaluates the potential for in-combination effects with other plans and projects.

This SCI species is examined below in relation to the implications of the Project in view of its conservation objectives – i.e. the attributes and targets.

### 2.5.1 Implications of the Project on the Special Conservation Interest species

#### 2.5.1.1 Kingfisher (A229)

**Direct Loss due to mortality/physical contact or due to physical loss of suitable habitat**: it is evaluated that there is **no likelihood of direct loss** or fragmentation of this SCI species or suitable habitat for nesting or foraging due to

(i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SPA, and
(ii) furthermore no areas with suitability for Kingfisher nesting or foraging were recorded within the Project site boundary. The nearest suitable habitat is located along the River Nore within the SPA downstream of the W3 crossing.

Watercourse/drain crossings and works in close proximity to watercourses or wet drainage channels are limited to the Ballynalacken Windfarm site (1 natural watercourse crossing at W1, 4 wet drainage channel crossings D1 – D4), the Internal Cable Link (W2) and the Ballynalacken Grid Connection (W3). The potential for direct loss effects is limited to the construction phase of the Project, as no works will be required at watercourses or wet drainage channels during the operational or decommissioning phases. Due to the separation distance of the Tinnalintan Substation, windfarm met mast, and haul route works from watercourses, it is considered that there is no potential for direct loss effects as a result of the development of these Project elements.

No Kingfisher were recorded during any bird surveys, or during Kingfisher habitat surveys along watercourses connected to the Project site. The watercourse and wet drainage channels within the Project site were examined for suitability for Kingfisher. These watercourses and wet drainage channels are shallow and narrow (0.5m at W1 on Cloghnagh headwater stream, 0.5–1m wet drainage channels, 1 – 2m on the Rathduff_15). Furthermore, the Rathduff_15 is non-perennial in nature and is dry for part of the year. Although the W3 crossing occurs c.180m upstream from the River Nore SPA, no suitable habitat occurs at the bridge crossing and only the lowest section of this watercourse (close to its confluence with the River Nore) provides some low suitability for nesting Kingfisher. Due to the fact that this stream is dry for part of the year, it is considered sub-optimal as foraging habitat for Kingfisher and unsuitable for nesting or roosting habitat. It was concluded that none of the watercourses or wet drainage channels within the Project site are of high fisheries value and all are considered sub-optimal as foraging habitat for Kingfisher and unsuitable for nesting or roosting habitat.

No instream works will occur in natural watercourses, the new crossing at W1 in the Cloghnagh stream will use a bottomless culvert as the new crossing structure, while the cabling works at W2 will cross the Rathduff_15 at the existing culvert and road bridge with no requirement for instream works and cabling works at W3 will be carried out either in the deck of the bridge or by directional drilling under the bridge and watercourse. Therefore, due to the absence of Kingfisher at the Project site, and due to the absence of suitable habitat, this species is considered not likely to be present in close proximity to works. Due to the distance of the turbines and met mast from watercourses (min 50m), the separation distance to suitable Kingfisher habitat (4km), the typical flight heights of Kingfisher (<15m above ground), it is evaluated that collision of Kingfisher with operating turbines is highly unlikely to occur. It is evaluated that there is **no likelihood of Direct Loss due to mortality/physical contact with Kingfisher or through physical loss, reduction or fragmentation of suitable Kingfisher nesting, roosting or foraging habitat.**

Taking into account that the Ballynalacken Windfarm Project has no likelihood of Direct Loss effects to Kingfisher, it is considered that cumulative effects with other plans and projects are not likely to occur.

**Disturbance or Displacement due to watercourse crossing works or works in close proximity or due to loss of suitable habitat:** Surveys of watercourses and of the existing drains potentially affected by Project elements confirm that sub-optimal foraging habitat and no suitable nesting or roosting habitat occurs at, or in proximity to, watercourse or wet drain crossing locations, or within the site boundary of the Project, and therefore disturbance or displacement of Kingfisher is not likely to occur. It is noted that one watercourse crossing (W3 over the Rathduff_15) occurs upstream from the River Nore SPA, with only the lowest sections of this watercourse (immediately upstream of its confluence with the River Nore) providing some low suitability for nesting Kingfisher, due to the fact that this stream is dry for part of the year and the brief/temporary duration of works at/in close proximity to W3, it is considered that disturbance/displacement impacts are unlikely to occur. It is therefore assessed that the development of **the Project will not result in any disturbance or displacement effects to Kingfisher** within or ex-situ the SPA.

Taking into account that the Ballynalacken Windfarm Project will not result in any disturbance or displacement effects to Kingfisher, it is considered that cumulative effects with other plans and projects are not likely to occur.

**Degradation via Reductions in Water Quality or change in Water Quantity:** There are 3 No. watercourse crossings and 4 No. drain crossings that intersect with the Ballynalacken Windfarm Project. None of these aquatic habitats were of high fisheries value where the works are planned. All of these watercourses and wet drainage channels are upstream of the River Nore SPA. As such, the primary concern for this impact is the degradation of these watercourses flowing downstream into the River Nore potentially affecting suitable downstream Kingfisher habitat.

With regard to the availability of prey-item species in the larger downstream watercourses, there is potential for impacts in downstream water quality from surface run-off at W2 or W3 crossing works. Though, unlikely to occur, a breach of the watercourse bed during directional drilling works at W3 (crossing option b), would result in the release of a small volume of sediment and drilling fluid, Bentonite, being released. Bentonite is a non-toxic drilling fluid, and any volumes of sediment released would be negligible and localised. Therefore any change to water quality would be negligible/low in magnitude with negligible significant effects as a result of runoff from the Project construction, operation or decommissioning of the Project due to the separation distance of the works from watercourses (generally in excess of 90m from construction works areas), the absence of any instream work, the location of the main works (windfarm site) spread over several sub-catchments with only the cable route and grid connection crossing having upstream connection to the SPA boundary; the small number of watercourses onsite, the installation of the windfarm site drainage network ahead of works, and the short-term duration (12-16 months) of the construction phase. As aquatic species (fish, crayfish) and other prey items can tolerate some reductions in water quality for a short durations, the low Q-values and general riverine health at the watercourses connected to the Ballynalacken Windfarm Project indicate that that these reductions in water quality will not contribute to a significant change in the pre-existing baseline or differ from the receiving environment in a 'Do-Nothing' Scenario for kingfisher foraging habitat. **It is therefore assessed that that the Ballynalacken Windfarm Project will not adversely affect any of the Conservation Objective attributes as a result of Degradation effects from reductions in water quality within or ex-situ the SPA**.

In relation to changes in Water Quantities, the hydrological assessment in the EIAR (Water chapter - Section EIAR 8.3.4.2.2) found that the increase in average daily/monthly volumes of runoff due to the emplacement of new permanent hardcore areas would result in an increase of 0.43% over baseline levels. Furthermore, the hydrological assessment found that there will be no change to the existing drainage regimes as a result of the Project because the surface water drainage system, which forms part of the Project design, incorporates regular clean water cross drains, check dams, settlement ponds, regular buffered outfalls and natural vegetation filters which will ensure that there will be no change to existing drainage regimes or flow paths. **Therefore, it is evaluated that the Ballynalacken Windfarm Project will not result in Degradation effects due to changes in Water Quantity.**

Taking into account that the Ballynalacken Windfarm Project will not result in any degradation effects to Kingfisher, it is considered that cumulative effects with other plans and projects are not likely to occur.

**Degradation via Spread of Invasive Species:** The spread/release of invasive species may cause a reduction in the extent and quality of Kingfisher nesting habitat, which require barren banksides, via excessive growth and competition for habitat and nutrients covering the banksides of watercourses, and reducing the extent and quality of nesting habitat and making it inaccessible.

It is evaluated that there is potential for Degradation to this SCI species or suitable habitat for nesting or foraging as the proposed Ballynalacken Windfarm Project site boundary is upstream of the SPA.

However, this impact is not considered likely due to:

(i) the absence of instream works in waterbodies connected to the River Nore SPA
(ii) no record of invasive species within 50m of the grid connection or internal cable route.

No instream works are proposed to occur at W2 and W3 which are the crossings upstream of the Nore SPA. Neither of these crossings will involve instream works. Given the absence of invasive species along the cable route and grid connection route that cross W2 and W3 respectively, the absence of any suitable nesting habitat within the Rathduff_15, t**his impact (spread of invasive species) is unlikely to affect any attributes related to the River SPA SCI or its conservation attributes.**

Taking into account that the Ballynalacken Windfarm Project is unlikely to adversely affect the conservation objectives for Kingfisher, it is considered that cumulative effects with other plans and projects are also unlikely to adversely affect the conservation objectives for Kingfisher.

#### 2.5.1.2 Summary of the Implications of the unmitigated Project on the River Nore SPA

Following the impact assessment of likely and potential adverse effects as a result of the Proposed Ballynalacken Windfarm Project – both alone and in combination, in the absence of appropriate mitigation measures, it is considered that the SCI Kingfisher is vulnerable to adverse effects, as summarised in the table hereunder.

| **Special Conservation Interest** | **Is the Project likely, or does it have potential, to adversely affect the conservation objectives.** | | | |
|---|---|---|---|---|
| | **Direct Loss** | **Degradation** | **Disturbance/ Displacement** | **Spread of Invasive Species** |
| Kingfisher (A229) | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. | No likelihood for the Project to adversely affect the conservation objectives. |

#### 2.5.1.3 Requirement for Mitigation measures

<u>The Ballynalacken Windfarm Project will not adversely affect the conservation objectives for the Special Conservation Interest species, Kingfisher, and therefore, no mitigation measures are proposed specifically for the protection of Kingfisher.</u>

However, measures have been proposed to prevent and avoid adverse effects to the River Barrow and River Nore SAC via reductions in water quality or via the spread of invasive species (see Section 2.4.2). It is considered that the implementation of the SAC mitigation measures **related to sediment, contaminant, water runoff management and to the spread of invasive species are sufficient to remove the pre-mitigation very low to low magnitude adverse effects to no effect**.

### 2.5.2 Residual Effects on the Integrity of the Natura 2000 site

Given the unlikelihood of sediment run-off to occur, the mitigation measures provided in section 2.4.2 are appropriate and comprehensive to prevent any such effects from resulting in even a negligible magnitude adverse effect on receptors listed as SCIs of the River Nore SPA.

The spread of invasive species is a common and increasing impact source from developments across Ireland. In the absence of mitigation, this impact almost always poses low to high magnitude adverse effects on sensitive receptors. The measures provided in section 2.4.2 are accepted best practice to manage and prevent this impact from occurring. As such, these measures remove any potential for invasive species spread within the boundaries of the SPA or within watercourses/habitats in use by SCI species ex-situ of the SPA.

Following the implementation of the mitigation measures, based on the accepted best practice standards and documented effectiveness of these measures for other developments of similar scale and nature, it can be concluded that the Proposed Ballynalacken Windfarm Project will not result in adverse effects on the integrity of the River Nore SPA, in circumstances where no reasonable scientific doubt remains.

Based on the stated mitigation measures provided above, including the timing of works at W3. There are no residual effects related to cumulative interactions that pose risk for adverse effects. As such, it can be concluded that the Proposed Ballynalacken Windfarm Project will not result in cumulative adverse effects with other projects on the integrity of the River Nore SPA, in circumstances where no reasonable scientific doubt remains.

## 2.6 Conclusion

This Natura Impact Statement has been prepared in support of the Proposed Ballynalacken Windfarm Project, in order to allow an Appropriate Assessment determination in the context of Article 6(3) of the Habitats Directive, in view of existing case law.

This Report has been prepared in order to evaluate the significance of potential effects on Natura 2000 sites from the Proposed Ballynalacken Windfarm Project, alone and/or in-combination with other projects and land-use activities.

A Screening Evaluation was carried out for all Natura 2000 sites within a 15km radius of the Project. The Screening Evaluation concluded that that the potential for likely significant effects on the Qualifying Interests of the River Barrow and River Nore SAC and the Special Conservation Interests of the River Nore SPA could not be excluded.

It has been determined that, following the implementation of mitigation measures for the protection of water quality and against the spread of invasive species, as outlined in Section 2.4.2, that the effects of the proposed Ballynalacken Windfarm Project will not, alone or in-combination, give rise to adverse effects on the integrity of the River Barrow and River Nore SAC (002162), or of the River Nore SPA (004233).

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC defines integrity as the 'coherence of the sites ecological structure and function, across its whole area, or the habitats, complex of habitats and/or population of species for which the site is classified'. In addition to the Birds Directive 2009/147/EC which aims to 'protect all naturally occurring wild bird species present in the EU and their most important habitats…'

Given the application of prescribed protective measures for the avoidance of impacts and the implementation of the required mitigation measures, it is concluded that the proposed Ballynalacken Windfarm Project either alone or in-combination, will not give rise to adverse effects on the integrity of any of the Natura 2000 sites evaluated herein, in circumstances where no reasonable scientific doubt remains.

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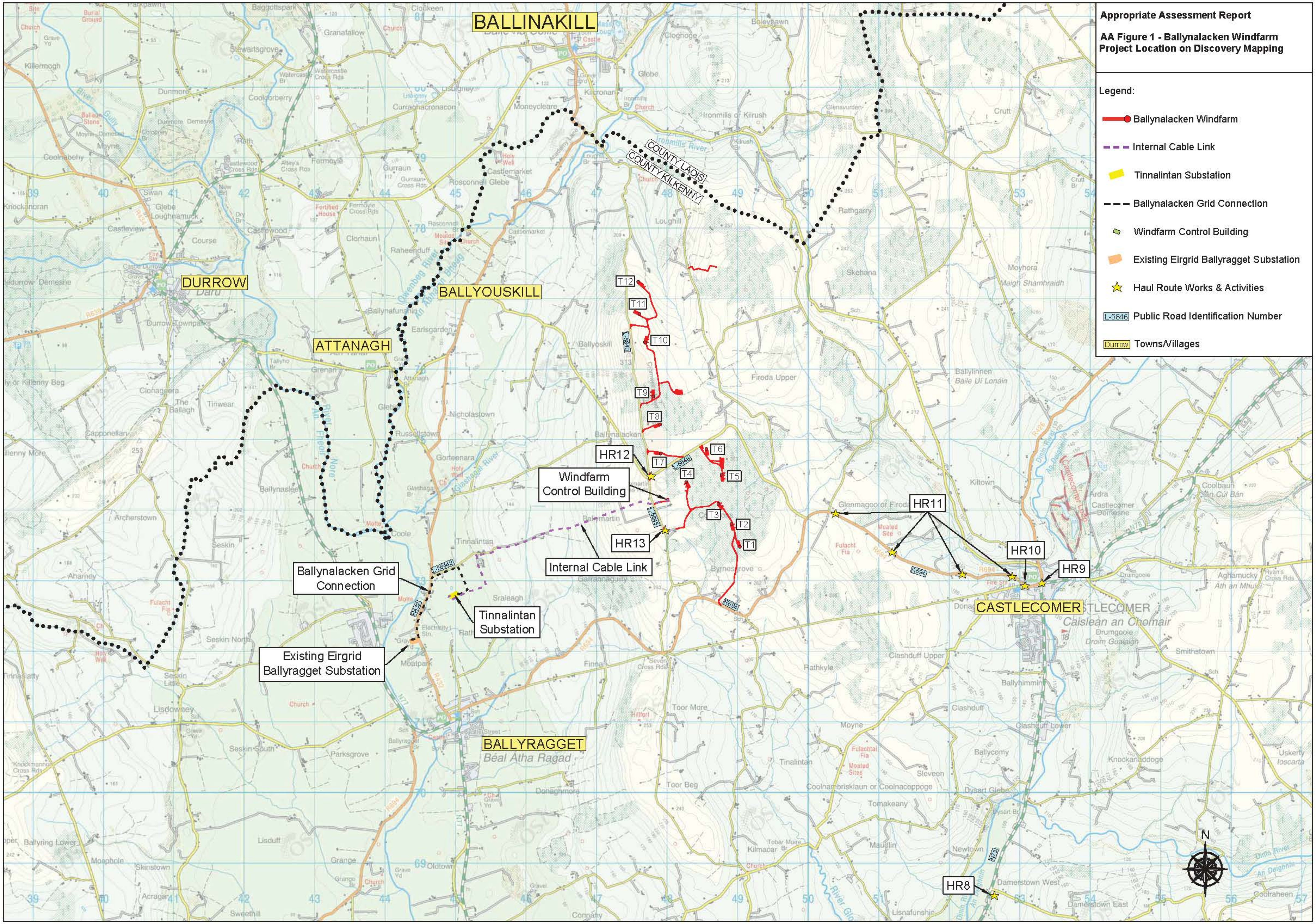
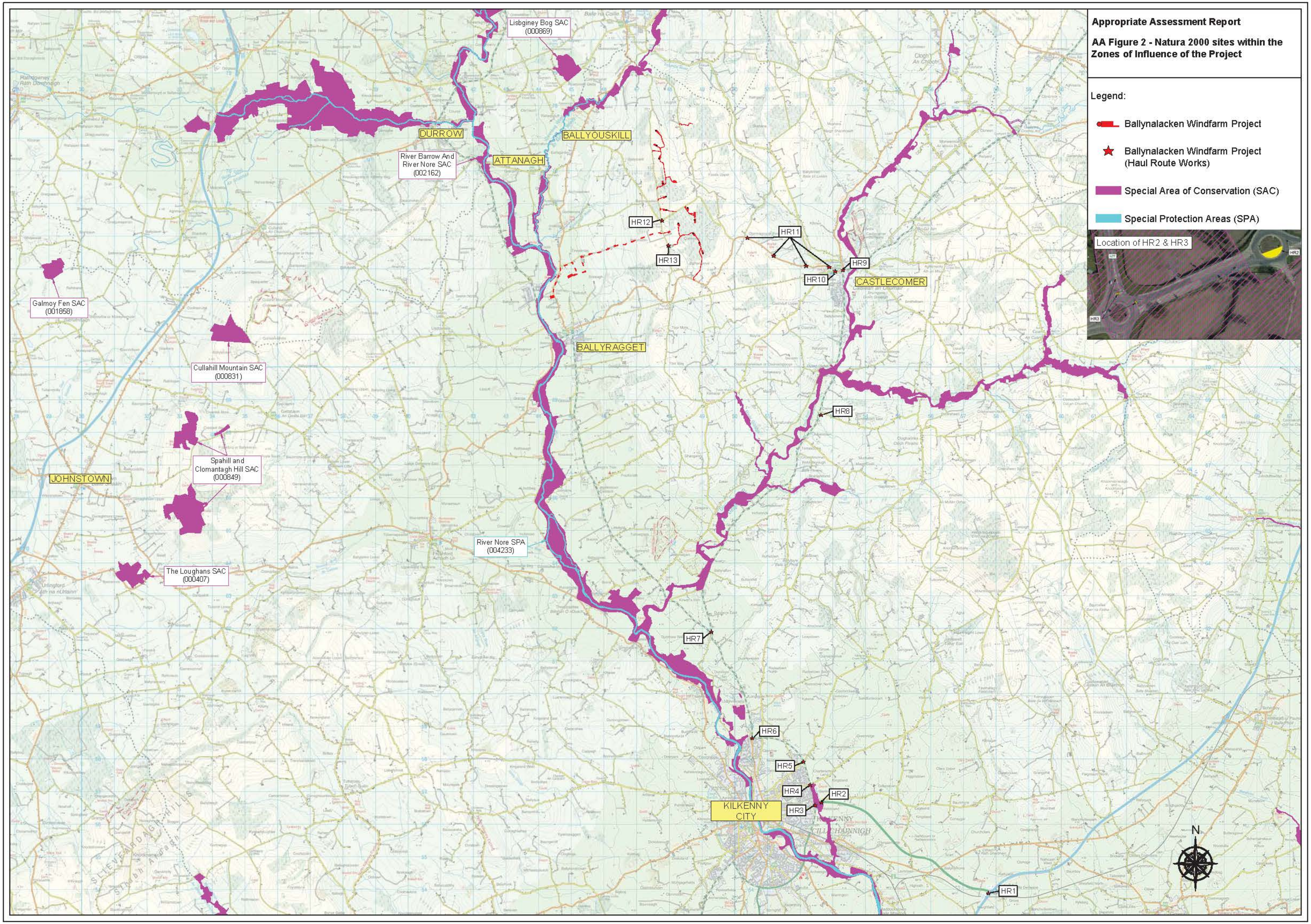


Appropriate Assessment Report
AA Figure 1 - Ballynalacken Windfarm Project Location on Discovery Mapping
Legend:
Ballynalacken Windfarm
Internal Cable Link
Tinnalintan Substation
Ballynalacken Grid Connection
Windfarm Control Building
Existing Eirgrid Ballyragget Substation
Haul Route Works & Activities
L-5846 Public Road Identification Number
Durrow Towns/Villages
BALLINAKILL
DURROW
BALLYOUSKILL
ATTANAGH
BALLYRAGGET
CASTLECOMER
COUNTY LAOIS
COUNTY KILKENNY
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
HR8
HR9
HR10
HR11
HR12
HR13
Windfarm Control Building
Internal Cable Link
Ballynalacken Grid Connection
Tinnalintan Substation
Existing Eirgrid Ballyragget Substation
N


Appropriate Assessment Report
AA Figure 2 - Natura 2000 sites within the Zones of Influence of the Project
Legend:
Ballynalacken Windfarm Project
Ballynalacken Windfarm Project (Haul Route Works)
Special Area of Conservation (SAC)
Special Protection Areas (SPA)
Location of HR2 & HR3
Lisbginey Bog SAC (000869)
DURROW
BALLYOUSKILL
ATTANAGH
River Barrow And River Nore SAC (002162)
HR12
HR13
HR11
HR9
HR10
CASTLECOMER
Galmoy Fen SAC (001858)
Cullahill Mountain SAC (000831)
BALLYRAGGET
HR8
Spahill and Clomantagh Hill SAC (000849)
JOHNSTOWN
River Nore SPA (004233)
The Loughans SAC (000407)
HR7
HR6
HR5
HR4
HR2
HR3
KILKENNY CITY
HR1
N

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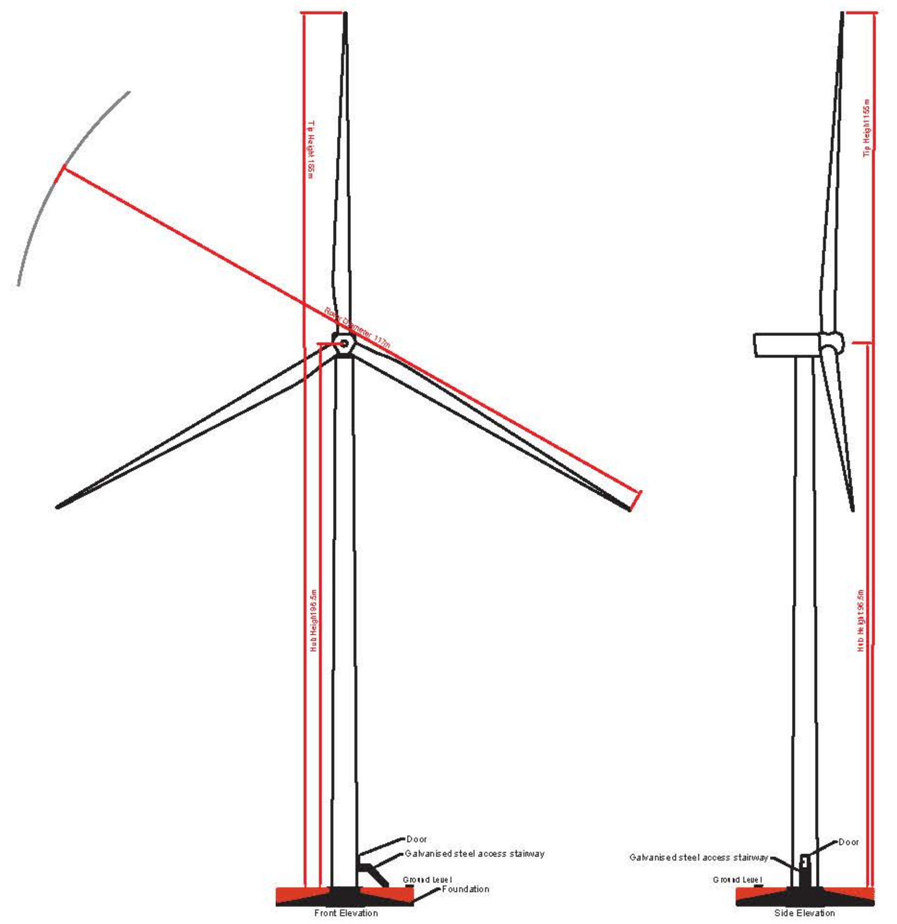
**AA Figure 3 - Ballynalacken Windfarm Project on Aerial Mapping**


Legend:

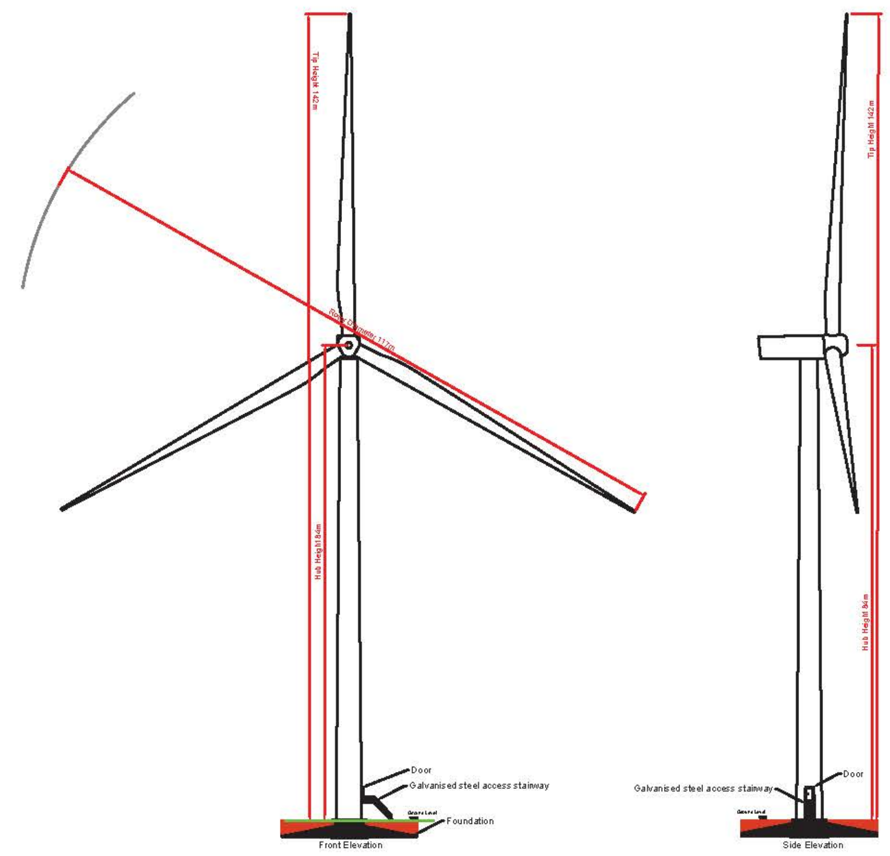
- Turbine
- Hardcore Area
- Windfarm Control Building
- Internal Windfarm Cabling
- Tinnalintan Substation
- Internal Cable Link
- Ballynalacken Grid Connection
- Temporary Construction Compound
- Borrow Pit
- Public Road Widening Works
- Joint Bay
- Met Mast
- Telecom Relay Pole
- Temporary Deposition Area
- Temporary Road
- Long Term Storage Berm
- EPA Watercourse
- L-5818 Public Road Identification Number

**Appropriate Assessment Report**

**AA Figure 4.1 - Ballynalacken Wind Turbines, Foundations and Hardstanding Areas**

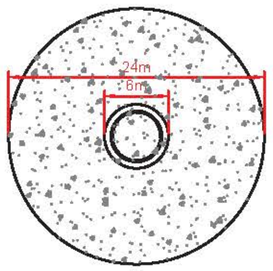



Turbine dimensions shown on this Drawing apply to Turbines T1, T2, T3, T5, T6, T7, T8, T9, T10, T11 and T12

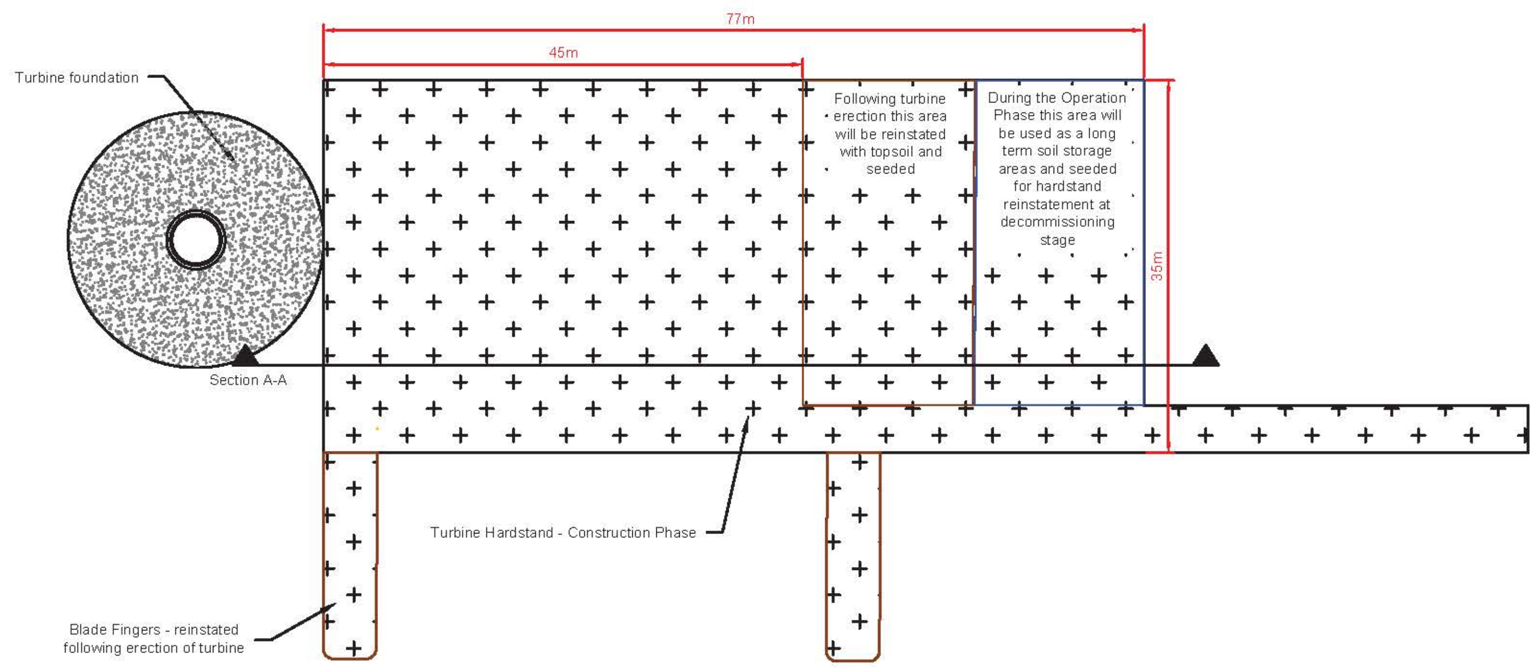



Turbine dimensions shown on this Drawing apply to Turbine T4 only

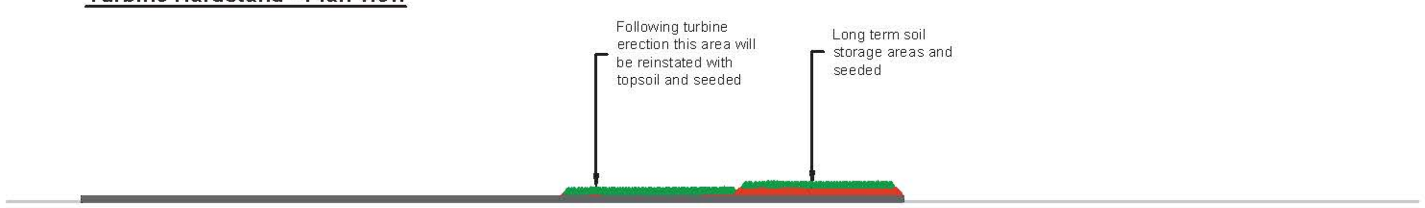

**Turbine Foundation - Section view**




**Turbine Foundation - Plan view**



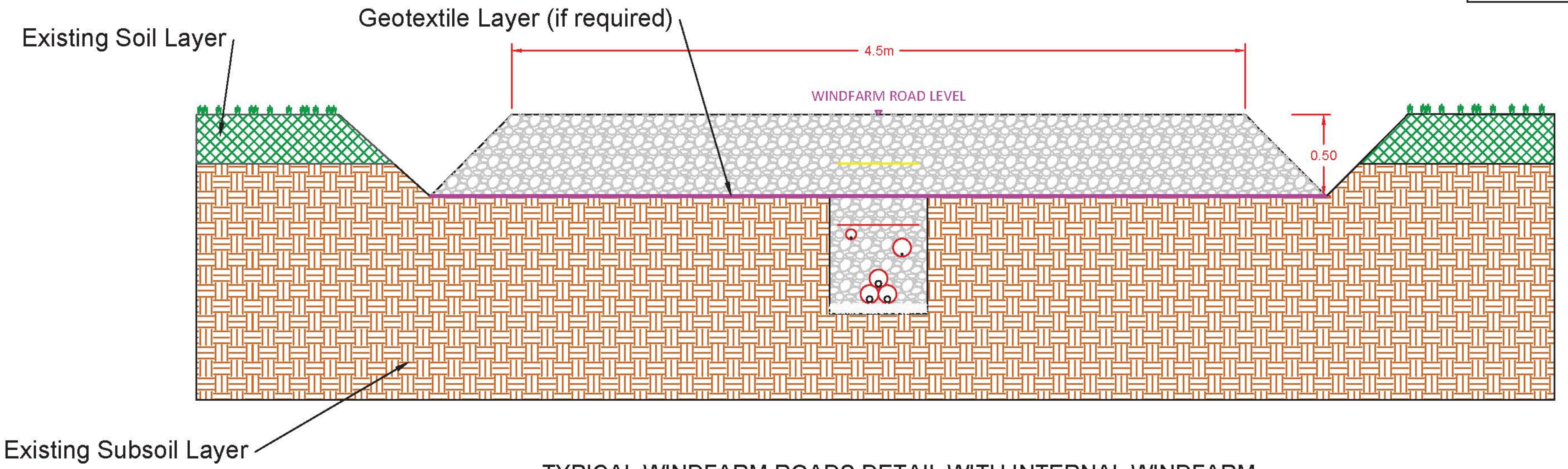

**Turbine Hardstand - Plan view**



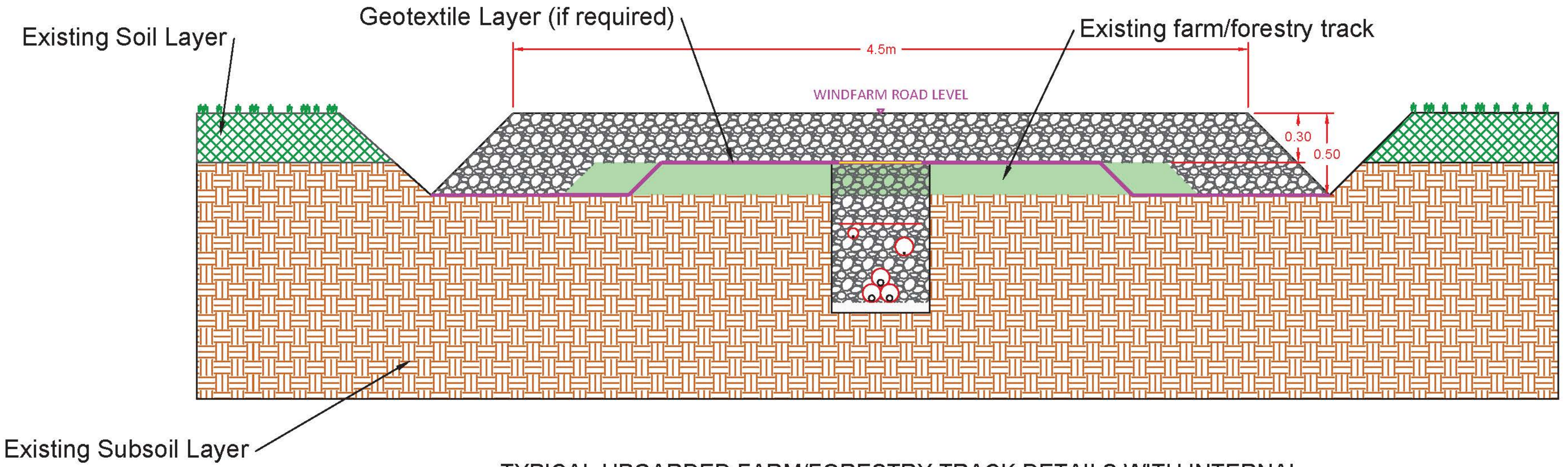

**Section A-A - Turbine Hardstand Cross section of Operation stage hardstand**

Appropriate Assessment Report

AA Figure 4.2 - Windfarm Site Roads



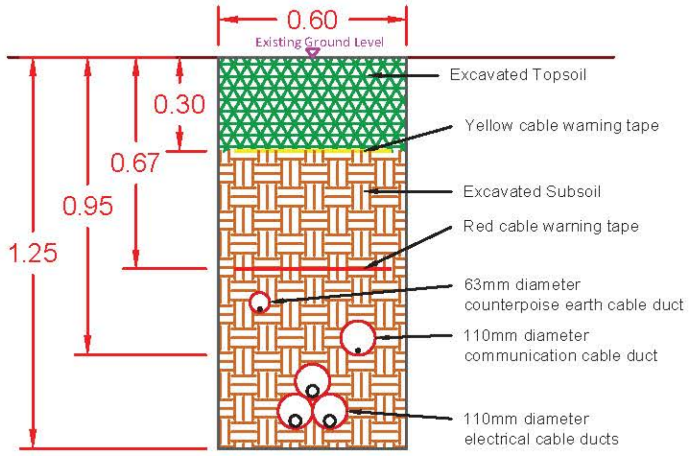

TYPICAL WINDFARM ROADS DETAIL WITH INTERNAL WINDFARM CABLES TRENCH INCLUDED



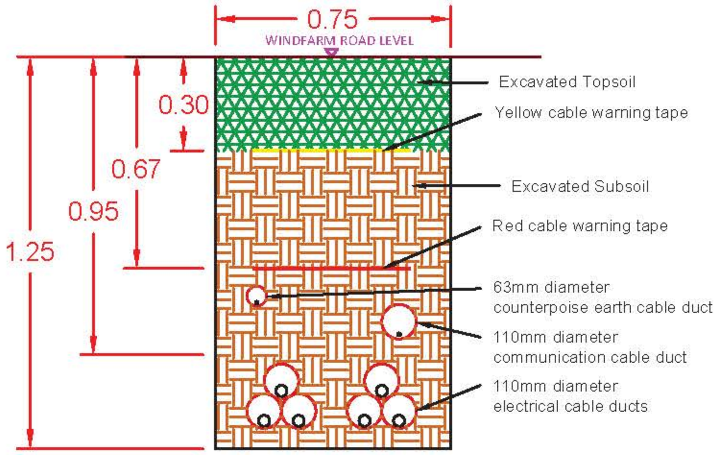

TYPICAL UPGARDED FARM/FORESTRY TRACK DETAILS WITH INTERNAL WINDFARM CABLES TRENCH INCLUDED

**Appropriate Assessment Report**

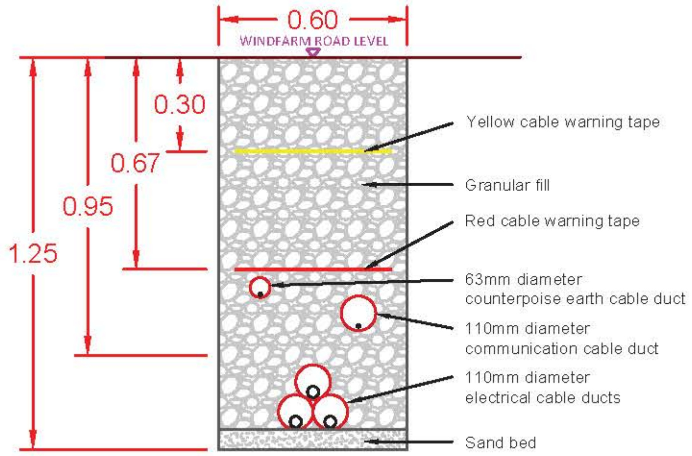
**AA Figure 4.3 - Internal Windfarm Cabling and Internal Cable Link**



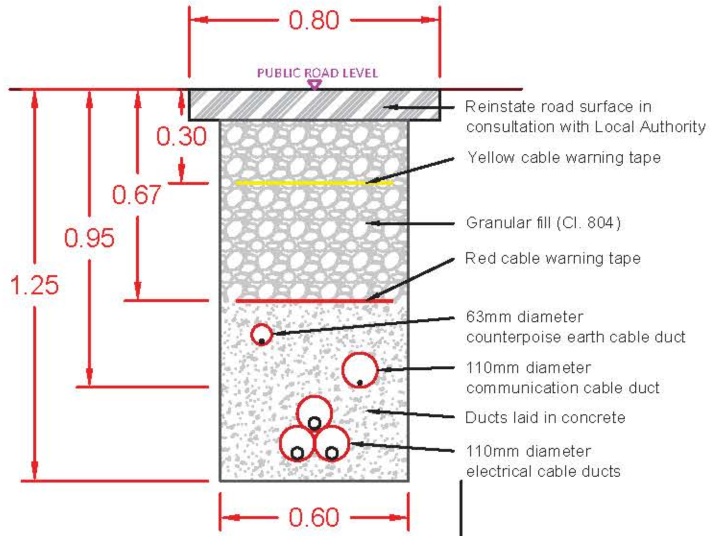

CABLES TRENCH - TYPICAL SINGLE CIRCUIT TRENCH SECTION THROUGH AGRICULTURAL LANDS



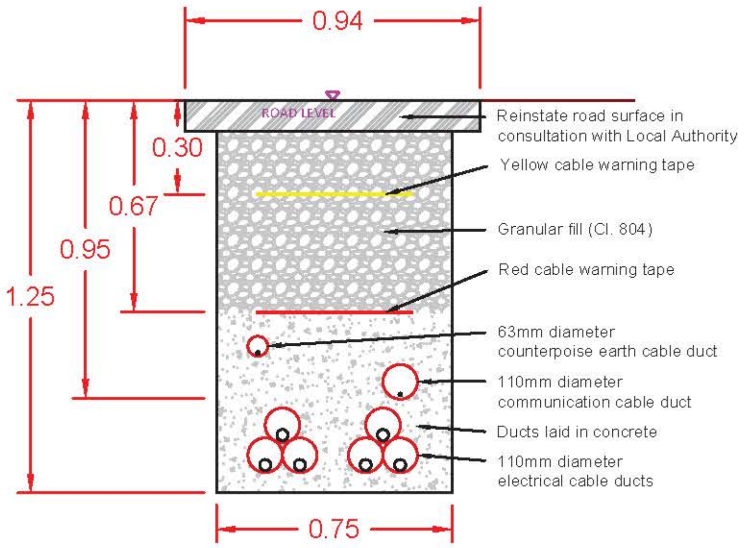

CABLES TRENCH - TYPICAL DOUBLE CIRCUIT TRENCH SECTION THROUGH AGRICULTURAL LANDS



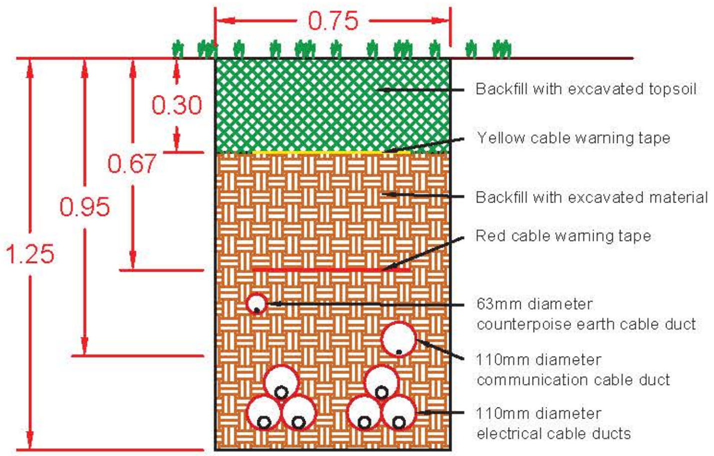

CABLES TRENCH - TYPICAL SINGLE CIRCUIT TRENCH SECTION THROUGH WINDFARM ROADS



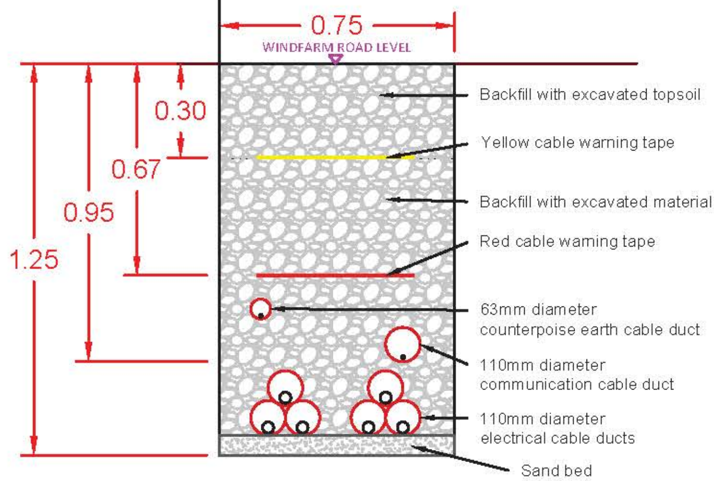

CABLES TRENCH - TYPICAL SINGLE CIRCUIT TRENCH SECTION THROUGH PUBLIC ROADS




WINDFARM CABLE LINK CABLES TRENCH SECTION CROSSING PUBLIC ROADS



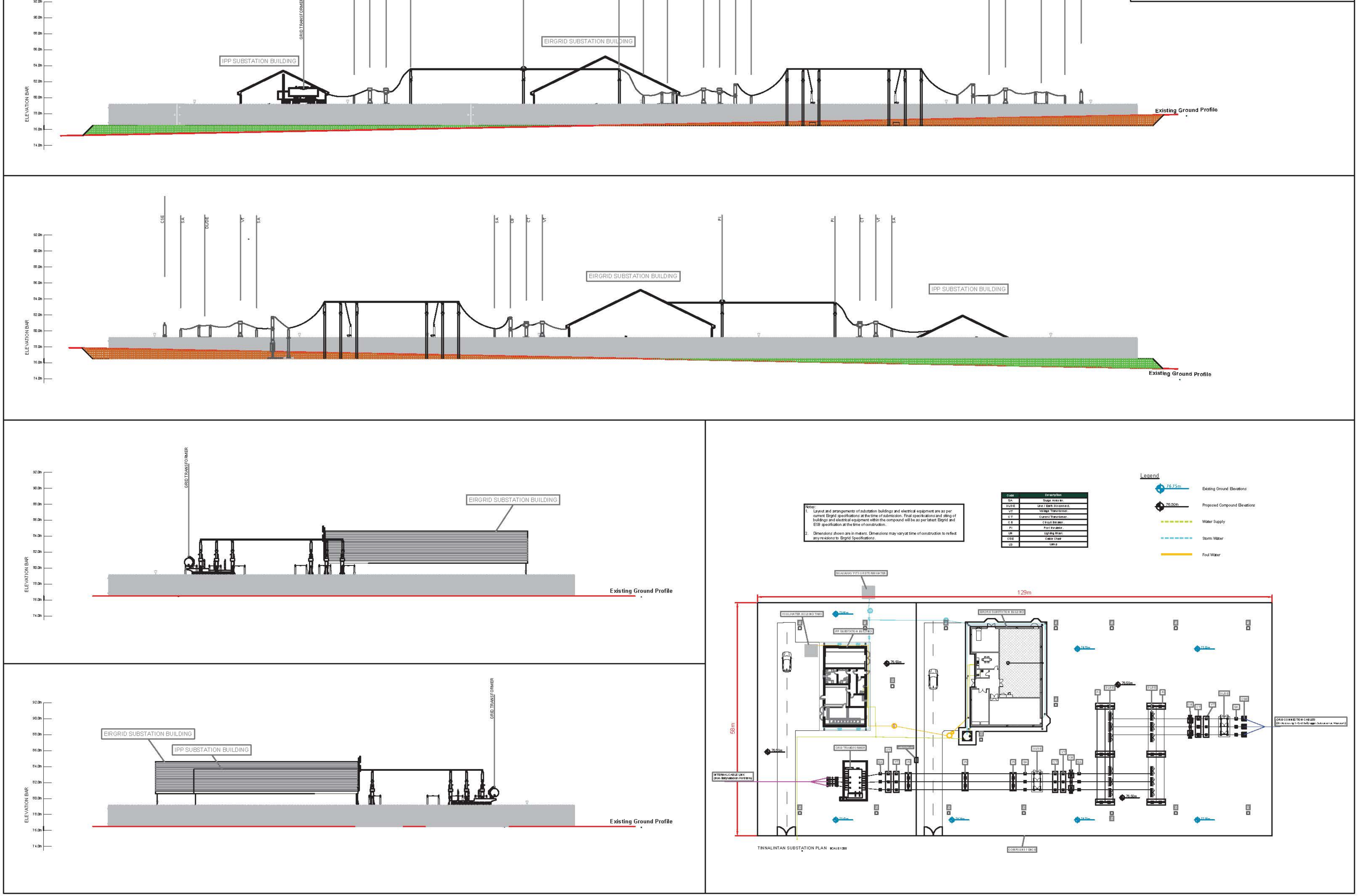

WINDFARM CABLE LINK CABLES TRENCH SECTION THROUGH AGRICULTURAL LANDS




WINDFARM CABLE LINK CABLES TRENCH SECTION THROUGH WINDFARM ROADS

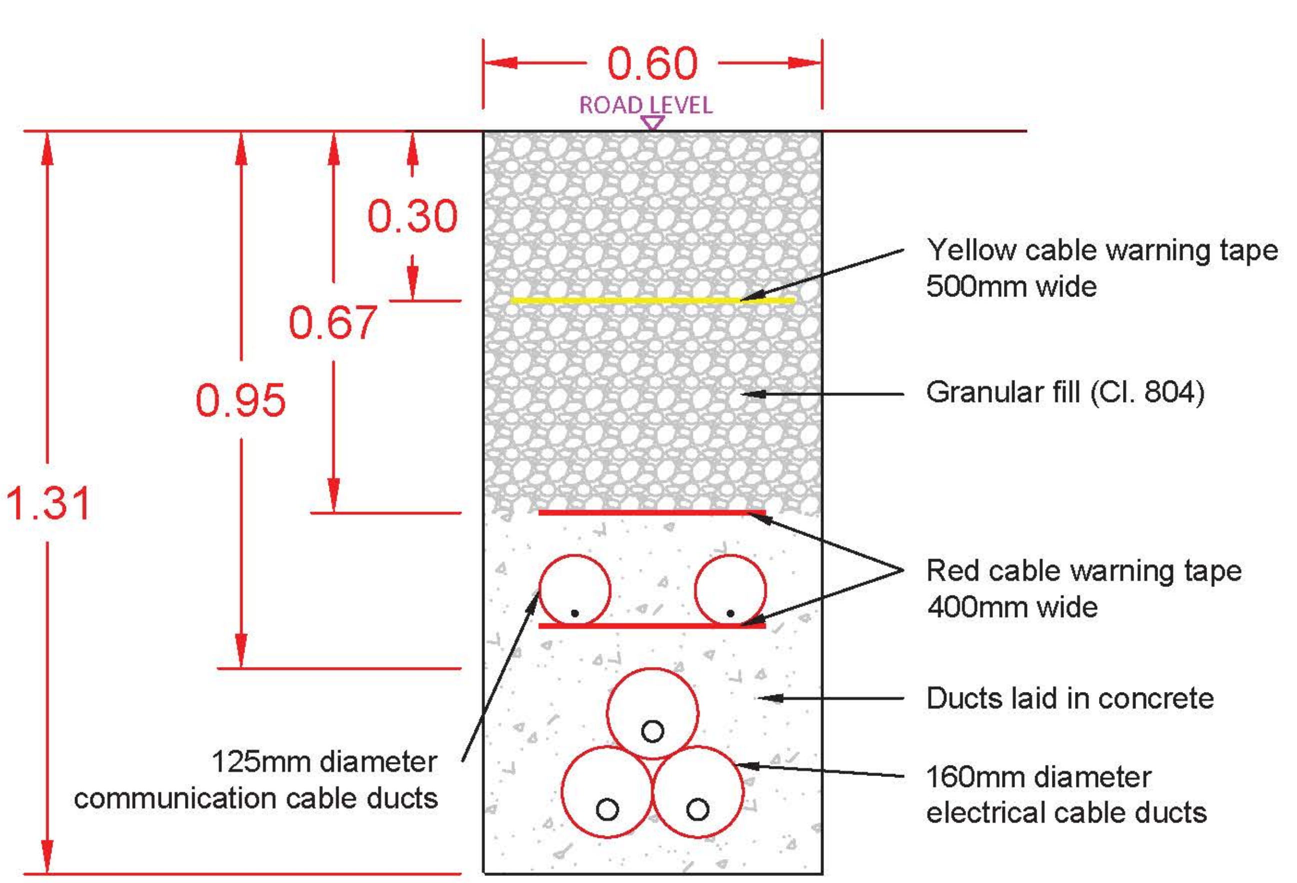
## Appropriate Assessment Report

## AA Figure 4.4 - Tinnalintan Substation

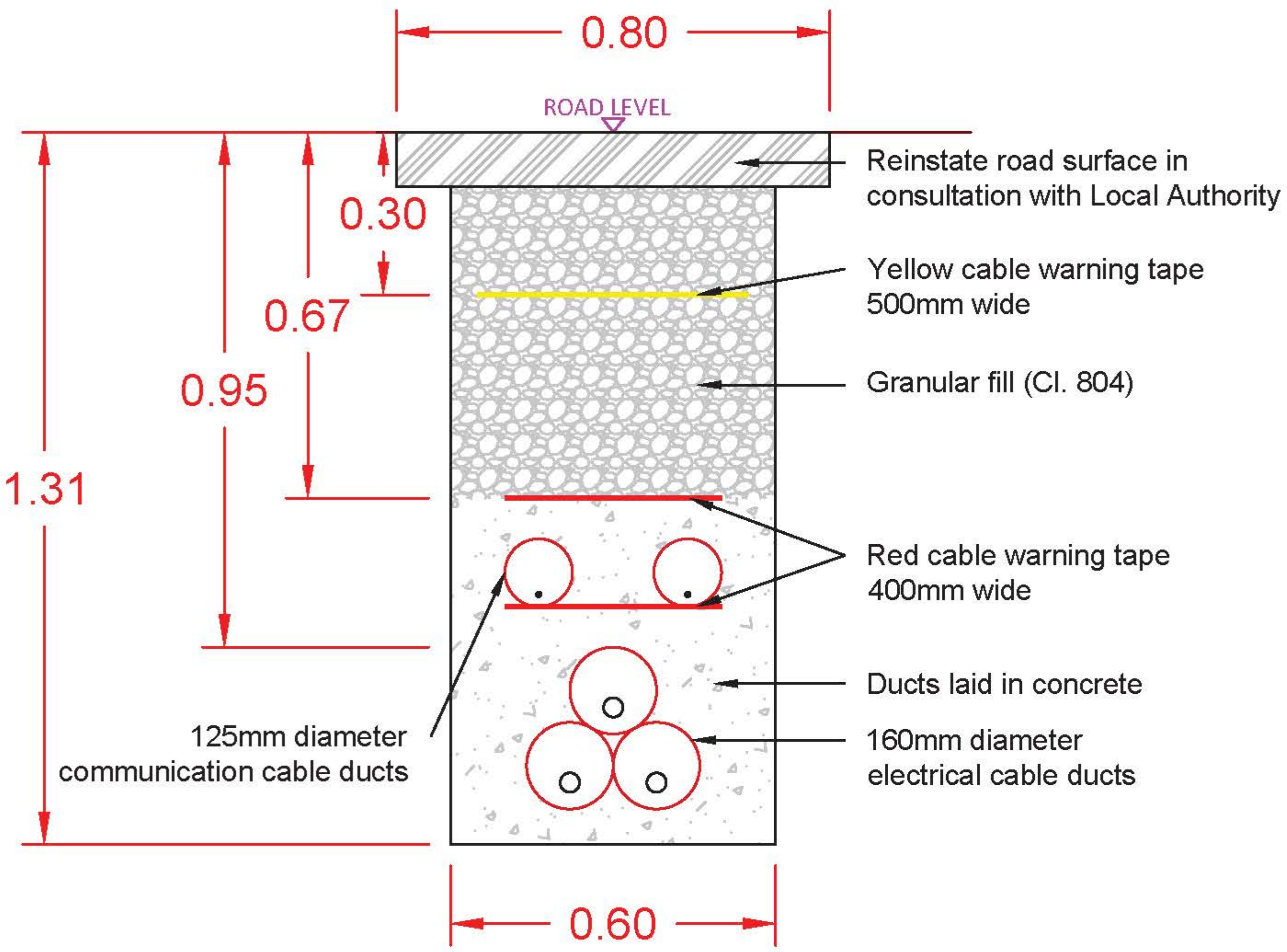


Appropriate Assessment Report

AA Figure 4.5 - Ballynalacken Grid Connection cabling works



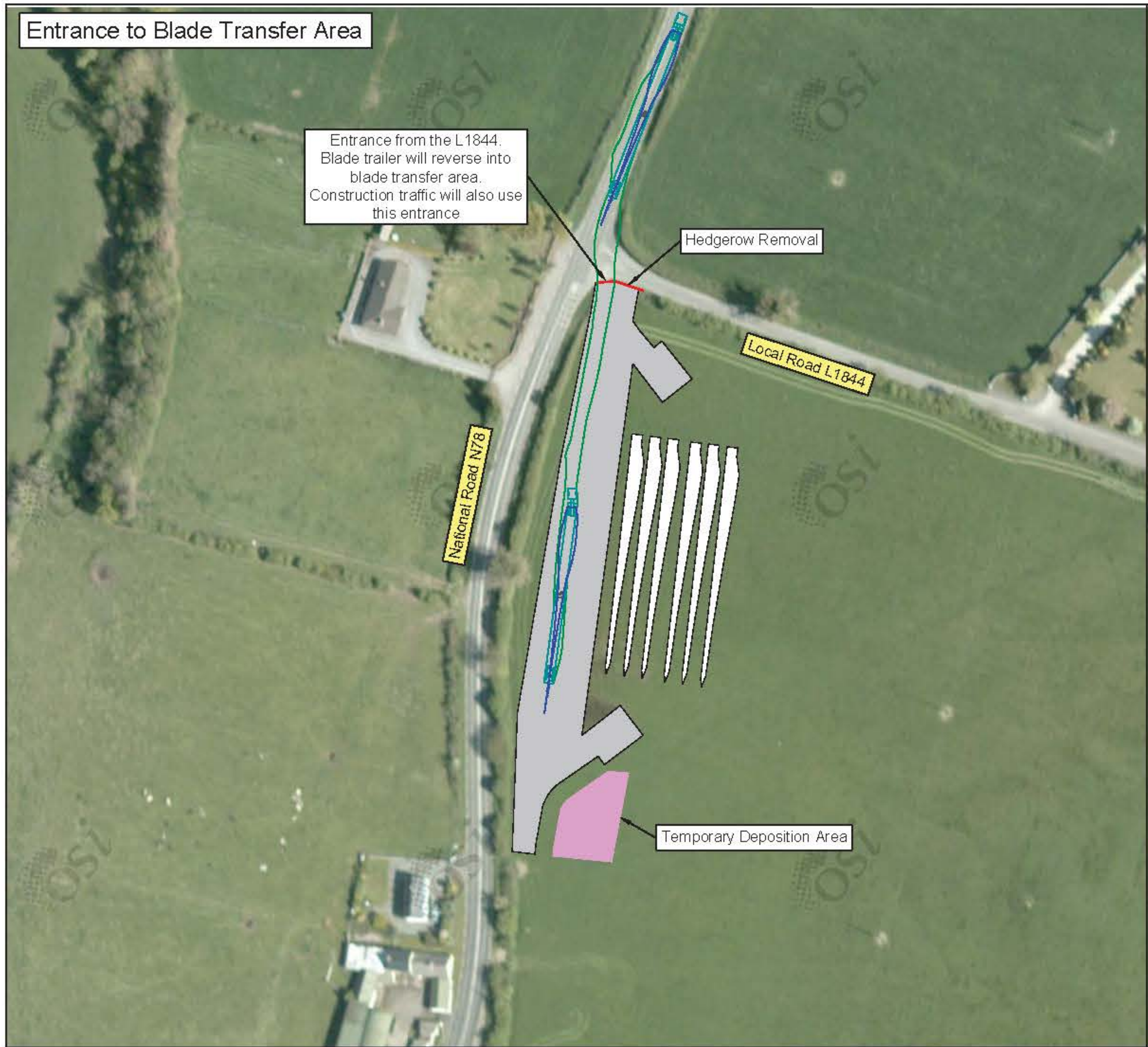

110kV CABLES TRENCH - TYPICAL SINGLE CIRCUIT TRENCH SECTION THROUGH PRIVATE TRACK/HARDCORE COMPOUND AREAS

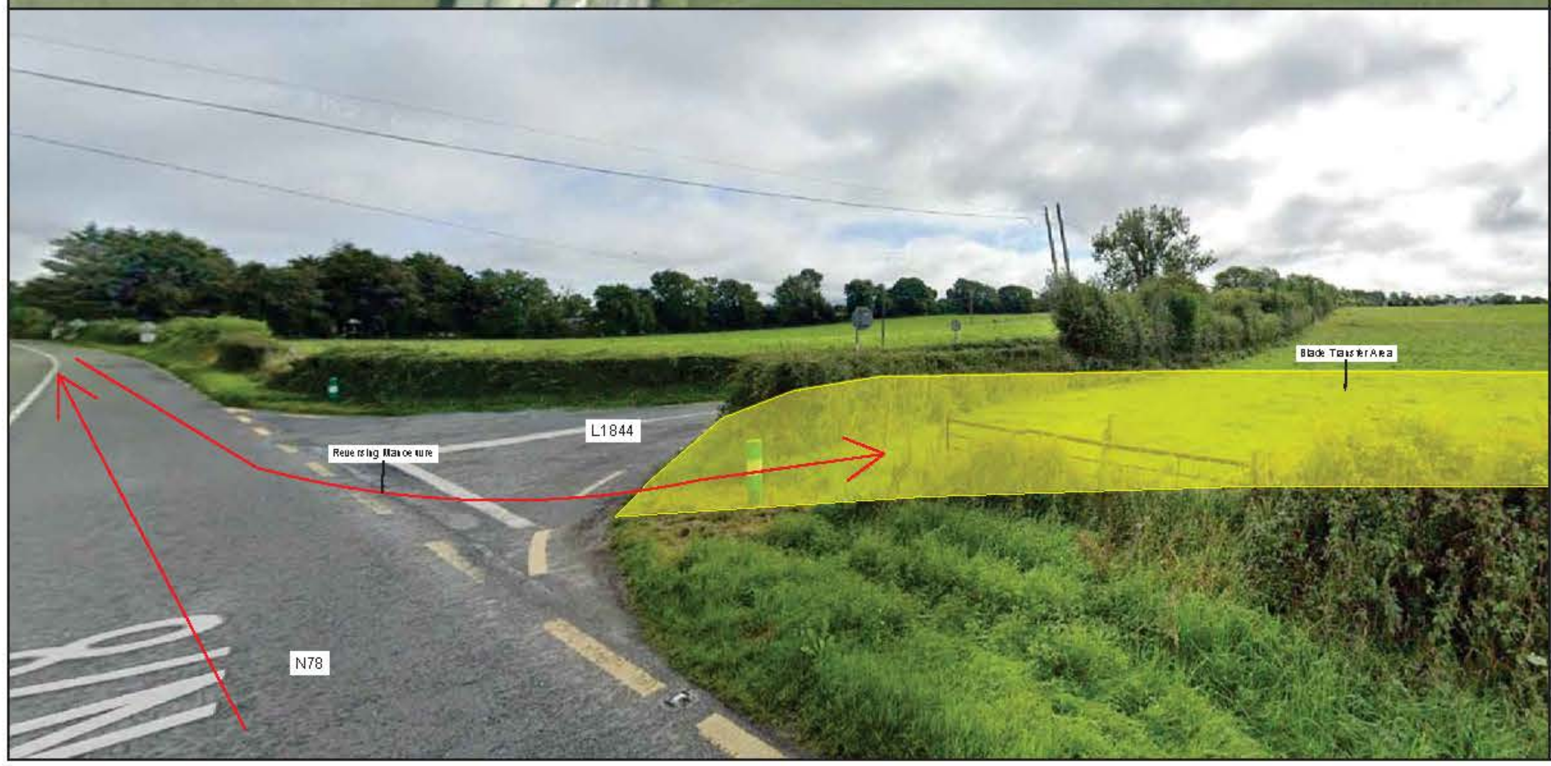


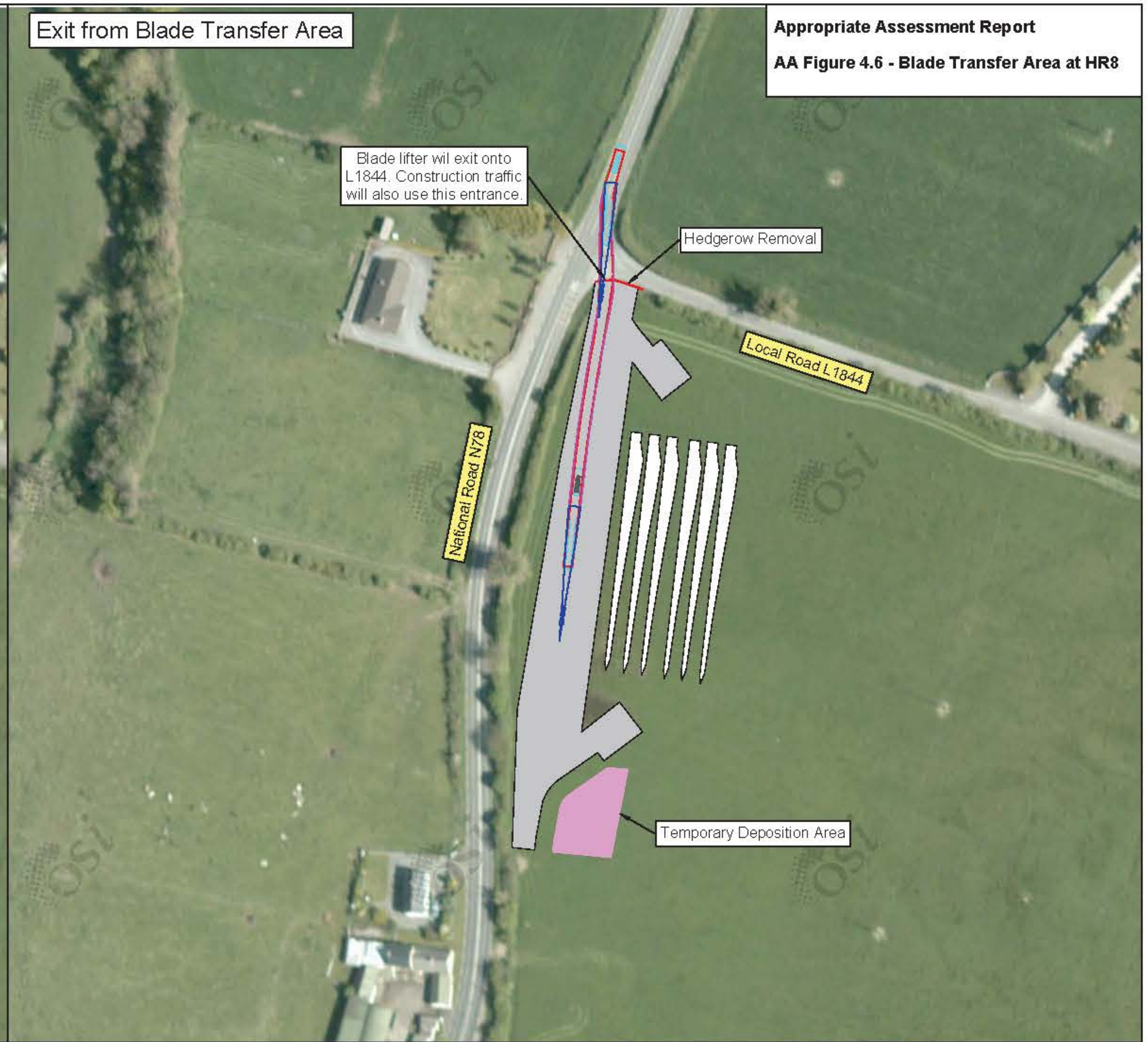

110kV CABLES TRENCH - TYPICAL SINGLE CIRCUIT TRENCH SECTION THROUGH PUBLIC ROADS

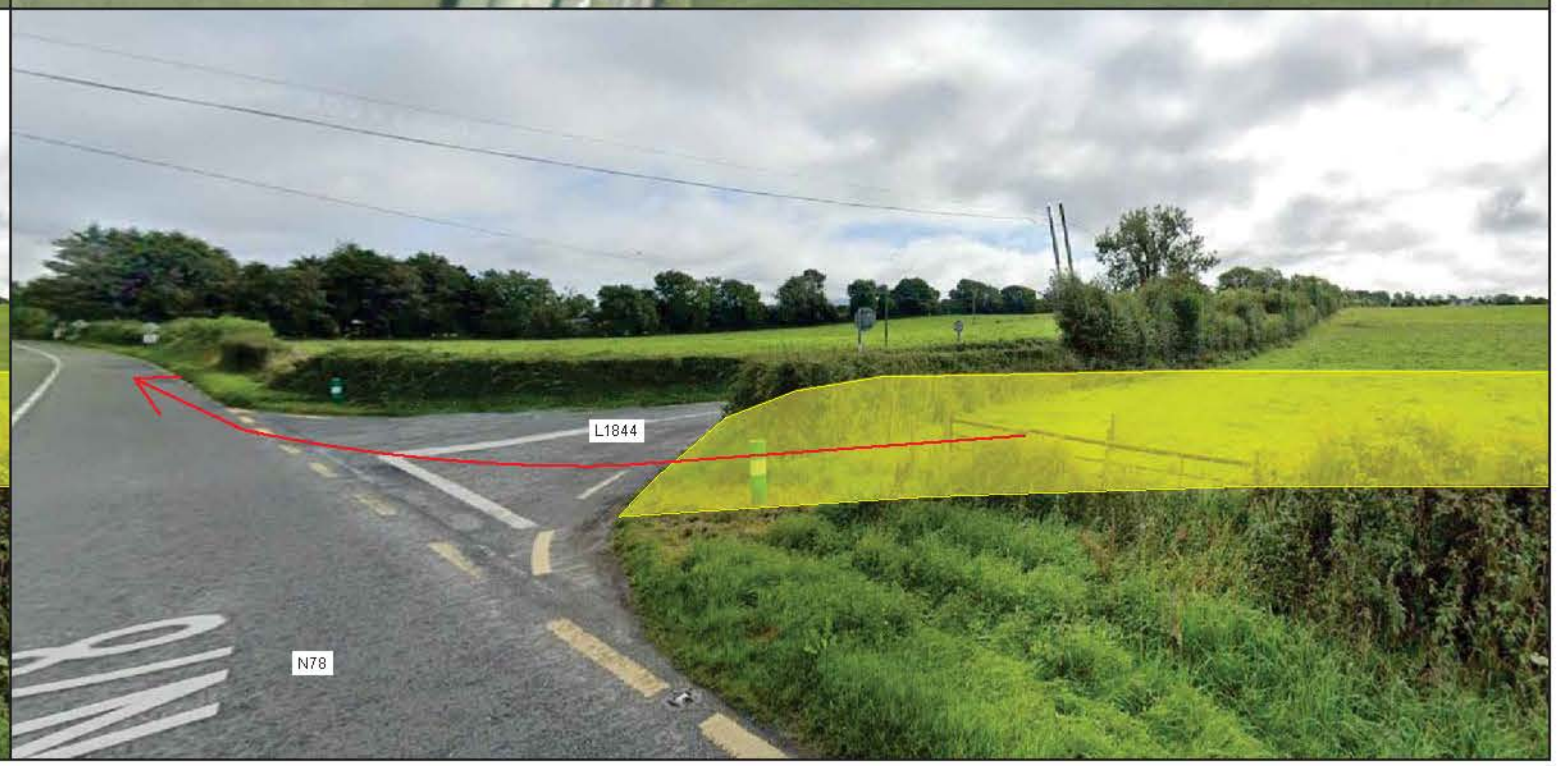
**Appropriate Assessment Report**

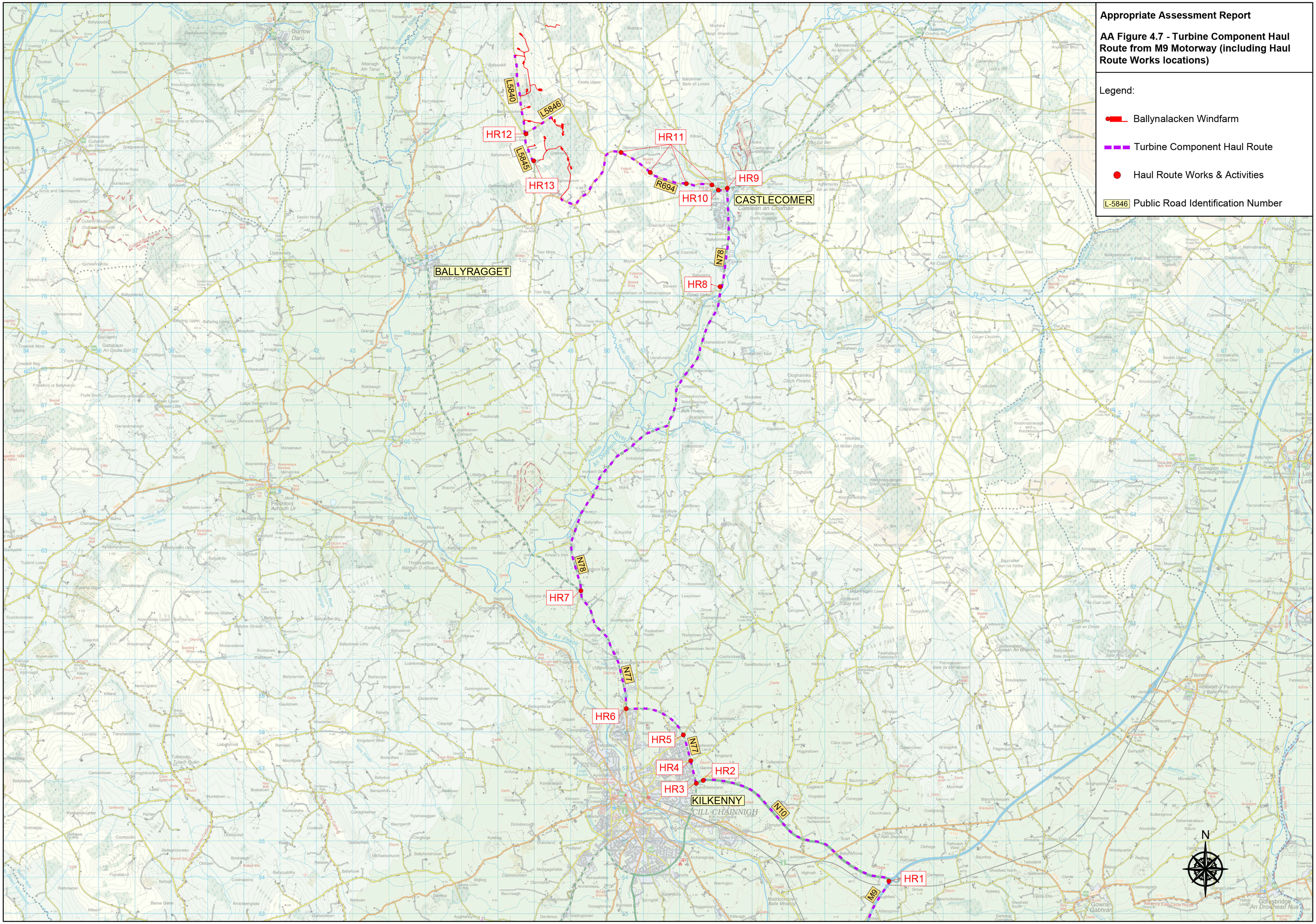
**AA Figure 4.6 - Blade Transfer Area at HR8**



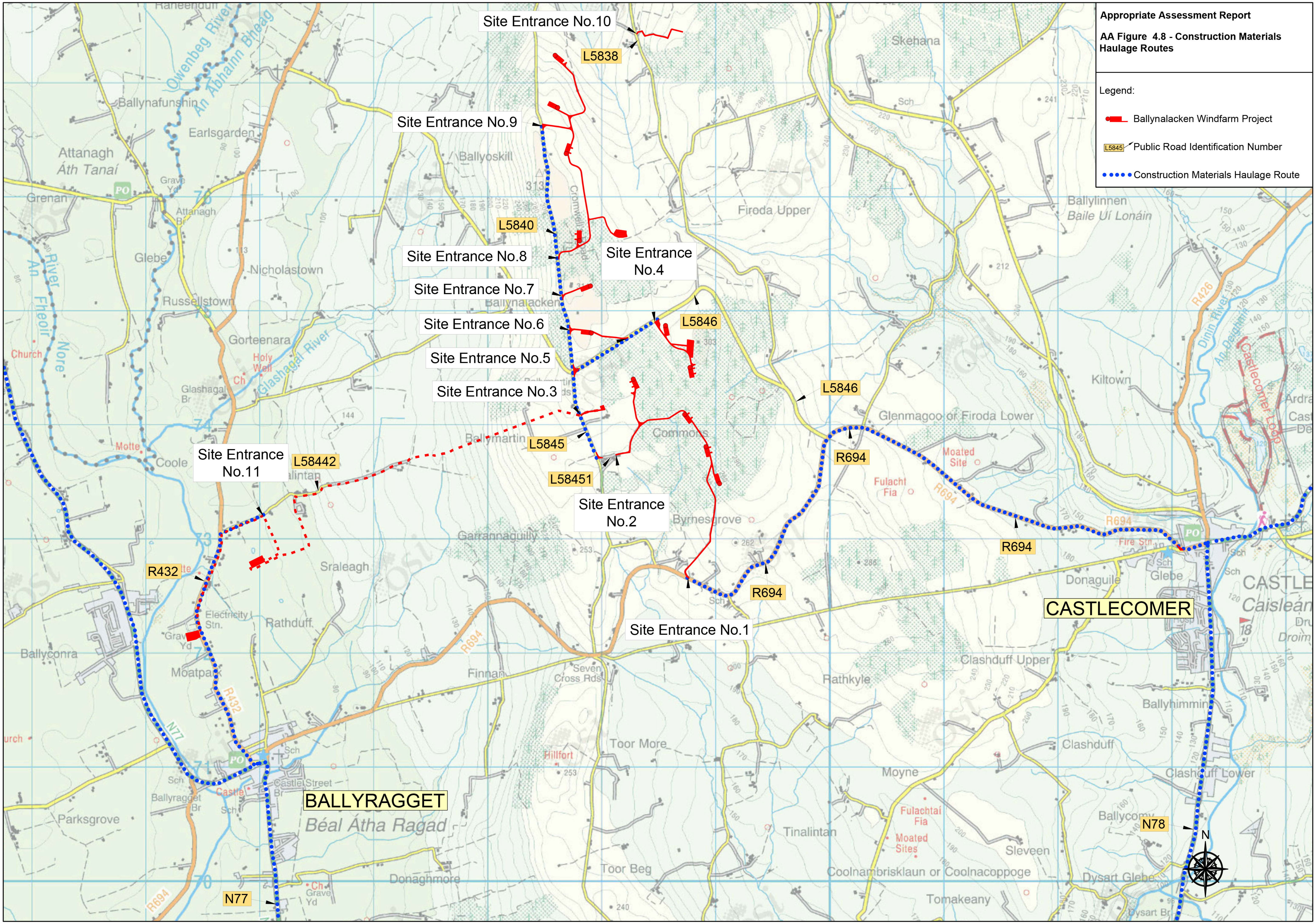



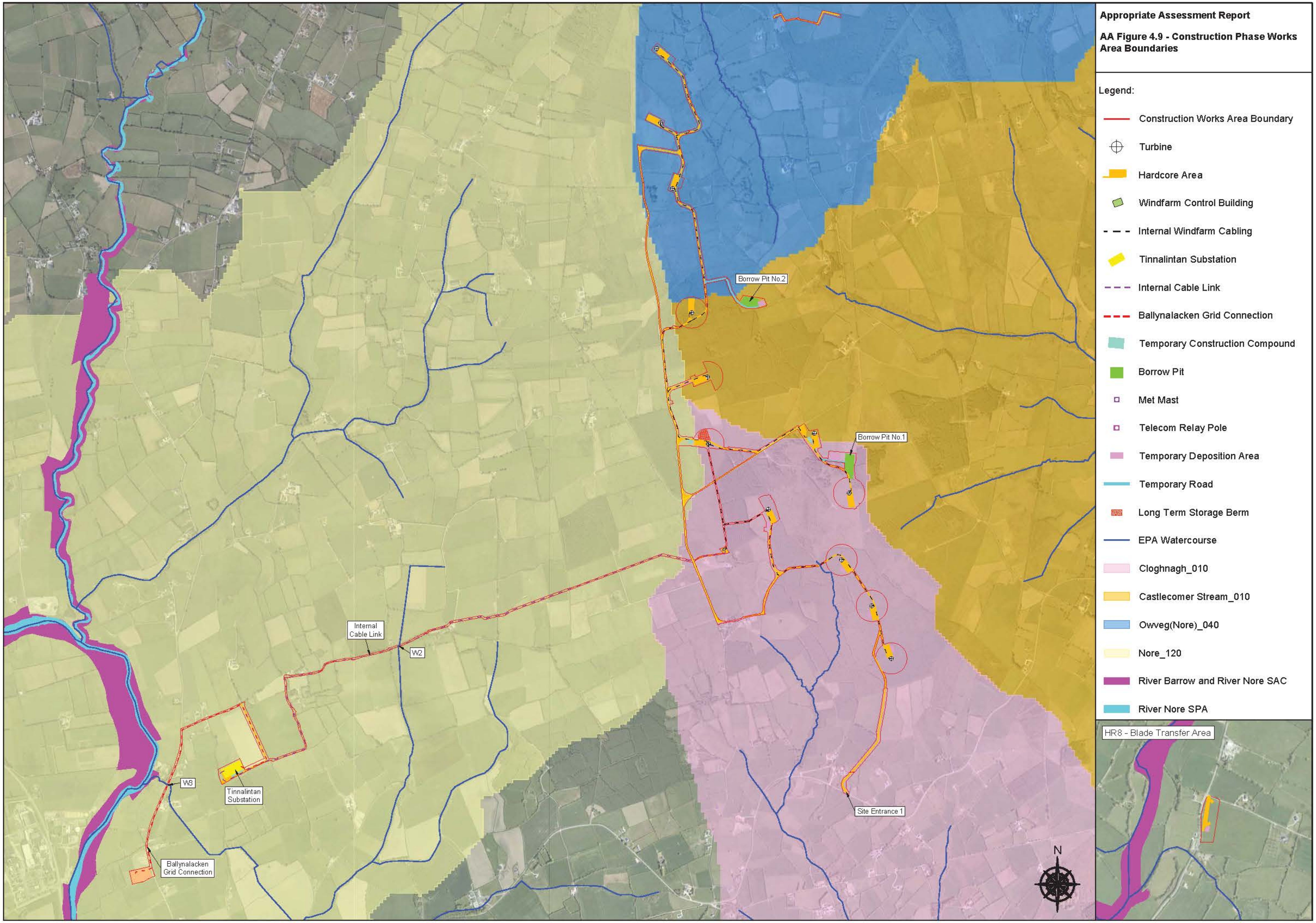



Appropriate Assessment Report

AA Figure 4.7 - Turbine Component Haul Route from M9 Motorway (including Haul Route Works locations)


Appropriate Assessment Report
AA Figure 4.8 - Construction Materials Haulage Routes
Legend:
Ballynalacken Windfarm Project
Public Road Identification Number
Construction Materials Haulage Route
Site Entrance No.1
Site Entrance No.2
Site Entrance No.3
Site Entrance No.4
Site Entrance No.5
Site Entrance No.6
Site Entrance No.7
Site Entrance No.8
Site Entrance No.9
Site Entrance No.10
Site Entrance No.11
L5838
L5840
L5845
L5846
L58442
L58451
R694
R432
N77
N78
CASTLECOMER
BALLYRAGGET
Béal Átha Ragad

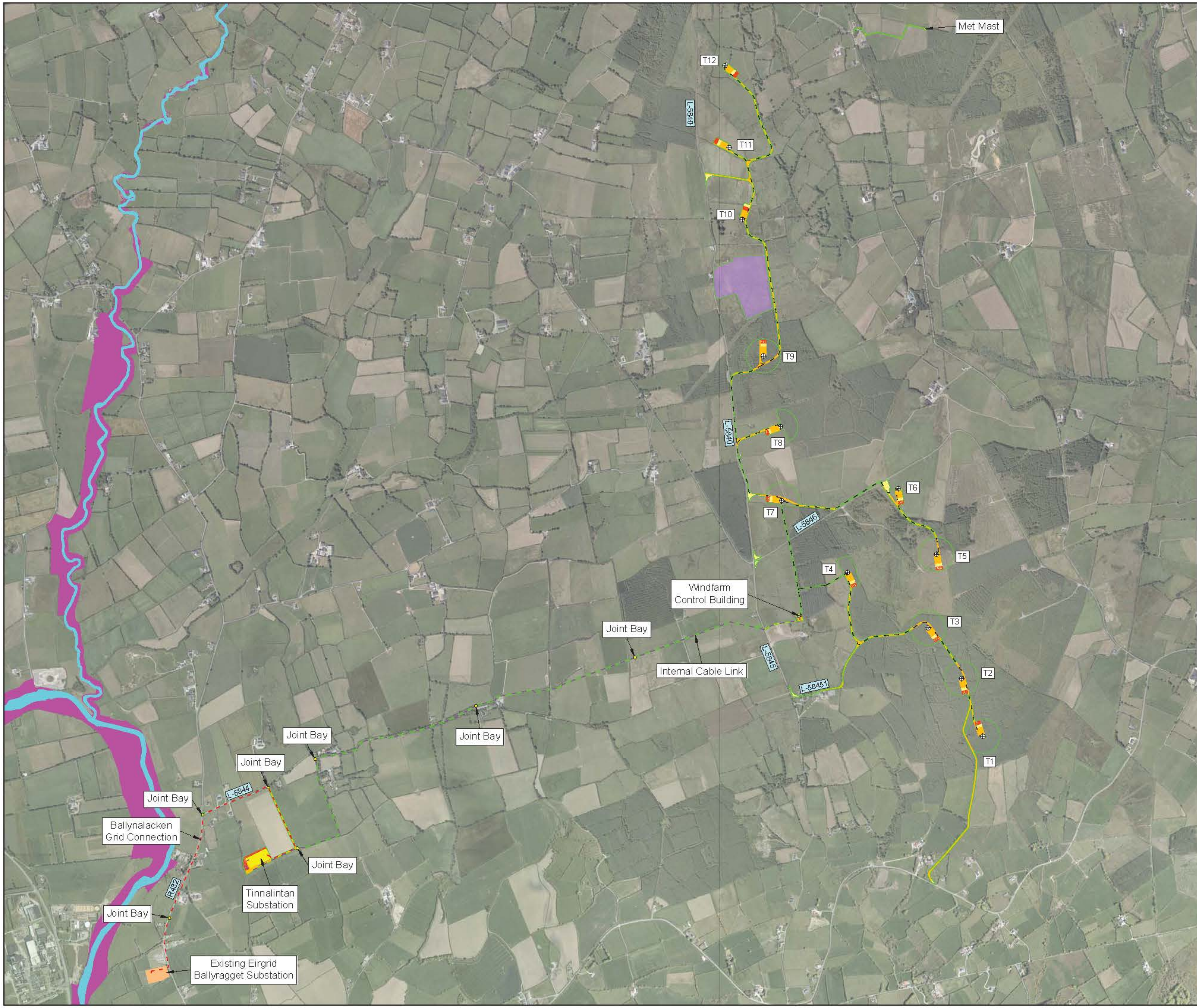
## Appropriate Assessment Report




**AA Figure 4.9 - Construction Phase Works Area Boundaries**

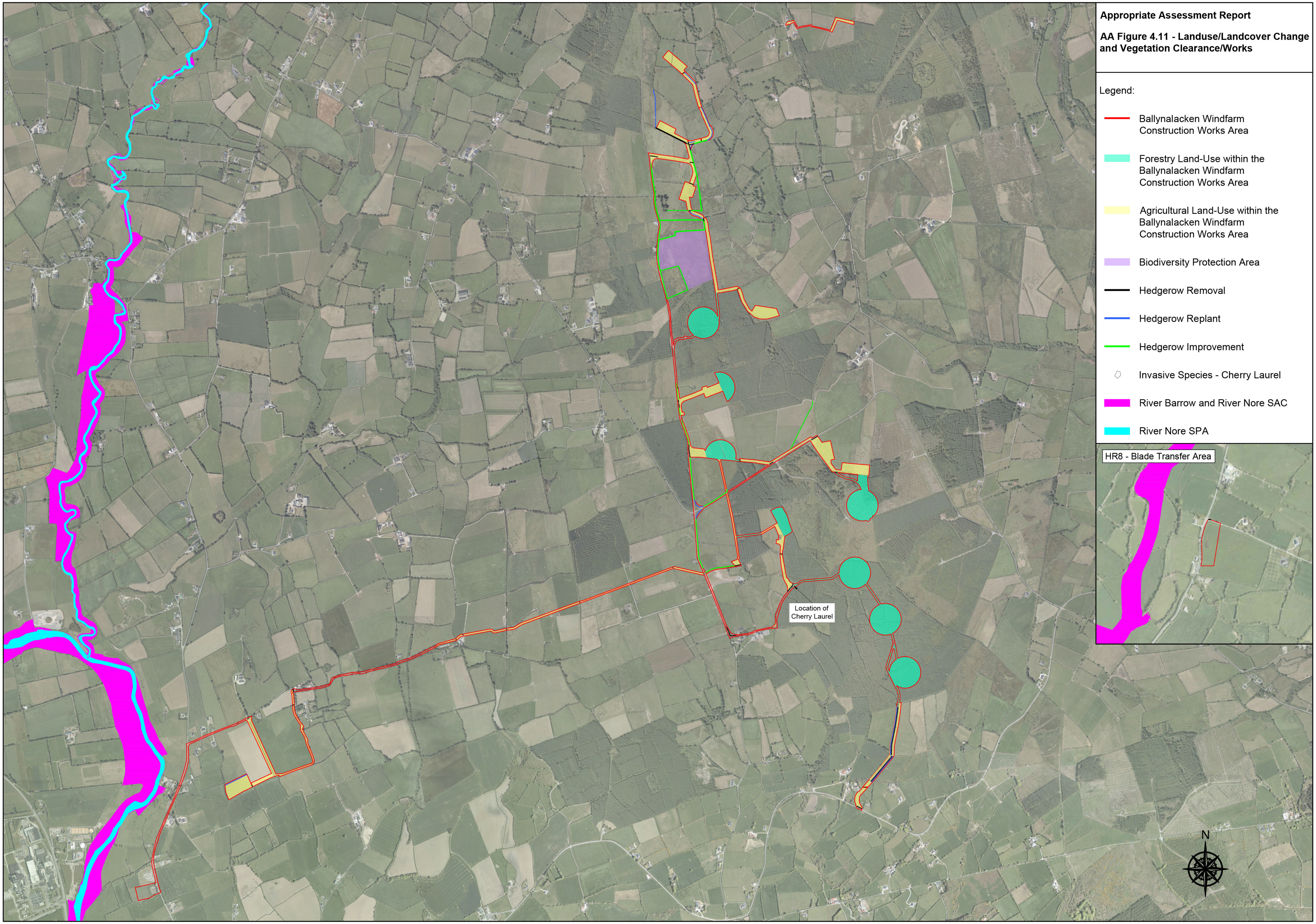
**Appropriate Assessment Report**

**Figure AA 4.10 - Operational Footprint & Operational/Decommissioning Works Areas**



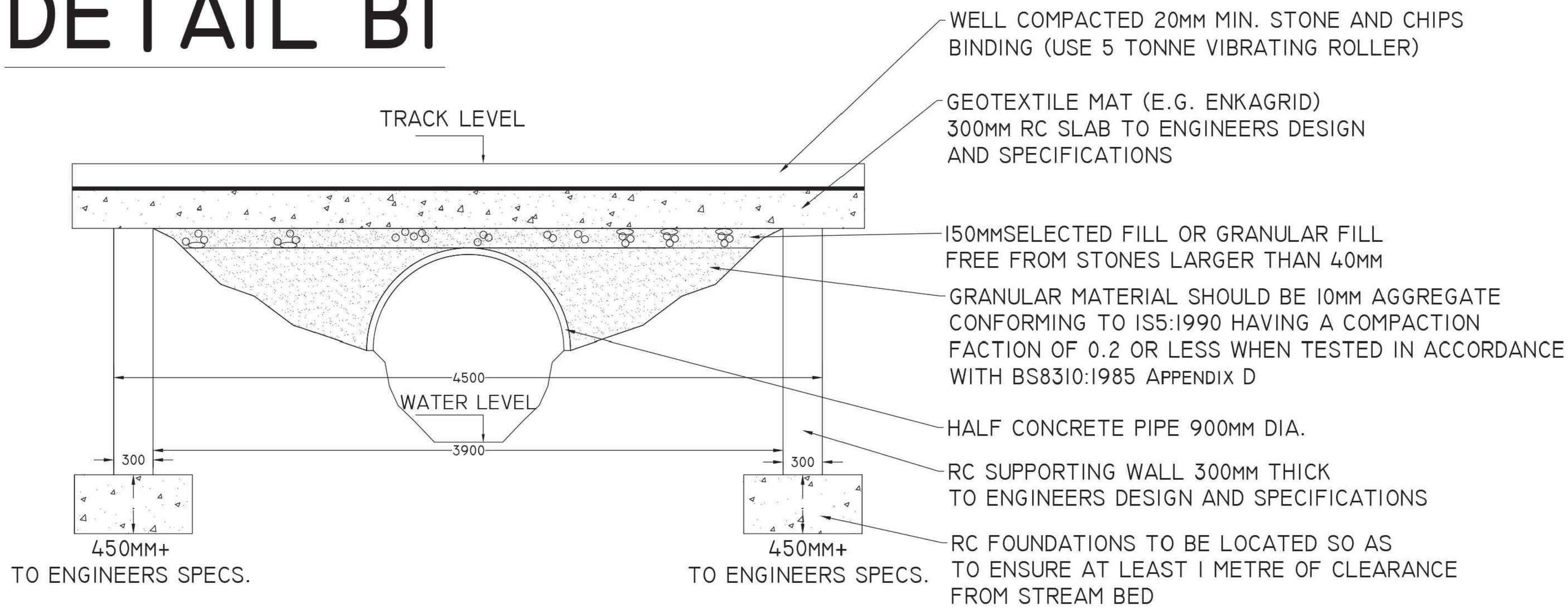

Legend:

- Turbine
- Hardcore Area
- Concealed Hardcore Area
- Windfarm Control Building
- Internal Windfarm Cabling
- Internal Cable Link
- Met Mast
- Telecom Relay Pole
- Long Term Storage Berm
- Joint Bay
- Operational Works Area (also used during decommissioning works/activities)
- Biodiversity Protection Area
- Ballynalacken Grid Connection
- Tinnalintan Substation
- Existing EirGrid Ballyragget Substation
- L-5840 Public Road Identification Number
- River Barrow and River Nore SAC
- River Nore SPA


Appropriate Assessment Report
AA Figure 4.11 - Landuse/Landcover Change and Vegetation Clearance/Works
Legend:
Ballynalacken Windfarm Construction Works Area
Forestry Land-Use within the Ballynalacken Windfarm Construction Works Area
Agricultural Land-Use within the Ballynalacken Windfarm Construction Works Area
Biodiversity Protection Area
Hedgerow Removal
Hedgerow Replant
Hedgerow Improvement
Invasive Species - Cherry Laurel
River Barrow and River Nore SAC
River Nore SPA
HR8 - Blade Transfer Area
Location of Cherry Laurel
N


Appropriate Assessment Report
AA Figure 4.12 - Location of Excavations and Soil Storage Berms at the Windfarm, Internal Cable Link, Tinnalintan Substation and Ballynalacken Grid Connection
Legend:
Turbine
Hardcore Area
Windfarm Control Building
Internal Windfarm Cabling
Tinnalintan Substation
Internal Cable Link
Ballynalacken Grid Connection
Temporary Construction Compound
Borrow Pit
Met Mast
Telecom Relay Pole
Temporary Berm
Temporary Deposition Area
Temporary Road
Long Term Storage Berm
River Barrow and River Nore SAC
River Nore SPA
HR8 - Blade Transfer Area
Met Mast
T12
T11
T10
T9
Borrow Pit No.2
T8
Temporary Construction Compound No.1
T6
Borrow Pit No.1
T5
Temporary Construction Compound No.2
T7
T4
Windfarm Control Building
T3
T2
T1
Internal Cable Link
Ballynalacken Grid Connection
Tinnalintan Substation
Temporary Construction Compound No.3
Existing Eirgrid Ballyragget Substation
N

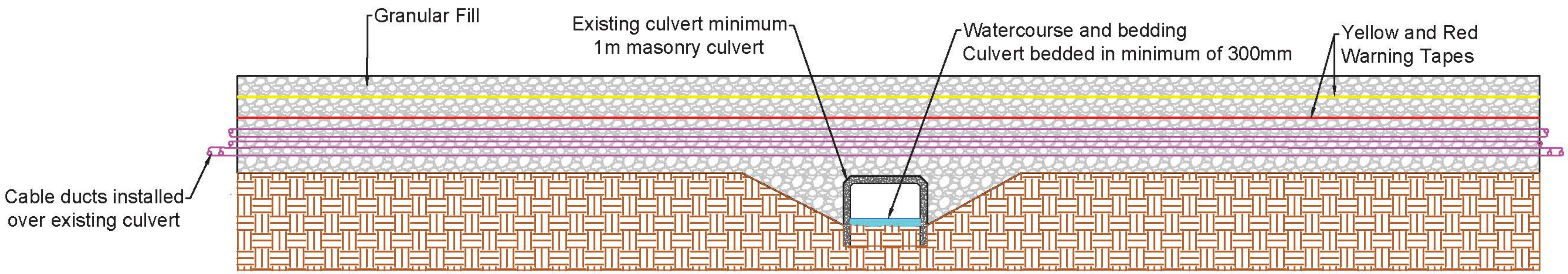
# DETAIL BI




'TYPE A' TYPICAL SECTION OF STREAM BOTTOMLESS CULVERT THRU' ROAD (WHERE APPLICABLE)

CROSS SECTION OF WORKS AT WATERCOURSE CROSSING **W1** AND WET DRAINAGE CHANNELS CROSSING WORKS **D1, D3 & D4**

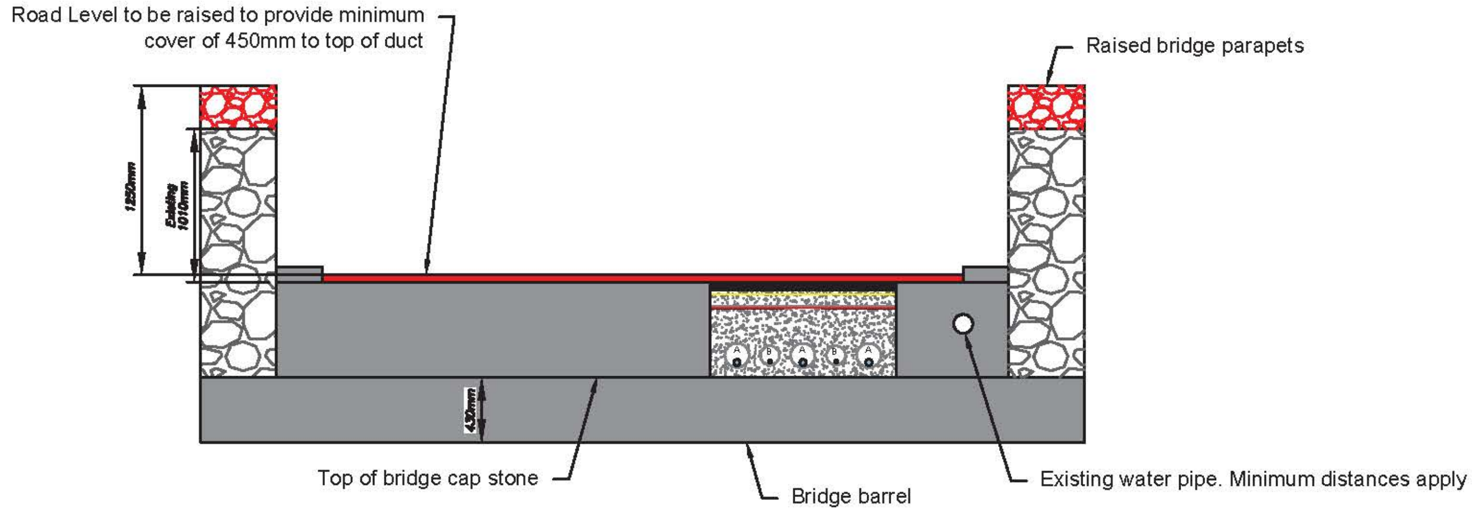
**AA Figure 4.14 - Watercourse Crossing Works at W2** ***(in public road over existing culvert)***




CROSS SECTION OF CABLES TO BE INSTALLED IN THE PUBLIC ROAD ABOVE THE EXISTING CULVERT **AT W2**. NO INSTREAM WORKS

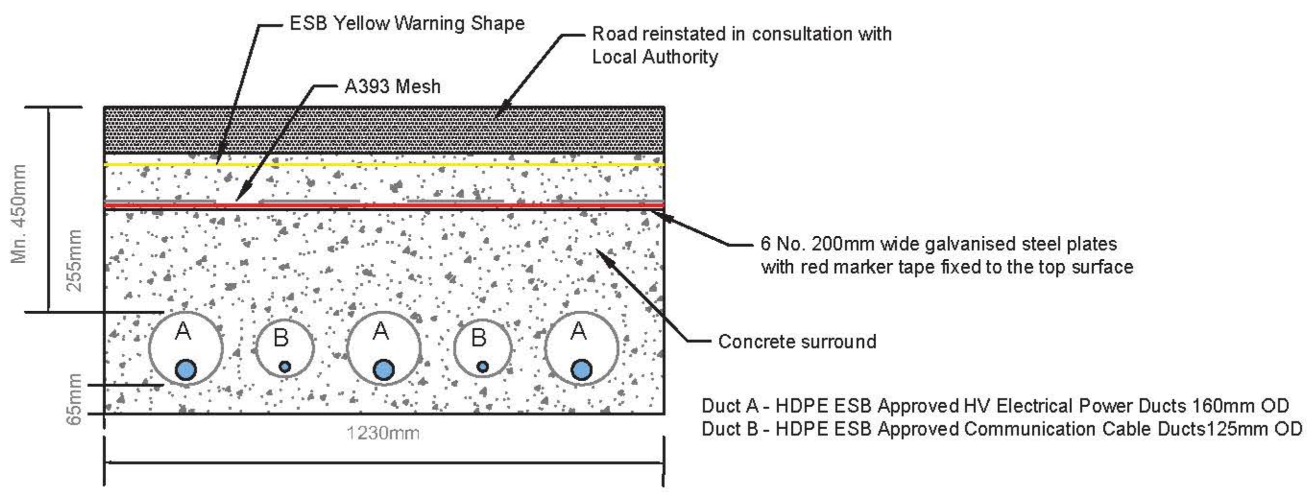
**Appropriate Assessment Report**

**AA Figure 4.15 - Watercourse Crossing Works at W3 Bridge - Option 1 *(trenching in deck of bridge)***




**<u>Cross Section of Crossing within bridge deck at W3 - Rathduff Stream</u>**

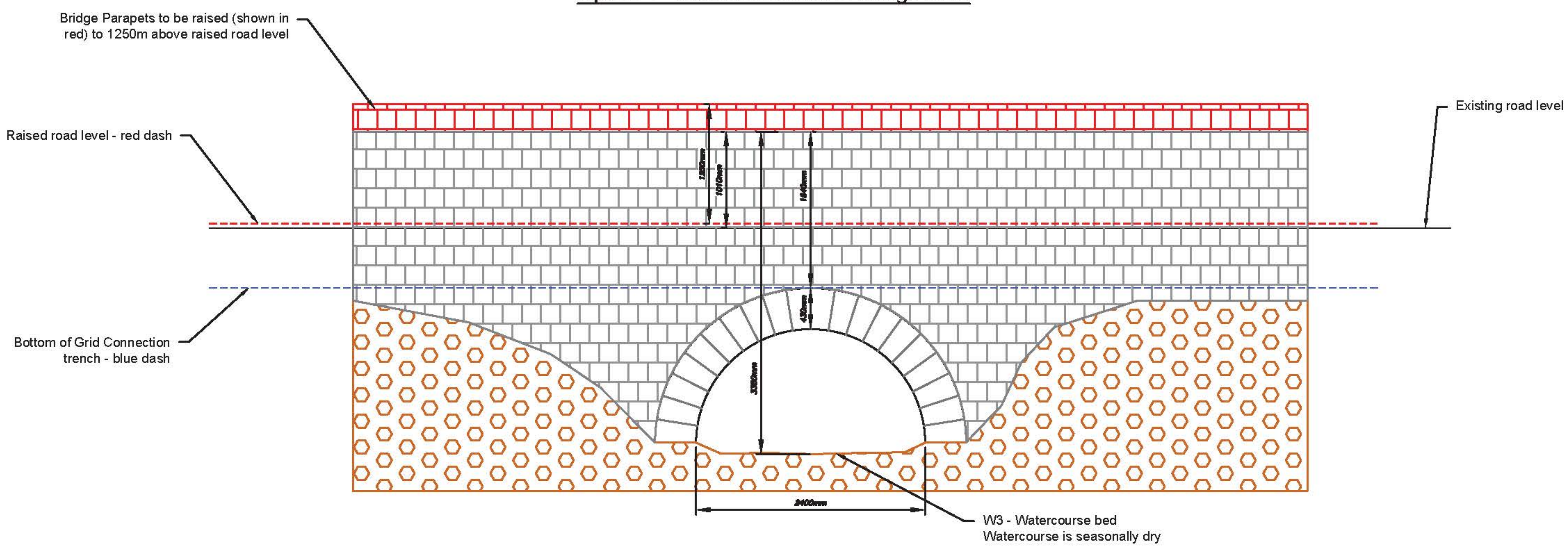
Note: 450mm is EirGrids minimum verticle cover to HV Power Ducts




**<u>Cross Section of Cables in Flat Formation.</u>**

Proposed at W3 due to the shallow cover in bridge deck

**<u>Option 1 - Cables installed in bridge deck</u>**

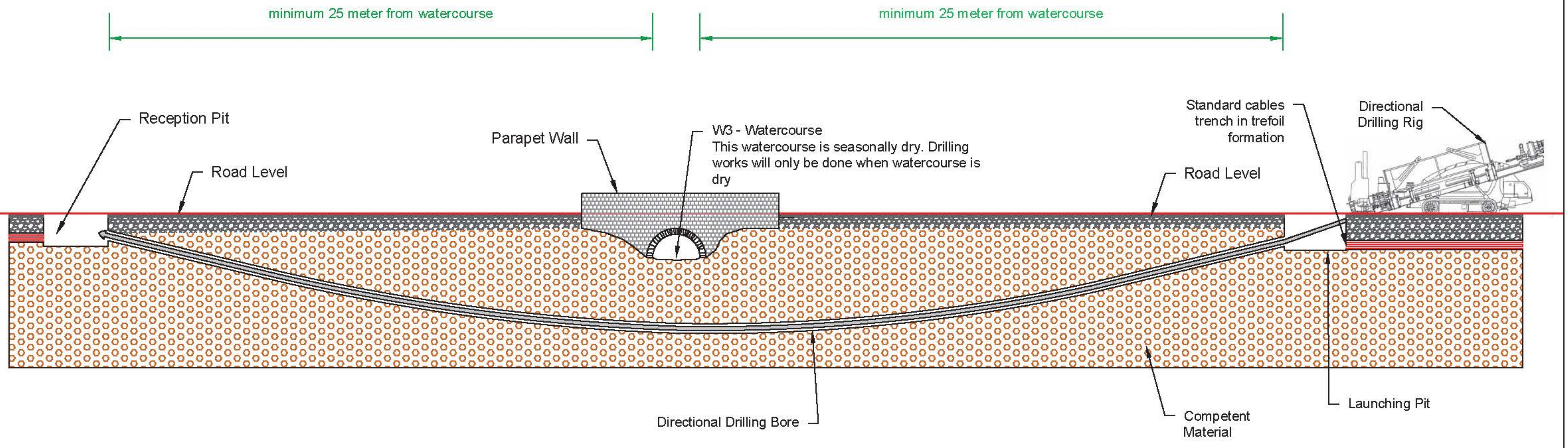



**<u>Elevation of Crossing within bridge deck at W3 - Rathduff Stream</u>**

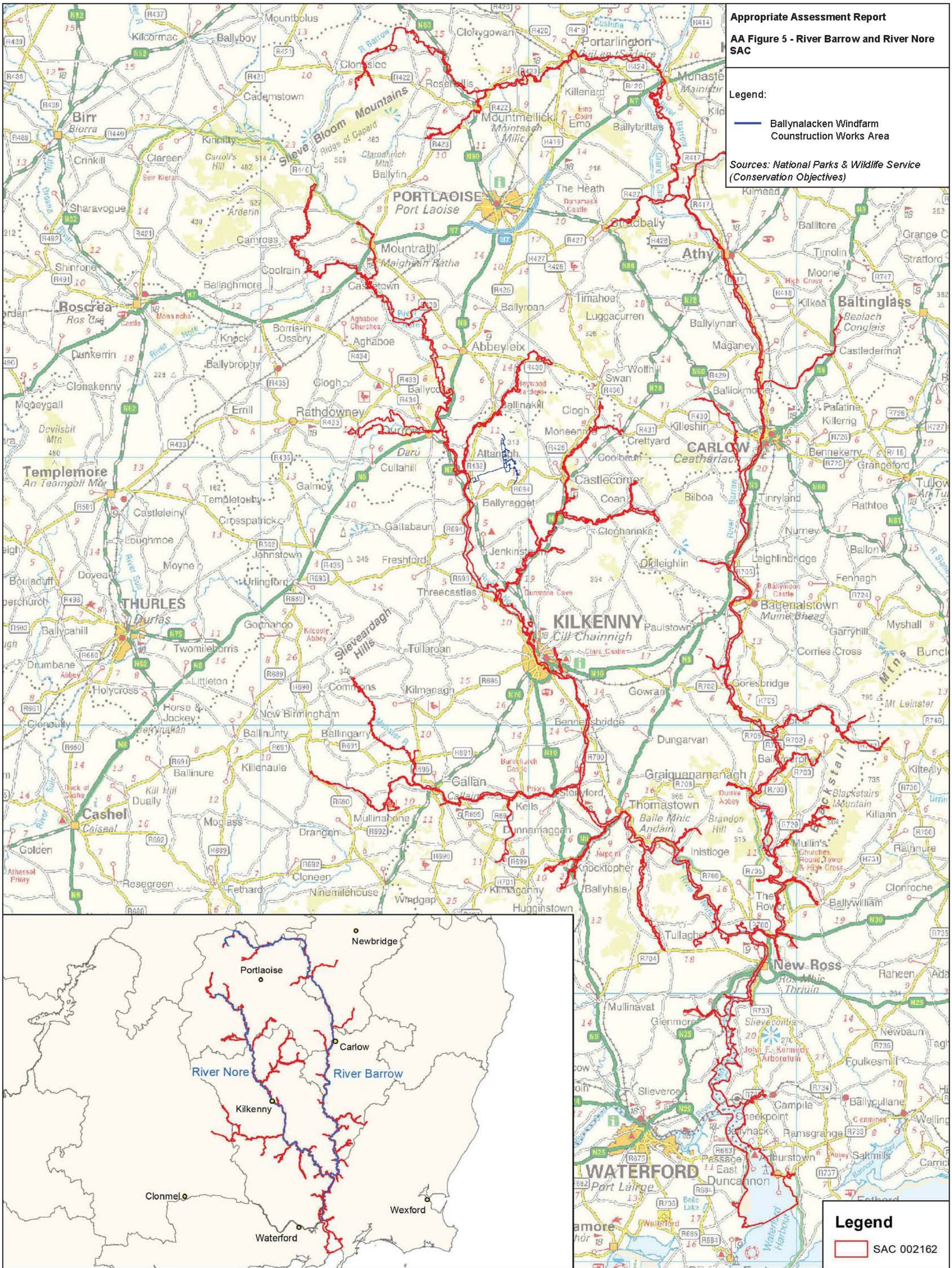
**Appropriate Assessment Report**

**AA Figure 4.16 - Watercourse Crossing Works at W3 Bridge - Option 2 *(directional drilling)***

## Option 2 - Directional Drill




**Cross section view of directional drilling at the W3 - Rathduff Stream**

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Department of Arts, Heritage and the Gaeltacht

**MAP 1:**
**RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES SAC DESIGNATION**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

0 5 10 15 km

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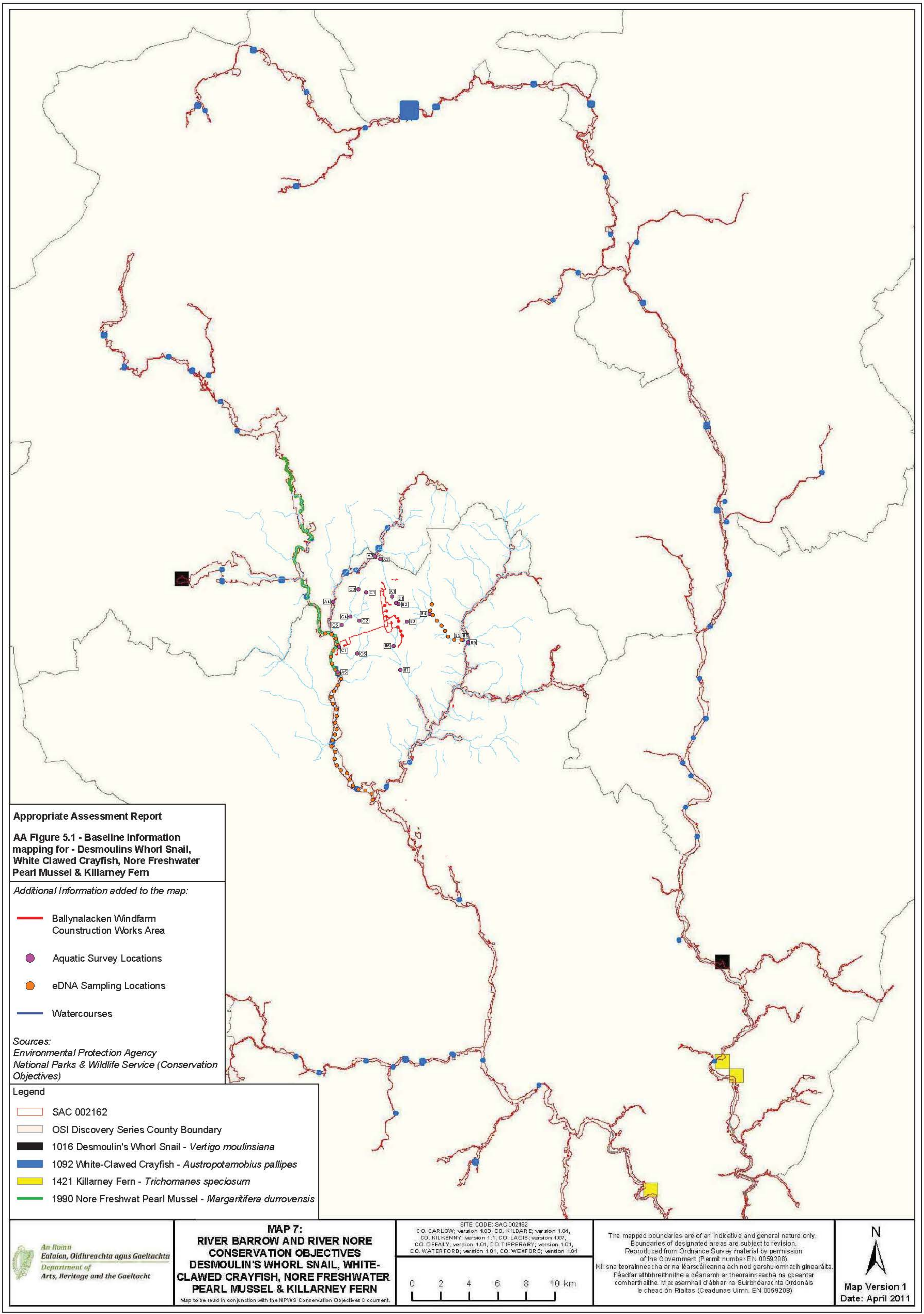
N

Map Version 1
Date: April 2011


Appropriate Assessment Report
AA Figure 5.1 - Baseline Information mapping for - Desmoulins Whorl Snail, White Clawed Crayfish, Nore Freshwater Pearl Mussel & Killarney Fern
Additional Information added to the map:
Ballynalacken Windfarm Counstruction Works Area
Aquatic Survey Locations
eDNA Sampling Locations
Watercourses
Sources:
Environmental Protection Agency
National Parks & Wildlife Service (Conservation Objectives)
Legend
SAC 002162
OSI Discovery Series County Boundary
1016 Desmoulin's Whorl Snail - Vertigo moulinsiana
1092 White-Clawed Crayfish - Austropotamobius pallipes
1421 Killarney Fern - Trichomanes speciosum
1990 Nore Freshwat Pearl Mussel - Margaritifera durrovensis
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Department of Arts, Heritage and the Gaeltacht
MAP 7:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES DESMOULIN'S WHORL SNAIL, WHITE-CLAWED CRAYFISH, NORE FRESHWATER PEARL MUSSEL & KILLARNEY FERN
Map to be read in conjunction with the NPWS Conservation Objectives Document.
SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01
0 2 4 6 8 10 km
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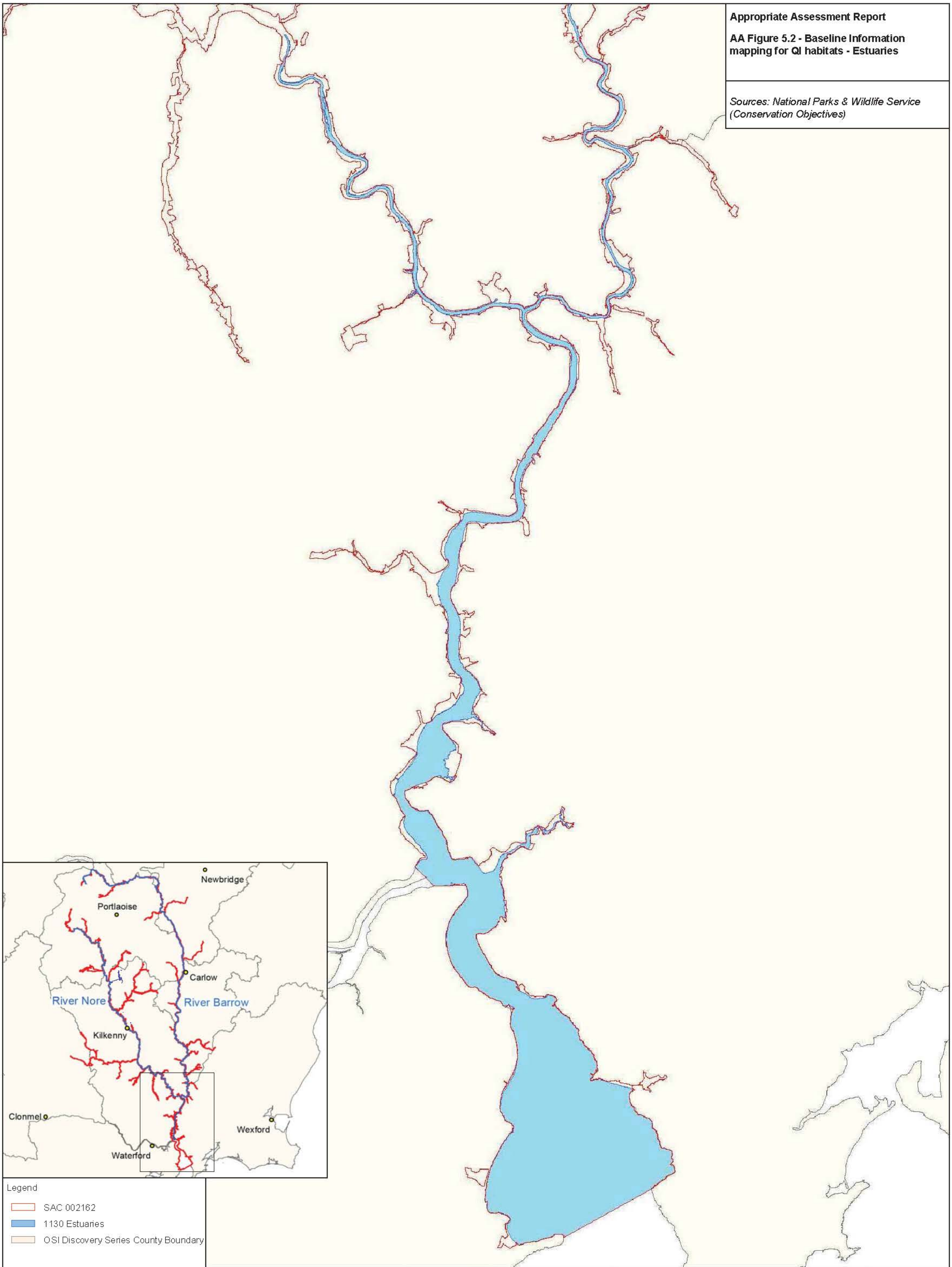
N
Map Version 1
Date: April 2011

**Appropriate Assessment Report**

**AA Figure 5.2 - Baseline Information mapping for QI habitats - Estuaries**

*Sources: National Parks & Wildlife Service (Conservation Objectives)*

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**MAP 2:**
**RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES ESTUARIES**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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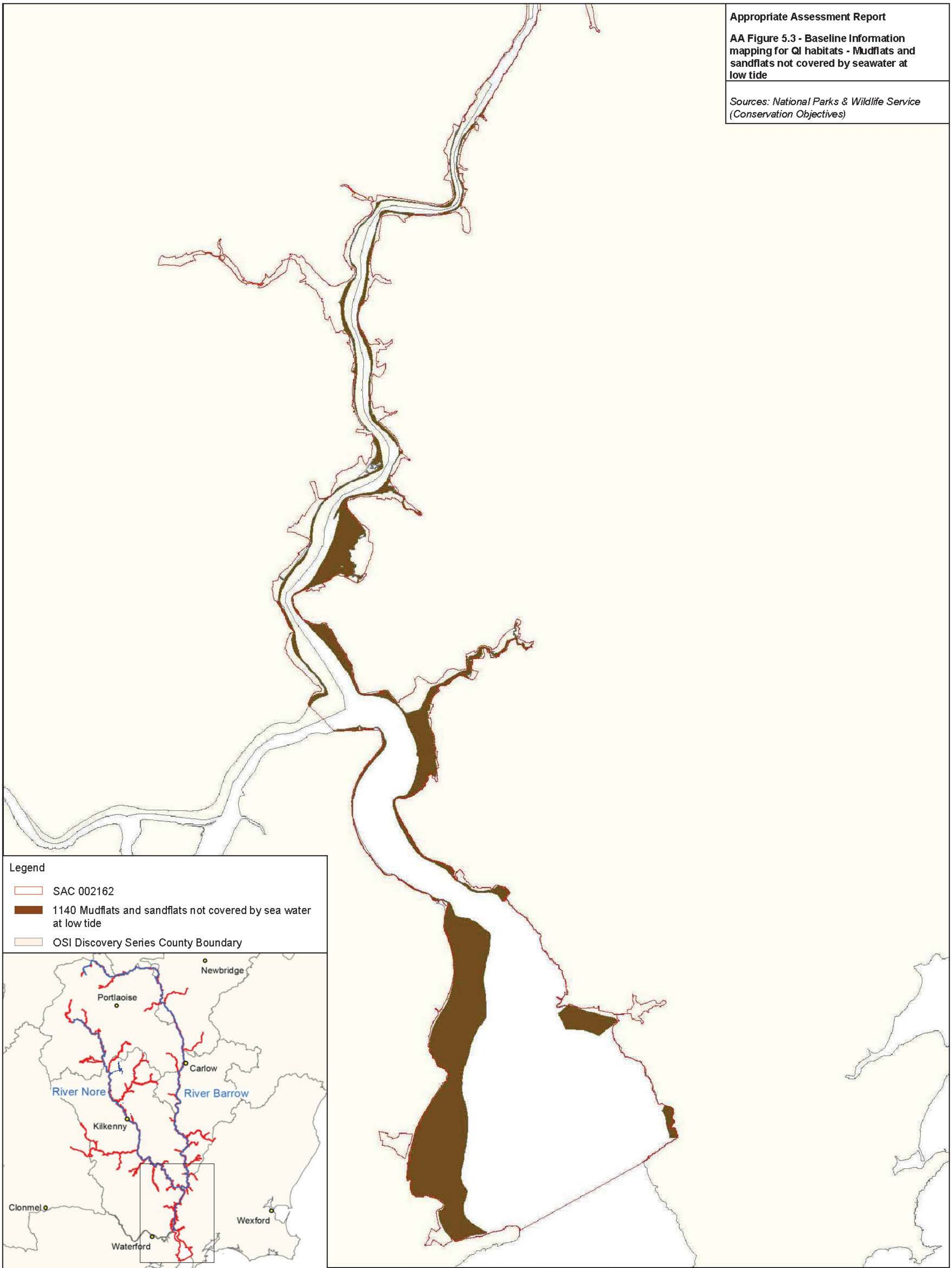
**Map Version 1**
**Date: April 2011**

**Appropriate Assessment Report**

**AA Figure 5.3 - Baseline Information mapping for QI habitats - Mudflats and sandflats not covered by seawater at low tide**

*Sources: National Parks & Wildlife Service (Conservation Objectives)*

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**MAP 3:**
**RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES TIDAL MUDFLATS AND SANDFLATS**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 103, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

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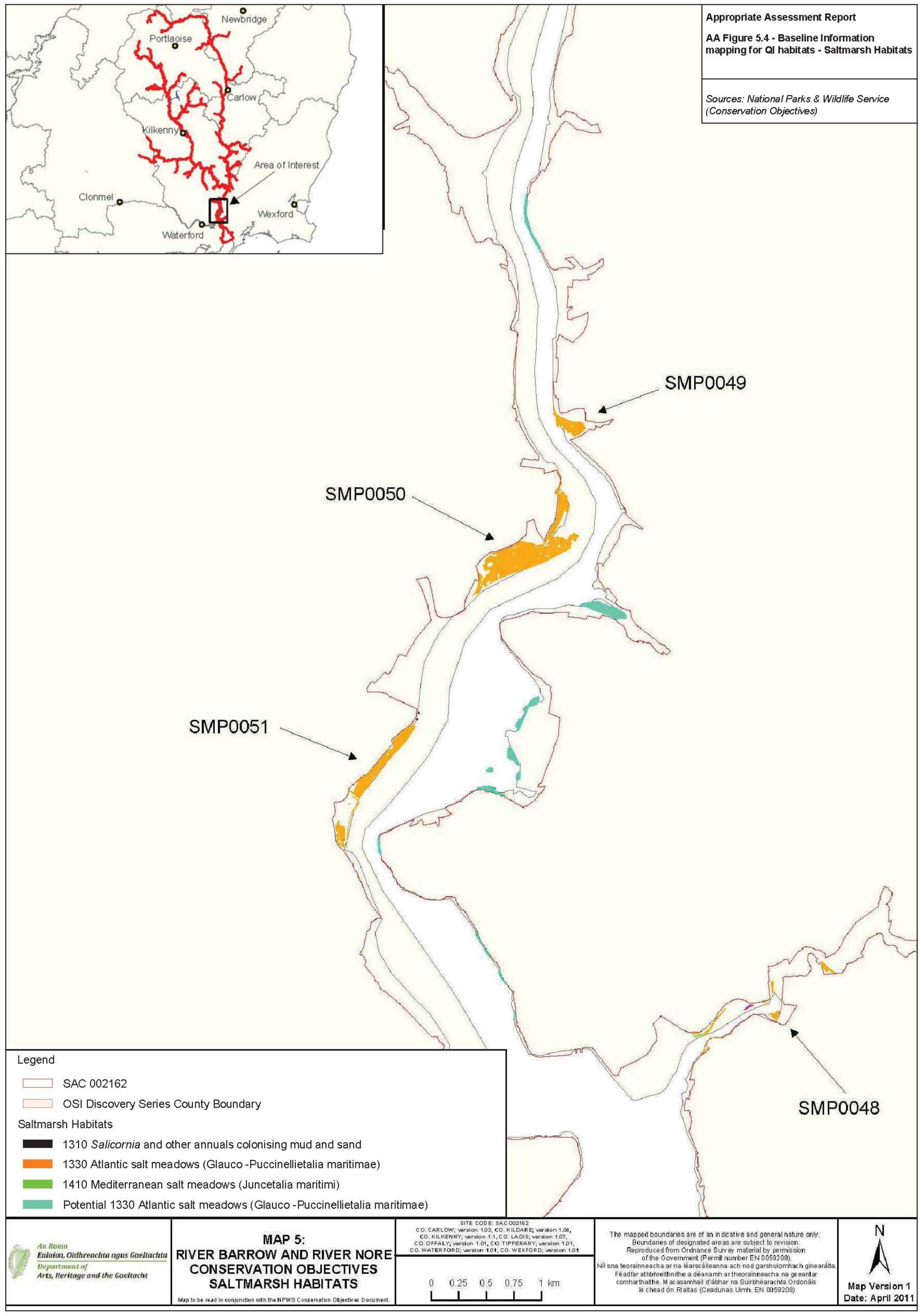
**Map Version 1**
**Date: April 2011**



Appropriate Assessment Report
AA Figure 5.4 - Baseline Information mapping for QI habitats - Saltmarsh Habitats
Sources: National Parks & Wildlife Service (Conservation Objectives)
Newbridge
Portlaoise
Carlow
Kilkenny
Area of Interest
Clonmel
Wexford
Waterford
SMP0049
SMP0050
SMP0051
SMP0048
Legend
SAC 002162
OSI Discovery Series County Boundary
Saltmarsh Habitats
1310 Salicornia and other annuals colonising mud and sand
1330 Atlantic salt meadows (Glauco -Puccinellietalia maritimae)
1410 Mediterranean salt meadows (Juncetalia maritimi)
Potential 1330 Atlantic salt meadows (Glauco -Puccinellietalia maritimae)
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MAP 5:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES SALTMARSH HABITATS
Map to be read in conjunction with the NPWS Conservation Objectives Document.
SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1:1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01
0 0.25 0.5 0.75 1 km
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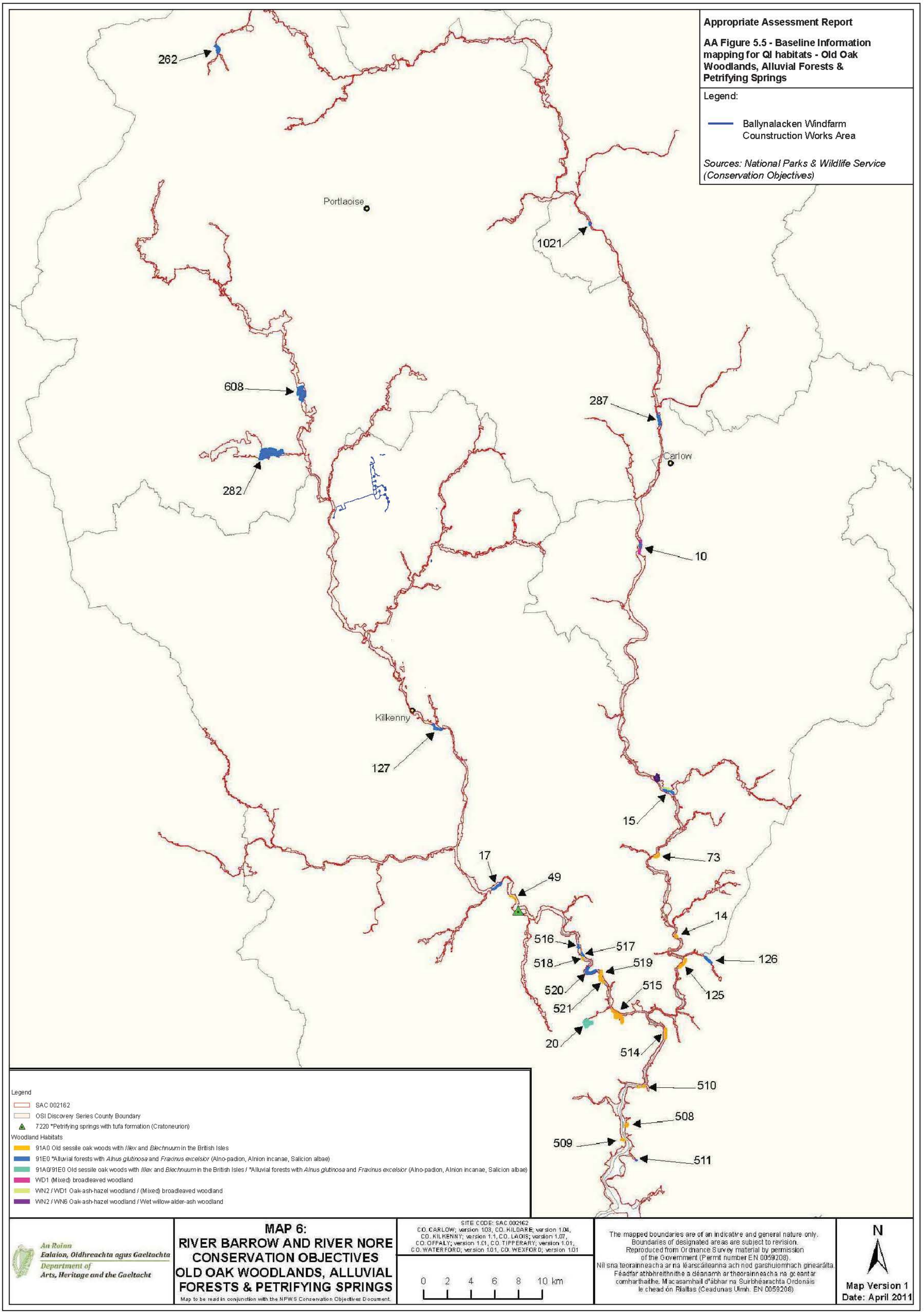
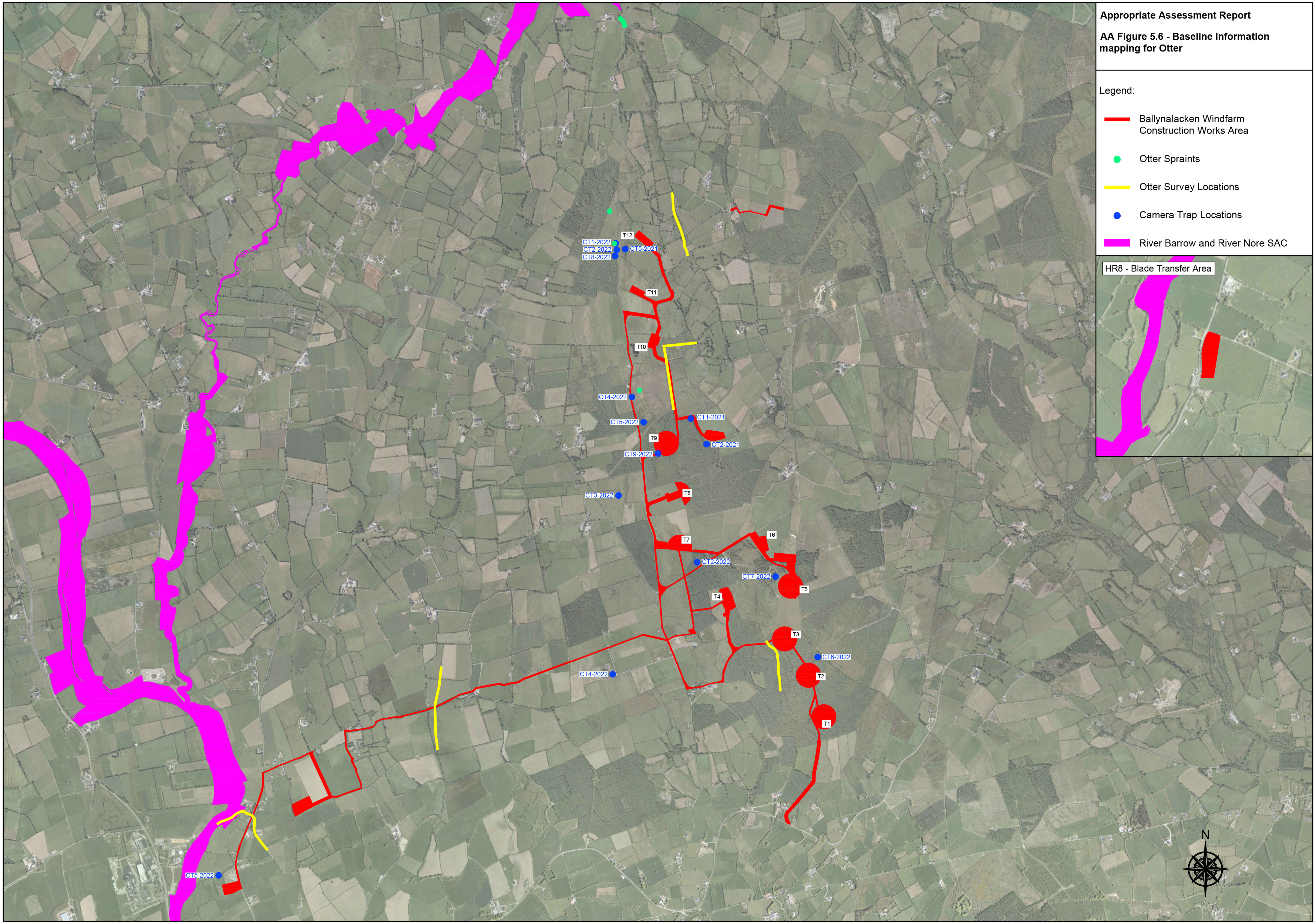
N
Map Version 1
Date: April 2011


Appropriate Assessment Report
AA Figure 5.5 - Baseline Information mapping for QI habitats - Old Oak Woodlands, Alluvial Forests & Petrifying Springs
Legend:
Ballynalacken Windfarm Counstruction Works Area
Sources: National Parks & Wildlife Service (Conservation Objectives)
Portlaoise
Carlow
Kilkenny
262
1021
608
287
282
10
127
15
73
17
49
14
516
517
518
519
126
520
515
125
521
20
514
510
508
509
511
Legend
SAC 002162
OSI Discovery Series County Boundary
7220 *Petrifying springs with tufa formation (Cratoneurion)
Woodland Habitats
91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae)
91A0/91E0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles / *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae)
WD1 (Mixed) broadleaved woodland
WN2 / WD1 Oak-ash-hazel woodland / (Mixed) broadleaved woodland
WN2 / WN6 Oak-ash-hazel woodland / Wet willow-alder-ash woodland
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
MAP 6:
RIVER BARROW AND RIVER NORE
CONSERVATION OBJECTIVES
OLD OAK WOODLANDS, ALLUVIAL
FORESTS & PETRIFYING SPRINGS
Map to be read in conjunction with the NPWS Conservation Objectives Document.
SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04,
CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07,
CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01,
CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01
0 2 4 6 8 10 km
The mapped boundaries are of an indicative and general nature only.
Boundaries of designated areas are subject to revision.
Reproduced from Ordnance Survey material by permission
of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta.
Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar
comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis
le chead ón Rialtas (Ceadunas Uimh. EN 0059208).
N
Map Version 1
Date: April 2011



Appropriate Assessment Report
AA Figure 5.6 - Baseline Information mapping for Otter
Legend:
Ballynalacken Windfarm Construction Works Area
Otter Spraints
Otter Survey Locations
Camera Trap Locations
River Barrow and River Nore SAC
HR8 - Blade Transfer Area
T12
T11
T10
T9
T8
T7
T6
T5
T4
T3
T2
T1
CT1-2022
CT2-2022
CT8-2022
CT5-2021
CT4-2022
CT5-2022
CT1-2021
CT2-2021
CT9-2022
CT3-2022
CT2-2022
CT7-2022
CT6-2022
CT4-2022
CT5-2022
N

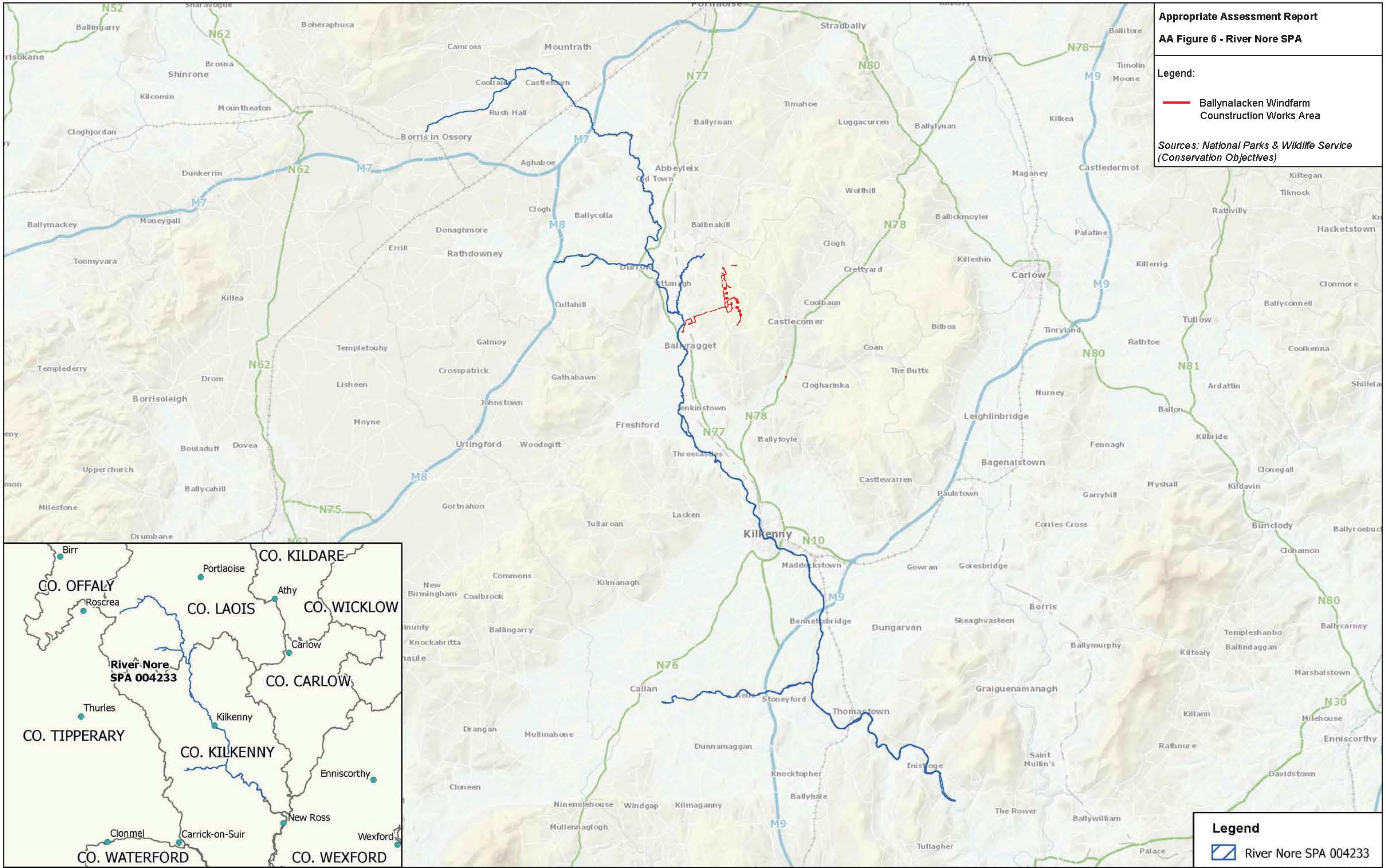
**Appropriate Assessment Report**

**AA Figure 6 - River Nore SPA**

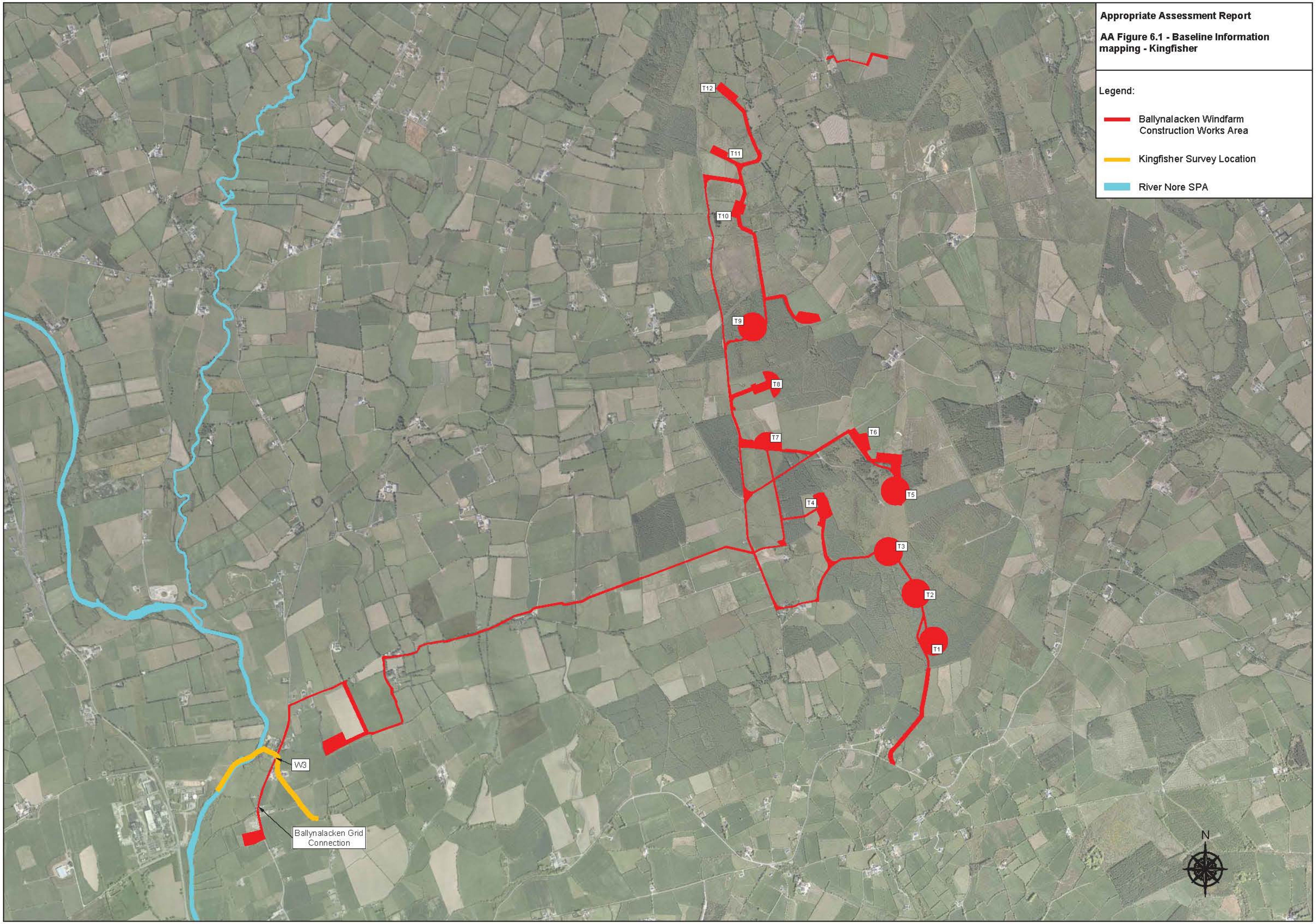
Legend:

Ballynalacken Windfarm Counstruction Works Area

*Sources: National Parks & Wildlife Service (Conservation Objectives)*




| | | | | |
|---|---|---|---|---|
| NPWS An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra National Parks and Wildlife Service | **MAP 1: RIVER NORE SPA CONSERVATION OBJECTIVES SPA DESIGNATION**<br>Map to be read in conjunction with the NPWS Conservation Objectives Document | **SITE CODE: SPA 004233; version 3 CO. KILKENY, LAOIS**<br>0 2 4 8 Kilometres | The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. © Includes National Mapping Division of Tailte Éireann data reproduced under National Mapping Division of Tailte Éireann Licence number CYAL50351092.<br>Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. © Folaionn sé rannán Náisiúnta Mapála de shonral Tailte Éireann arna atáirgeadh faoin rannán mapála Náisiúnta d'uimhir cheadúnais Tailte Éireann CYAL50351092 | N<br>Map version 1 Date: May 2024 |


Appropriate Assessment Report
AA Figure 6.1 - Baseline Information mapping - Kingfisher
Legend:
Ballynalacken Windfarm Construction Works Area
Kingfisher Survey Location
River Nore SPA
T12
T11
T10
T9
T8
T7
T6
T5
T4
T3
T2
T1
W3
Ballynalacken Grid Connection
N

# AA Appendix 1

# Conservation Objectives – River Barrow & River Nore SAC

# National Parks and Wildlife Service

## *Conservation Objectives*

## River Barrow and River Nore SAC 002162

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

## Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:
- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

**Notes/Guidelines:**

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

## Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002162 River Barrow and River Nore SAC

| QI | Description |
|---|---|
| 1016 | Desmoulin's whorl snail *Vertigo moulinsiana* |
| 1029 | Freshwater pearl mussel *Margaritifera margaritifera* |
| 1092 | White-clawed crayfish *Austropotamobius pallipes* |
| 1095 | Sea lamprey *Petromyzon marinus* |
| 1096 | Brook lamprey *Lampetra planeri* |
| 1099 | River lamprey *Lampetra fluviatilis* |
| 1103 | Twaite shad *Alosa fallax* |
| 1106 | Atlantic salmon (*Salmo salar*) (only in fresh water) |
| 1130 | Estuaries |
| 1140 | Mudflats and sandflats not covered by seawater at low tide |
| 1310 | *Salicornia* and other annuals colonizing mud and sand |
| 1330 | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) |
| 1355 | Otter *Lutra lutra* |
| 1410 | Mediterranean salt meadows (*Juncetalia maritimi*) |
| 1421 | Killarney fern *Trichomanes speciosum* |
| 1990 | Nore freshwater pearl mussel *Margaritifera durrovensis* |
| 3260 | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation |
| 4030 | European dry heaths |
| 6430 | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels |
| 7220 | * Petrifying springs with tufa formation (*Cratoneurion*) |
| 91A0 | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles |
| 91E0 | * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) |

## Supporting documents, relevant reports & publications (listed by date)

***Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications***

**Title:** Desmoulin's whorl snail (*Vertigo moulinsiana* - 1016) Conservation Status Assessment Report

**Year:** 2011

**Author:** Moorkens, E. ; Killeen, I.

**Series:** Unpublished Report to NPWS

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**Title:** River Barrow and River Nore SAC (002162): Conservation objectives supporting document - woodland habitats [Version 1]

**Year:** 2011

**Author:** NPWS

**Series:** Unpublished Report to NPWS

---

**Title:** River Barrow and River Nore SAC (002162): Conservation objectives supporting document - coastal habitats [Version 1]

**Year:** 2011

**Author:** NPWS

**Series:** Unpublished Report to NPWS

---

**Title:** River Barrow and River Nore SAC (002162): Conservation objectives supporting document - marine habitats [Version 1]

**Year:** 2011

**Author:** NPWS

**Series:** Unpublished Report to NPWS

---

**Title:** Second Draft Nore Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

**Year:** 2010

**Author:** DEHLG

**Series:** Unpublished Report to NPWS

---

**Title:** Site investigations for *Sabellaria alveolata* (Honey-comb worm) biogenic reefs in Ireland

**Year:** 2010

**Author:** NPWS

**Series:** Unpublished Report to NPWS

---

**Title:** Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo

**Year:** 2010

**Author:** O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.

**Series:** Unpublished Report to NPWS

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**Title:** A provisional inventory of ancient and long-established woodland in Ireland

**Year:** 2010

**Author:** Perrin, P.M.; Daly, O.H.

**Series:** Irish Wildlife Manuals No. 46

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**Title:** Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland [Version 1.0]

**Year:** 2010

**Author:** Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.

**Series:** Irish Wildlife Manuals No. 48

**Title:** A technical manual for monitoring white-clawed crayfish *Austropotamobius pallipes* in Irish lakes
**Year:** 2010
**Author:** Reynolds, J.D.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
**Series:** Irish Wildlife Manuals No. 45

---

**Title:** Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011
**Year:** 2010
**Author:** SSC
**Series:** Unpublished Report to DCENR

---

**Title:** The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]
**Year:** 2009
**Author:** Government of Ireland
**Series:** Irish Statute Book

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**Title:** The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]
**Year:** 2009
**Author:** Government of Ireland
**Series:** Irish Statute Book

---

**Title:** Saltmarsh Monitoring Report 2007-2008
**Year:** 2009
**Author:** McCorry, M.; Ryle, T.
**Series:** Unpublished Report to NPWS

---

**Title:** *Margaritifera durrovensis* Survey of Nore River. June – July 2009. NS 2 project
**Year:** 2009
**Author:** Moorkens, E. A.
**Series:** Unpublished Report to NPWS

---

**Title:** Benthic Biotope classification of subtidal sedimentary habitats in the Lower River Suir candidate Special Area of Conservation and the River Nore and River Barrow candidate Special Area of Conservation
**Year:** 2008
**Author:** ARMS
**Series:** Unpublished Report to NPWS

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**Title:** A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Waterford Estuary
**Year:** 2008
**Author:** ASU
**Series:** Unpublished Report to NPWS

---

**Title:** Assessment of the Risk of Barriers to Fish Migration in the Nore Catchment, Southern Regional Fisheries Board
**Year:** 2008
**Author:** CFB; Compass Informatics
**Series:** Unpublished Report to CFB

**Title:** Poor water quality constrains the distribution and movements of Twaite shad *Alosa fallax fallax* (Lacepede, 1803) in the watershed of river Scheldt

**Year:** 2008

**Author:** Maas, J.; Stevens, M. ; Breine, J.

**Series:** Hydrobiologia 602, 129 - 143

**Title:** All Ireland Species Action Plan - Killarney fern

**Year:** 2008

**Author:** NPWS ; EHS-NI

**Series:** Unpublished Report to NPWS & EHS-NI

**Title:** National Survey of Native Woodlands 2003-2008

**Year:** 2008

**Author:** Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

**Series:** Unpublished Report to NPWS

**Title:** Saltmarsh Monitoring Report 2006

**Year:** 2007

**Author:** McCorry, M.

**Series:** Unpublished Report to NPWS

**Title:** Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

**Year:** 2007

**Author:** NPWS

**Series:** Unpublished Report to NPWS

**Title:** A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

**Year:** 2007

**Author:** O'Connor, W.

**Series:** Irish Wildlife Manuals No. 26

**Title:** Assessment of fish passage and the ecological impact of migration barriers on the River Nore catchment

**Year:** 2007

**Author:** Sullivan, A.

**Series:** Nore Suir Rivers Trust & OPW

**Title:** Otter Survey of Ireland 2004/2005

**Year:** 2006

**Author:** Bailey, M.; Rochford, J.

**Series:** Irish Wildlife Manuals No. 23

**Title:** The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams

**Year:** 2006

**Author:** Geist, J.; Porkka, M.; Kuehn, R.

**Series:** Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

**Title:** The distribution of Lamprey in the River Barrow SAC

**Year:** 2006

**Author:** King, J.J.

**Series:** Irish Wildlife Manuals No. 21

**Title:** Otters - ecology, behaviour and conservation

**Year:** 2006

**Author:** Kruuk, H.

**Series:** Oxford University Press

**Title:** The ecology and conservation of the gametophyte generation of the Killarney Fern (*Trichomanes speciosum* Willd.) in Ireland

**Year:** 2005

**Author:** Kingston, N. ; Hayes, C.

**Series:** Biology and Environment: Proceedings of the Royal Irish Academy 105B(2): 71-79

**Title:** Pilot Project for Monitoring Populations of the Freshwater Pearl Mussel. Baseline survey of the Nore River SAC, Counties Laois and Kilkenny

**Year:** 2004

**Author:** Moorkens, E. A.

**Series:** Unpublished Report to NPWS

**Title:** Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

**Year:** 2003

**Author:** Harvey, J.; Cowx, I.

**Series:** Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough

**Title:** Ecology of Watercourses Characterised by *Ranunculion fluitantis* and *Callitricho-Batrachion* Vegetation

**Year:** 2003

**Author:** Hatton-Ellis, T.W.; Grieve, N.

**Series:** Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough.

**Title:** Ecology of the Allis and Twaite shad

**Year:** 2003

**Author:** Maitland, P.S.; Hatton-Ellis, T.W.

**Series:** Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough

**Title:** A survey of the white-clawed crayfish, *Austropotamobius pallipes* (Lereboullet) and of water quality in two catchments of Eastern Ireland

**Year:** 2002

**Author:** Demers, A.; Reynolds, J. D.

**Series:** Bulletin Français de la Pêche et de la Pisciculture, 367: 729-740

**Title:** Reversing the habitat fragmentation of British woodlands

**Year:** 2002

**Author:** Peterken, G.

**Series:** WWF-UK, London

**Title:** A survey of broadleaf woodlands in 3 SACs: Barrow-Nore, River Unshin & Lough Forbes

**Year:** 2000

**Author:** Browne, A.; Dunne, F.; Roche, N.

**Series:** Unpublished Report to NPWS

**Title:** Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

**Year:** 1999

**Author:** Kingston, S.; O'Connell, M.; Fairley, J.S.

**Series:** Biol & Environ Proc R Ir Acad B 99B:173–182

**Title:** Conservation Management of the White-clawed Crayfish, *Austropotamobius pallipes*

**Year:** 1998

**Author:** Reynolds, J.D.

**Series:** Irish Wildlife Manuals No. 1

---

**Title:** Studies on the biology and ecology of Margaritifera in Ireland

**Year:** 1996

**Author:** Moorkens, E.A.

**Series:** Unpublished PhD thesis, University of Dublin, Trinity College.

---

**Title:** Imminent extinction of the Nore freshwater pearl mussel *Margaritifera durrovensis* Phillips: a species unique to Ireland

**Year:** 1994

**Author:** Moorkens, E.A. ; Costello, M.J.

**Series:** Aquatic Conservation: Marine and Freshwater Ecosystems 4,363-365

---

**Title:** The spatial organization of otters (*Lutra lutra*) in Shetland

**Year:** 1991

**Author:** Kruuk, H.; Moorhouse, A.

**Series:** J. Zool, 224: 41-57

---

**Title:** The vegetation of Irish rivers

**Year:** 1987

**Author:** Heuff, H.

**Series:** Unpublished Report

---

**Title:** Otter survey of Ireland

**Year:** 1982

**Author:** Chapman, P.J.; Chapman, L.L.

**Series:** Unpublished Report to Vincent Wildlife Trust

## Spatial data sources

| | |
|---|---|
| **Year:** | 2010 |
| **Title:** | EPA transitional waterbody data |
| **GIS operations:** | Clipped to SAC boundary |
| **Used for:** | 1130 (map 2) |

| | |
|---|---|
| **Year:** | Interpolated 2011 |
| **Title:** | Intertidal and subtidal surveys 2008 & 2010 |
| **GIS operations:** | Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data |
| **Used for:** | Marine community types, 1140 (maps 3 & 4) |

| | |
|---|---|
| **Year:** | 2005 |
| **Title:** | OSi Discovery series vector data |
| **GIS operations:** | High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; Saltmarsh and Sand Dune datasets erased out if applicable |
| **Used for:** | Marine community types base data (map 4) |

| | |
|---|---|
| **Year:** | Revision 2010 |
| **Title:** | Saltmarsh Monitoring Project 2007-2008. Version 1 |
| **GIS operations:** | QIs selected; clipped to SAC boundary; overlapping regions with Sand Dune data investigated and resolved with expert opinion used |
| **Used for:** | 1310, 1330, 1410 (map 5) |

| | |
|---|---|
| **Year:** | Derived 2011 |
| **Title:** | Internal NPWS files |
| **GIS operations:** | Dataset created from spatial reference contained in files |
| **Used for:** | 7220 (map 6) |

| | |
|---|---|
| **Year:** | Revision 2010 |
| **Title:** | National Survey of Native Woodlands 2003-2008. Version 1 |
| **GIS operations:** | QIs selected; clipped to SAC boundary |
| **Used for:** | 91A0, 91E0 (map 6) |

| | |
|---|---|
| **Year:** | 2011 |
| **Title:** | NPWS rare and threatened species database |
| **GIS operations:** | Dataset created from spatial references in database records |
| **Used for:** | 1016, 1092, 1421, 1990 (map 7) |

| | |
|---|---|
| **Year:** | 2005 |
| **Title:** | OSi Discovery series vector data |
| **GIS operations:** | Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the landward side of the river banks data; creation of a 20m buffer applied to river centerline and stream data; combination of 10m river banks and 20m river and stream centerline buffer datasets; combined river and stream buffer dataset clipped to HWM; combination of HWM buffer dataset with river and stream buffer dataset; overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary |
| **Used for:** | 1355 (no map) |

## 1016 Desmoulin's whorl snail *Vertigo moulinsiana*

**To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution: occupied sites | Number | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 | Data from NPWS rare and threatened species database |
| Population size: adults | Number per positive sample | At least 5 adults snails in at least 50% of samples | Attribute and target from Moorkens and Killeen (2011) |
| Population density | Percentage positive samples | Adult snails present in at least 60% of samples per site | Attribute and target from Moorkens and Killeen (2011) |
| Area of occupancy | Hectares | Minimum of 1ha of suitable habitat per site | Attribute and target from Moorkens and Killeen (2011) |
| Habitat quality: vegetation | Percentage of samples with suitable vegetation | 90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011) | Attribute and target from Moorkens and Killeen (2011) |
| Habitat quality: soil moisture levels | Percentage of samples with appropriate soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) | Attribute and target from Moorkens and Killeen (2011) |

## 1029 Freshwater pearl mussel *Margaritifera margaritifera*

**The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species.**

## 1092 White-clawed crayfish *Austropotamobius pallipes*

**To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution | Occurrence | No reduction from baseline. See map 7 | The crayfish is present almost throughout this SAC. The records extend as far downstream as Thomastown on the Nore and Graiguenamanagh on the Barrow |
| Population structure: recruitment | Percentage occurrence of juveniles and females with eggs | Juveniles and/or females with eggs in at least 50% of positive samples | See Reynolds et al. (2010) for further details |
| Negative indicator species | Occurrence | No alien crayfish species | Alien crayfish species are identified as major direct threat to this species and as disease vector. See Reynolds (1998) for further details |
| Disease | Occurrence | No instances of disease | Disease is identified as major threat and has occurred in Ireland even in the absence of alien vectors. See Reynolds (1998) for further details |
| Water quality | EPA Q value | At least Q3-4 at all sites sampled by EPA | Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA) |
| Habitat quality: heterogeneity | Occurrence of positive habitat features | No decline in heterogeneity or habitat quality | Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree-roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions must be available on the whole length of occupied habitat |

## 1095 Sea lamprey *Petromyzon marinus*

**To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution: extent of anadromy | % of river accessible | Greater than 75% of main stem length of rivers accessible from estuary | Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers |
| Population structure of juveniles | Number of age/size groups | At least three age/size groups present | Attribute and target based on data from Harvey and Cowx (2003) and O'Connor, (2007). King (2007) provides survey information for the Barrow |
| Juvenile density in fine sediment | Juveniles/m² | Juvenile density at least 1/m² | Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) |
| Extent and distribution of spawning habitat | m² and occurrence | No decline in extent and distribution of spawning beds | Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |
| Availability of juvenile habitat | Number of positive sites in 3rd order channels (and greater), downstream of spawning areas | More than 50% of sample sites positive | Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |

## 1096 Brook lamprey *Lampetra planeri*

**To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution | % of river accessible | Access to all watercourses down to first order streams | Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artifical barriers |
| Population structure of juveniles | Number of age/size groups | At least three age/size groups of brook/river lamprey present | Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target |
| Juvenile density in fine sediment | Juveniles/m² | Mean catchment juvenile density of brook/river lamprey at least 2/m² | Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis |
| Extent and distribution of spawning habitat | m² and occurrence | No decline in extent and distribution of spawning beds | Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |
| Availability of juvenile habitat | Number of positive sites in 2nd order channels (and greater), downstream of spawning areas | More than 50% of sample sites positive | Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |

## 1099 River lamprey *Lampetra fluviatilis*

**To restore the favourable conservation condition of River lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution: extent of anadromy | % of river accessible | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers |
| Population structure of juveniles | Number of age/size groups | At least three age/size groups of river/brook lamprey present | Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target |
| Juvenile density in fine sediment | Juveniles/$m^2$ | Mean catchment juvenile density of brook/river lamprey at least 2/$m^2$ | Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/$m^2$ in optimal conditions and more than 2/$m^2$ on a catchment basis |
| Extent and distribution of spawning habitat | $m^2$ and occurrence | No decline in extent and distribution of spawning beds | Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |
| Availability of juvenile habitat | Number of positive sites in 2nd order channels (and greater), downstream of spawning areas | More than 50% of sample sites positive | Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information |

## 1103 Twaite shad *Alosa fallax*

**To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
| --- | --- | --- | --- |
| Distribution: extent of anadromy | % of river accessible | Greater than 75% of main stem length of rivers accessible from estuary | In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas |
| Population structure: age classes | Number of age classes | More than one age class present | Regular breeding has been confirmed in the River Barrow in recent years, but not in the Nore |
| Extent and distribution of spawning habitat | m² and occurrence | No decline in extent and distribution of spawning habitats | |
| Water quality: oxygen levels | Milligrammes per litre | No lower than 5mg/l | Attribute and target based on Maas, Stevens and Briene (2008) |
| Spawning habitat quality: Filamentous algae; macrophytes; sediment | Occurrence | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth | See Maitland and Hatton-Ellis (2003) for further information |

## 1106 Atlantic salmon (*Salmo salar*) (only in fresh water)

**To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution: extent of anadromy | % of river accessible | 100% of river channels down to second order accessible from estuary | Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers |
| Adult spawning fish | Number | Conservation Limit (CL) for each system consistently exceeded | A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Nore is currently exceeding its CL, while the Barrow is below its CL |
| Salmon fry abundance | Number of fry/5 minutes electrofishing | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling | Target is threshold value for rivers currently exceeding their conservation limit (CL) |
| Out-migrating smolt abundance | Number | No significant decline | Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*) |
| Number and distribution of redds | Number and occurrence | No decline in number and distribution of spawning redds due to anthropogenic causes | Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat |
| Water quality | EPA Q value | At least Q4 at all sites sampled by EPA | Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA) |

## 1130 Estuaries

**To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | The permanent habitat area is stable or increasing, subject to natural processes. See map 2 | Habitat area was estimated using OSI data and the defined Transitional Water Body area under the Water Framework Directive as 3856ha. See marine supporting document for further details |
| Community distribution | Hectares | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 | The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details |
| Community extent | Hectares | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 | The likely area of this community is derived from a survey undertaken in 2010 (NPWS, 2010). See marine supporting document for further details |

## 1140 Mudflats and sandflats not covered by seawater at low tide

**To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | The permanent habitat area is stable or increasing, subject to natural processes. See map 3 | Habitat area was estimated using OSI data as 926ha. See marine supporting document for further details |
| Community distribution | Hectares | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex. See map 4 | The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details |

## 1310 *Salicornia* and other annuals colonizing mud and sand

**To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville - 0.03ha. See map 5 | Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The Ringville sub-site was mapped and no additional areas of potential Salicornia mudflat were identified from an examination of aerial photographs, giving a total estimated area of 0.03ha. NB futher unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details |
| Habitat distribution | Occurrence | No decline, subject to natural processes. See map 5 | See coastal habitats supporting document for further details |
| Physical structure: sediment supply | Presence/absence of physical barriers | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | See coastal habitats supporting document for further details |
| Physical structure: flooding regime | Hectares flooded; frequency | Maintain natural tidal regime | See coastal habitats supporting document for further details |
| Physical structure: creeks and pans | Occurrence | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: zonation | Occurrence | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation height | Centimetres | Maintain structural variation within sward | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation cover | Percentage cover at a representative sample of monitoring stops | Maintain more than 90% of area outside creeks vegetated. | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation composition: typical species and sub-communities | Percentage cover at a representative sample of monitoring stops | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009). | See coastal habitats supporting document for further details |
| Vegetation structure: negative indicator species: *Spartina anglica* | Hectares | No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |

## 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

**To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 1.25ha, Killowen - 2.59ha, Rochestown - 17.50ha, Ringville - 6.70ha. See map 5 | Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Four sub-sites were mapped and additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area of Atlantic salt meadow of 35.07ha. NB futher unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details |
| Habitat distribution | Occurrence | No decline, subject to natural processes. See map 5 | See coastal habitats supporting document for further details |
| Physical structure: sediment supply | Presence/absence of physical barriers | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions | See coastal habitats supporting document for further details |
| Physical structure: flooding regime | Hectares flooded; frequency | Maintain natural tidal regime | See coastal habitats supporting document for further details |
| Physical structure: creeks and pans | Occurrence | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: zonation | Occurrence | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation height | Centimetres | Maintain structural variation within sward | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation cover | Percentage cover at a representative sample of monitoring stops | Maintain more than 90% of area outside creeks vegetated | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation composition: typical species and sub-communities | Percentage cover at a representative sample of monitoring stops | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | See coastal habitats supporting document for further details |
| Vegetation structure: negative indicator species: *Spartina anglica* | Hectares | No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |

## 1355 Otter *Lutra lutra*

**To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution | Percentage positive survey sites | No significant decline | Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-east estimated at 73% (Bailey and Rochford, 2006) |
| Extent of terrestrial habitat | Hectares | No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds | No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007) |
| Extent of marine habitat | Hectares | No significant decline. Area mapped and calculated as 857.7ha | No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006) |
| Extent of freshwater (river) habitat | Kilometres | No significant decline. Length mapped and calculated as 616.6km | No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982) |
| Extent of freshwater (lake) habitat | Hectares | No significant decline. Area mapped and calculated as 2.6ha | No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007) |
| Couching sites and holts | Number | No significant decline | Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991) |
| Fish biomass available | Kilograms | No significant decline | Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999) |

## 1410 Mediterranean salt meadows (*Juncetalia maritimi*)

**To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 0.08ha, Rochestown - 0.04ha, Ringville - 6.70ha. See map 5 | Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Three sub-sites were mapped and no additional areas of potential saltmarsh were identified from an examination of aerial photoraphs, giving a total estimated area of Mediterranean salt meadow of 6.82ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details |
| Habitat distribution | Occurrence | No decline, subject to natural processes. See map 5 | See coastal habitats supporting document for further details |
| Physical structure: sediment supply | Presence/absence of physical barriers | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | See coastal habitats supporting document for further details |
| Physical structure: flooding regime | Hectares flooded; frequency | Maintain natural tidal regime | See coastal habitats supporting document for further details |
| Physical structure: creeks and pans | Occurrence | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: zonation | Occurrence | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation height | Centimetres | Maintain structural variation within sward | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation structure: vegetation cover | Percentage cover at a representative sample of monitoring stops | Maintain more than 90% of area outside creeks vegetated. | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |
| Vegetation composition: typical species and sub-communities | Percentage cover at a representative sample of monitoring stops | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | See coastal habitats supporting document for further details |
| Vegetation structure: negative indicator species: *Spartina anglica* | Hectares | No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur | Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details |

## 1421 Killarney fern *Trichomanes speciosum*

**To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution | Location | No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7 | Data from NPWS rare and threatened species database |
| Population size | Number | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds | Data from NPWS rare and threatened species database |
| Population structure: juvenile fronds | Occurrence | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations | 'Juvenile' sporophytes, which appear as small entire fronds, are known from this site. However, it is unknown whether they are due to apogamous growth or sexual reproduction. Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.) |
| Habitat extent | $m^2$ | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations | Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.) |
| Hydrological conditions: visible water | Occurrence | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations | Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.) |
| Hydrological conditions: humidity | Number of dessicated fronds | No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable | Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.) |
| Light levels: shading | Percentage | No changes due to anthropogenic impacts | Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.) |
| Invasive species | Occurrence | Absent or under control | NPWS and EHS-NI (2008) provides further details |

## 1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

**To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Distribution | Kilometres | Maintain at 15.5km. See map 7 | The population stretches from Poorman's Bridge (S407859) to Lismaine Bridge (S442660), with most of the population found between Poorman's Bridge and the Avonmore Creamery above Ballyragget (S 440 722) (Moorkens, 1996) |
| Population size: adult mussels | Number | Restore to 5,000 adult mussels | The extant wild population of Nore freshwater pearl mussel is estimated as 300 adult individuals (Moorkens, 2009) |
| Population structure: recruitment | Percentage per size class | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length | Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. This species is known not to have reproduced successfully in the River Nore since 1970 (Moorkens and Costello, 1994; Moorkens, 2004; Government of Ireland, 2009 [S.I. 272 of 2009]) |
| Population structure: adult mortality | Percentage | 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 | 5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses |
| Habitat extent | Kilometres | Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning | The species habitat is a stretch of large lowland river and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles |

## 1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

**To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Water quality: Macroinvertebrates and phytobenthos (diatoms) | Ecological quality ratio (EQR) | Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 | These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat of the Nore pearl mussel failed both standards during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water Objectives) Regulations 2009 |
| Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | Percentage | Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%) | High abundance of macroalgae was recorded during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate |
| Substratum quality: sediment | Occurrence | Restore substratum quality-stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment | The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles owing to sedimentation of the substratum. Significant sedimentation has been recorded during all recent mussel monitoring surveys. Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate |
| Substratum quality: oxygen availability | Redox potential | Restore to no more than 20% decline from water column to 5cm depth in substrate | Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The redox potential loss in 2009 was 58-64% at 5cm depth (DEHLG, 2010) |
| Hydrological regime: flow variability | Metres per second | Restore appropriate hydrological regimes | The availability of suitable Nore freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle |

## 1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

**To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Host fish | Number | Maintain sufficient juvenile salmonids to host glochidial larvae | Salmonid fish are host to the larval form of freshwater pearl mussels and thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. As native brown trout appear to be favoured by the Nore freshwater pearl mussel, it is particularly important that these are not out-competed by stocked fish |

## 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

**To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat distribution | Occurrence | No decline, subject to natural processes | The full distribution of this habitat and its sub-types in this site is currently unknown. The basis of the selection of the SAC for the habitat is the presence of an excellent example of the vegetation community (nutrient-rich type) associated with extensive tufa deposits on the river bed in the Kings tributary of the Nore (Heuff, 1987). Other examples of this or other sub-types may be present within the SAC |
| Habitat area | Kilometres | Area stable or increasing, subject to natural processes | The full extent of this habitat in this site is currently unknown. See above |
| Hydrological regime: river flow | Metres per second | Maintain appropriate hydrological regimes | Due to regular disturbance (through variations in flow), river macrophytes rarely reach a climax condition but frequently occur as transient communities. A natural (relatively unmodified) flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For most of the sub-types of this habitat, high flows are required to maintain the substratum (see below) necessary for the characteristic species. Flow variation is particularly important, with high and flood flows being critical to the hydromorphology |
| Hydrological regime: groundwater discharge | Metres per second | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | This attribute refers to sub-types with tufa formations. Groundwater discharges to this habitat throughout the year |
| Substratum composition: particle size range | Millimetres | The substratum should be dominated by large particles and free from fine sediments | The tufaceous sub-types develop on relatively stable substrata such as bedrock, boulders and cobbles, where tufa can deposit and accumulate. Tufa deposition is believed to be biologically mediated, by algae and bryophytes. The substratum must remain free of fine sediments such as clay, silt and fine sand, which would adversely affect the growth of algae and mosses |

## 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

**To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Water chemistry: minerals | Milligrammes per litre | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits | The tufaceous sub-types require mineral- (typically calcium-) rich groundwaters to allow deposition of tufa. Surface water must also be sufficiently base-rich to prevent chemical erosion. Alkalinity and/or total hardness data may also be relevant |
| Water quality: suspended sediment | Milligrammes per litre | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments | See substratum composition above. Turbidity data may also be relevant |
| Water quality: nutrients | Milligrammes per litre | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | Phosphorus (MRP) is typically the limiting nutrient, however increased nitrogen (NO3-) negatively impacts upon the N-fixing blue-green algal communities that frequently contribute to tufa deposition. Nutrient enrichment of the habitat typically leads to increased filamentous-green-algal biomass, and consequent changes in other algae, bryophyte and macrophyte species composition and abundance. Water quality should reach a minimum of Water Framework Directive good status, in terms of nutrient standards, and macroinvertebrate and phytobenthos quality elements |
| Vegetation composition: typical species | Occurrence | Typical species of the relevant habitat sub-type should be present and in good condition | The sub-types of this habitat are poorly understood and their typical species have not yet been defined. Typical species and appropriate targets may emerge to be site-specific. The typical species of the tufaceous sub-type in the Kings tributary of the Nore are identified in Heuff (1987). The typical species may include higher plants, bryophytes, macroalgae and microalgae |
| Floodplain connectivity | Area | The area of active floodplain at and upstream of the habitat should be maintained | River connectivity with the floodplain is essential for the functioning of this habitat. The site of the tufaceous sub-type in the King's River is within an area of floodplain, with further large floodplains upstream. Floodplains regulatefine sediment deposition within the channel. See substratum composition above |

## 4030 European dry heaths

**To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat distribution | Occurrence | No decline from current habitat distribution, subject to natural processes | Spatial extent currently unmapped but indicated as occurring on the steep, free-draining, river valley sides especially the Barrow and tributaries in the foothills of the Blackstairs Mountains (based on NPWS NHA Survey - 1997/98 Site Notes; Natura 2000 Form Explanatory Notes - May 2006; The above NHA survey was prior to the extensions to the SAC that included river habitat and estuary at Ballyhack which may have incorporated additional dry heath habitat) |
| Habitat area | Hectares | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations | Based on NPWS NHA Survey Site Notes (1997/98); Natura 2000 Form Explanatory Notes - May 2006 |
| Physical structure: free-draining, acid, low nutrient soil; rock outcrops | Occurrence | No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop | Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006 |
| Vegetation structure: sub-shrub indicator species | Percentage cover | Cover of characteristic sub-shrub indicator species at least 25%: gorse (*Ulex europaeus*) and where rocky outcrops occur bilberry (*Vaccinium myrtillus)* and woodrush (*Luzula sylvatica*). Some rock outcrops support English stonecrop (*Sedum anglicum*), sheep's bit (*Jasione montana*) and wild madder (*Rubia peregrina*) as well as important moss and lichen assemblages | Dry heath in this SAC occurs on free-draining nutrient poor soils and is often characterised by gorse and open acid grassland areas. A characteristic coastal dry heath of the southeast also occurs. Several rare plants occur including two species listed in the Red Data Book (Curtis and McGough, 1988). The species occurring on the site are listed in NPWS NHA Survey Site Notes - 1997/98. A brief overview of the principal characteristics of the dry heath habitat of this SAC is given in the Natura 2000 Explanatory Notes - May 2006 |
| Vegetation structure: senescent gorse | Percentage cover | Cover of senescent gorse less than 50% | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010) |
| Vegetation structure: browsing | Percentage cover | Long shoots of bilberry with signs of browsing collectively less than 33% | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010) |

## 4030 European dry heaths

**To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Vegetation structure: native trees and shrubs | Percentage cover | Cover of scattered native trees and shrub less than 20% | Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). From the NHA survey notes the main threats appear to be reclamation or invasion by scrub woodland |
| Vegetation composition: positive indicator species | Number | Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora | Dry heath in this SAC occurs on free-draining nutrient poor soils and is characterised by gorse and acid grassland areas. It corresponds to Annex I sub-type "heaths rich in gorse (*Ulex*) of the Atlantic margins" (European Commission, 2007). Based on NPWS NHA Survey Site Notes -1997/98; Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010) |
| Vegetation structure: positive indicator species | Percentage cover | Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora | Dry heath in this SAC is characterised by gorse and acid grassland areas and locally bilberry and woodrush. Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010) |
| Vegetation composition: bryophyte and non-crustose lichen species | Number | Number of bryophyte or non-crustose lichen species present at least 2 | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. 2010 |
| Vegetation composition: bracken (*Pteridium aquilinum*) | Percentage cover | Cover of bracken less than 10% - however see 'Notes' | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). Bracken appears to be quite dense in places and before any management action is considered its rate of spread needs to be established as well as its threat, if any, to other dry heath species and its potential value to important fauna (e.g. Twite) |

## 4030 European dry heaths

**To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Vegetation structure: weedy negative indicator species | Percentage cover | Cover of agricultural weed species (negative indicator species) less than 1% | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010) |
| Vegetation composition: non-native species | Percentage cover | Cover of non-native species less than 1%. | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010) |
| Vegetation composition: rare/scarce heath species | Location, area and number | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (*Orobanche rapum-genistae)* and the legally protected clustered clover (*Trifolium glomeratum*) | Broomrape is dependent on gorse at this site as it is parasitic on gorse roots. It is recorded as occurring on steep slopes above New Ross. A small area of excellent dry coastal heath at Ballyhack is interspersed with patches rock and of dry lowland grassland and has a high species diversity. Notably there is an excellent range of Clover (*Trifolium*) species including the legally protected clustered clover, a species known only from one other site in Ireland. Also *T. ornithopodiodes*, *T. striatum* and *Torilus nodosa*. Based on Natura 2000 Form Explanatory Notes May 2006, Irish Red Data Book (Curtis and Mc Gough, 1988) and on the NPWS database of rare and threatened vascular plants. Other areas of coastal heath may also occur |
| Vegetation structure: disturbed bare ground | Percentage cover | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) | Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified verison of the dry heath habitat condition assessment methodology of Perrin et al. (2010) |
| Vegetation structure: burning | Occurrence | No signs of burning within sensitive areas | Perrin et al. (2010) defines sensitive areas |

## 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

**To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat distribution | Occurrence | No decline, subject to natural processes | Distribution of this habitat in this site is currently unknown. Considered to occur in association with some riverside woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river (Natura 2000 Form Explanatory Notes) |
| Habitat area | Hectares | Area stable or increasing, subject to natural processes | Extent of this habitat in this site is currently unknown. See above |
| Hydrological regime: Flooding depth/height of water table | Metres | Maintain appropriate hydrological regimes | This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment |
| Vegetation structure:sward height | Centimetres | 30-70% of sward is between 40 and 150cm in height | Bare ground, due to natural indundation processes, may often be present. Attribute and target based on the Irish Semi-natural Grassland Survey (O'Neill et al., 2010) |
| Vegetation composition: broadleaf herb: grass ratio | Percentage | Broadleaf herb component of vegetation between 40 and 90% | Attribute and target based on O'Neill et al. (2010) |
| Vegetation composition: typical species | Number | At least 5 positive indicator species present | List of positive indicator species identified by O'Neill et al. (2010) |
| Vegetation composition: negative indicator species | Occurrence | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) | Species listed as being present in the site (Natura 2000 Form Explanatory Notes) |

## 7220 * Petrifying springs with tufa formation (*Cratoneurion*)

**To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Square metres | Area stable or increasing, subject to natural processes | Extent of this habitat in this site is currently unknown. An area ("Tens of square metres") has been described at one location (Natura 2000 Form Explanatory Notes; internal NPWS files), see below |
| Habitat distribution | Occurrence | No decline. See map 6 for recorded location | Full distribution of this habitat in this site is currently unknown. It has been described in woodlands at Dysart, between Thomastown and Inistioge (Natura 2000 Form Explanatory Notes; internal NPWS files). NB futher areas are likely to occur within the site |
| Hydrological regime: height of water table; water flow | Metres; metres per second | Maintain appropriate hydrological regimes | Current hydrological regimes are unknown. Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources |
| Water quality | Water chemistry measures | Maintain oligotrophic and calcareous conditions | Water chemistry is currently unknown. Water supply to petrifying springs is characteristically oligotrophic and calcareous |
| Vegetation composition: typical species | Occurrence | Maintain typical species | The bryophytes *Cratoneuron commutatum* and *Eucladium verticillatum* are diagnostic of this habitat. Both are found at the location described above. Natura 2000 Form Explanatory Notes and internal NPWS files also list other typical species |

## 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

**To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed: see map 6 | Minimum area, based on 13 sites surveyed by Perrin et al. (2008) - site codes 14, 20, 49, 73, 125, 508, 509, 510, 514, 515, 518, 519, 521, and other sources. NB further unsurveyed areas maybe present within the site |
| Habitat distribution | Occurrence | No decline. Surveyed locations shown on map 6 | Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site |
| Woodland size | Hectares | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion |
| Woodland structure: cover and height | Percentage and metres | Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer | Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details |
| Woodland structure: community diversity and extent | Hectares | Maintain diversity and extent of community types | Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details |
| Woodland structure: natural regeneration | Seedling:sapling:pole ratio | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | Oak regenerates poorly. In suitable sites ash can regenerate in large numbers although few seedlings reach pole size |
| Woodland structure: dead wood | $m^3$ per hectare; number per hectare | At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter | Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. |
| Woodland structure: veteran trees | Number per hectare | No decline | Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources |

## 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

**To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Woodland structure: indicators of local disctinctiveness | Occurrence | No decline | Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 14, 20, 73, 125, 508, 509, 510, 514, 515, 518, 521 as potential ancient/long established woodlands |
| Vegetation composition: native tree cover | Percentage | No decline. Native tree cover not less than 95% | Species reported in Perrin et al. (2008); Browne et al. (2000) |
| Vegetation composition: typical species | Occurrence | A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*) | Species reported in Perrin et al. (2008); Browne et al. (2000) |
| Vegetation composition: negative indicator species | Occurrence | Negative indicator species, particularly non-native invasive species, absent or under control | The following are the most common invasive species in this woodland type: beech (*Fagus sylvatica*), rhododendron (*Rhododendron ponticum*), cherry laurel (*Prunus laurocerasus*) |

## 91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

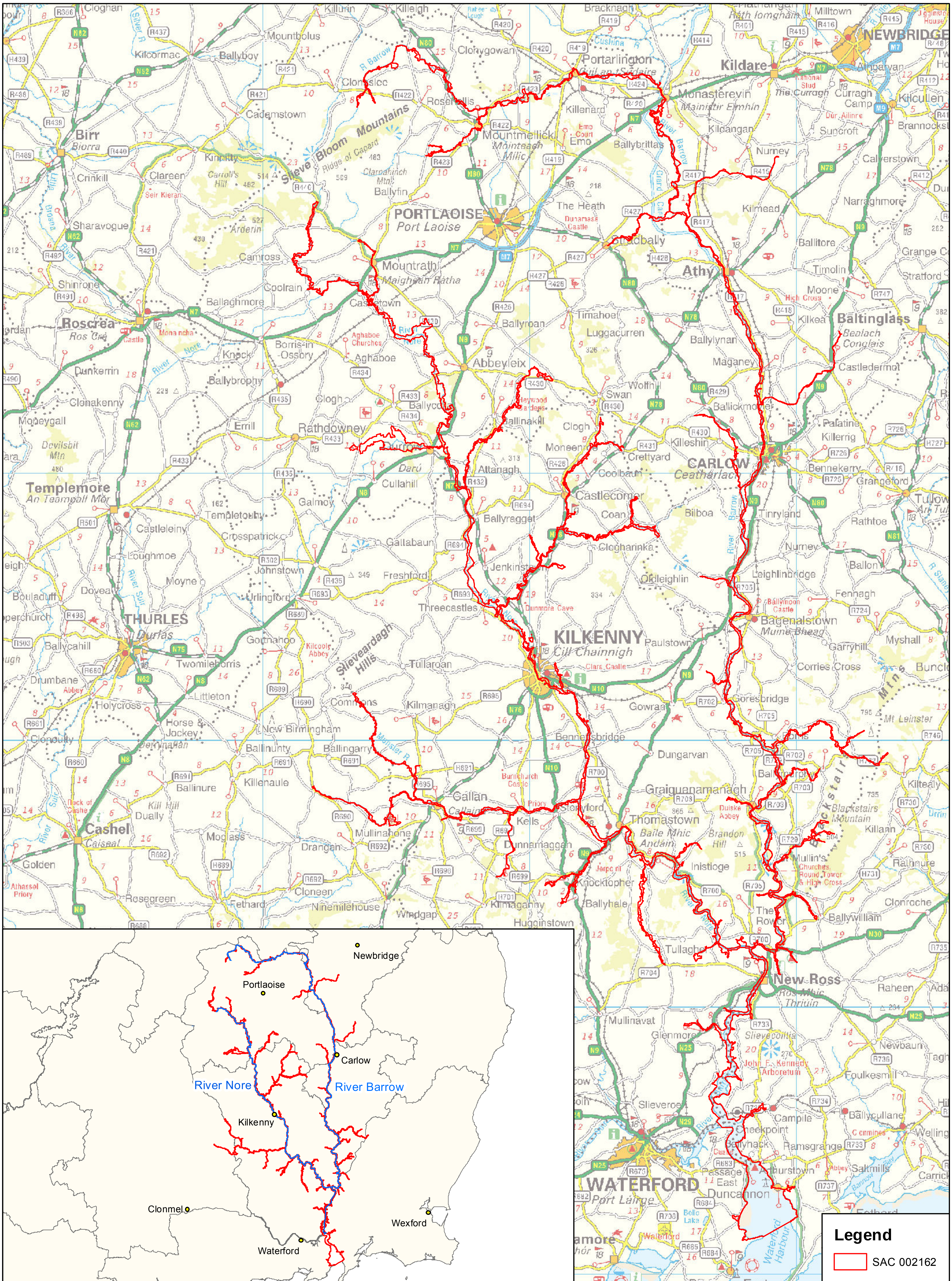
**To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6 | Minimum area, based on 16 sites surveyed by Perrin et al. (2008) - site codes 10, 15, 17, 126, 127, 262, 282, 287, 511, 516, 517, 518, 520, 608, 1021; Coillte LIFE project and other sources. NB further unsurveyed areas maybe present within the SAC |
| Habitat distribution | Occurrence | No decline. Surveyed locations shown on map 6 | Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site |
| Woodland size | Hectares | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size | The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion |
| Woodland structure: cover and height | Percentage and metres | Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer | Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details |
| Woodland structure: community diversity and extent | Hectares | Maintain diversity and extent of community types | Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details |
| Woodland structure: natural regeneration | Seedling:sapling:pole ratio | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size |
| Hydrological regime: Flooding depth/height of water table | Metres | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | Periodic flooding is essential to maintain alluvial woodlands along river flood plains but not for woodland around springs/seepage areas |
| Woodland structure: dead wood | $m^3$ per hectare; number per hectare | At least 30$m^3$/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) | Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem |

## 91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

**To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Woodland structure: veteran trees | Number per hectare | No decline | Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources |
| Woodland structure: indicators of local disctinctiveness | Occurrence | No decline | Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 10, 15, 17, 127, 282, 516, 517, 518, 608 as potential ancient/long established woodlands |
| Vegetation composition: native tree cover | Percentage | No decline. Native tree cover not less than 95% | Species reported in Perrin et al. (2008); Browne et al. (2000) |
| Vegetation composition: typical species | Occurrence | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) | Species reported in Perrin et al. (2008); Browne et al. (2000) |
| Vegetation composition: negative indicator species | Occurrence | Negative indicator species, particularly non-native invasive species, absent or under control | The following are the most common invasive species in this woodland type: sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*), rhododendron (*Rhododendron ponticum*), cherry laurel (*Prunus laurocerasus*), dogwood (*Cornus sericea*), Himalayan honeysuckle (*Leycesteria formosa*) and Himalayan balsam (*Impatiens grandiflora*) |




# MAP 1:
# RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

0 5 10 15 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

N

Map Version 1
Date: April 2011

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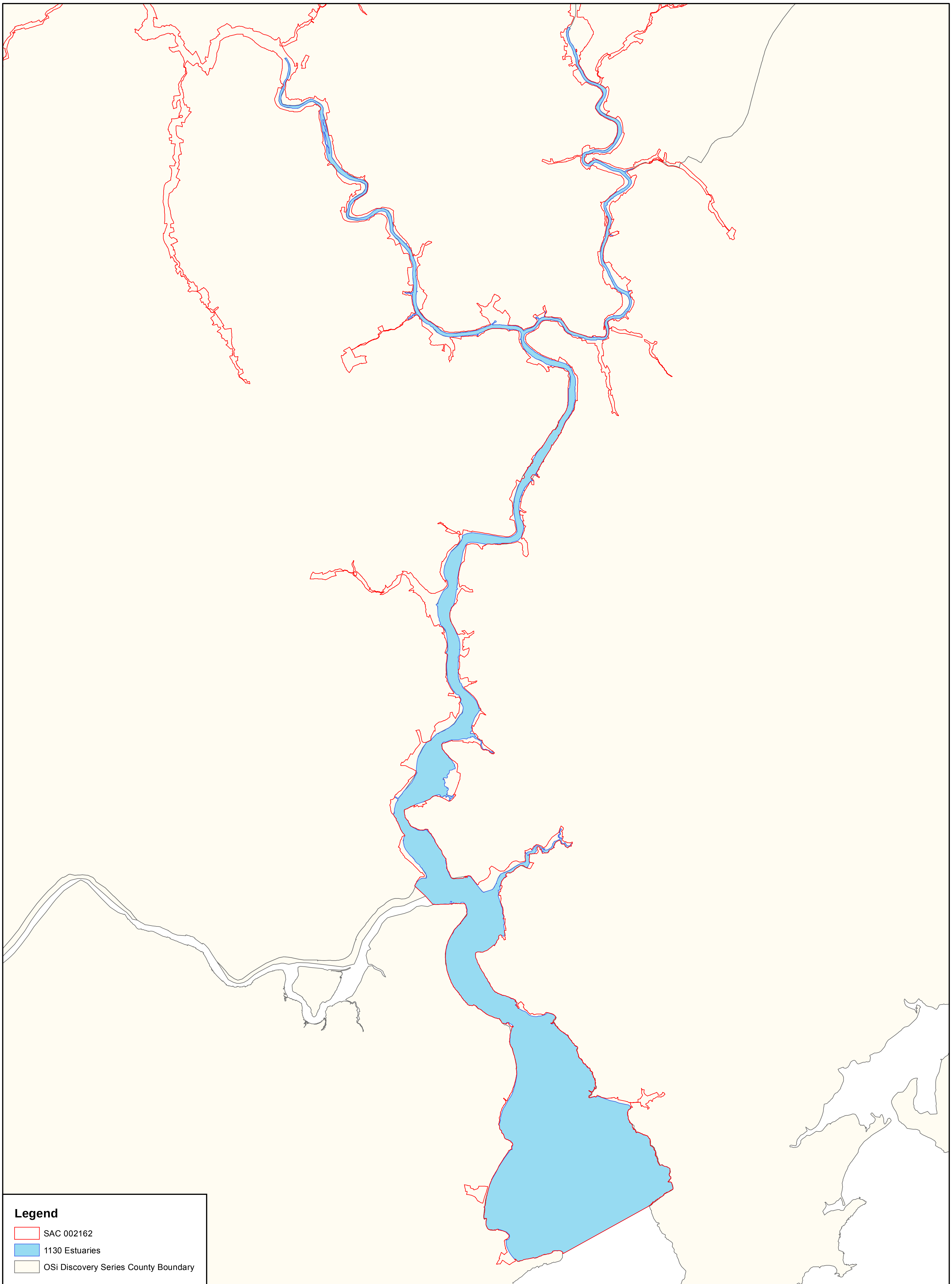
Department of Arts, Heritage and the Gaeltacht

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## MAP 2:
## RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES ESTUARIES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**

0 1 2 3 4 5 km

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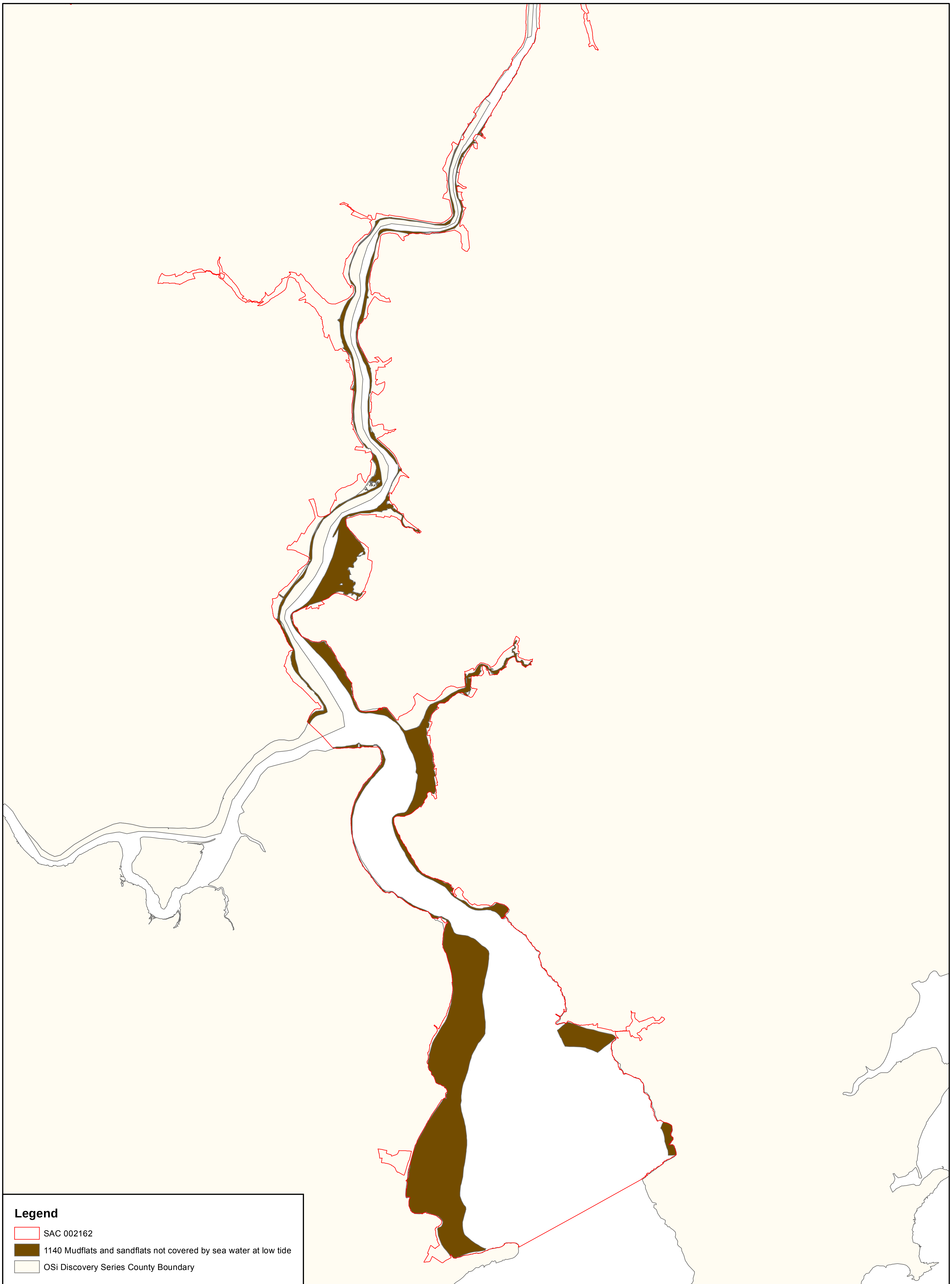
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta.
Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

N

**Map Version 1**
**Date: April 2011**

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**MAP 3:**
**RIVER BARROW AND RIVER NORE**
**CONSERVATION OBJECTIVES**
**TIDAL MUDFLATS AND SANDFLATS**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04,**
**CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07,**
**CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01,**
**CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**

0 1 2 3 km

The mapped boundaries are of an indicative and general nature only.
Boundaries of designated areas are subject to revision.
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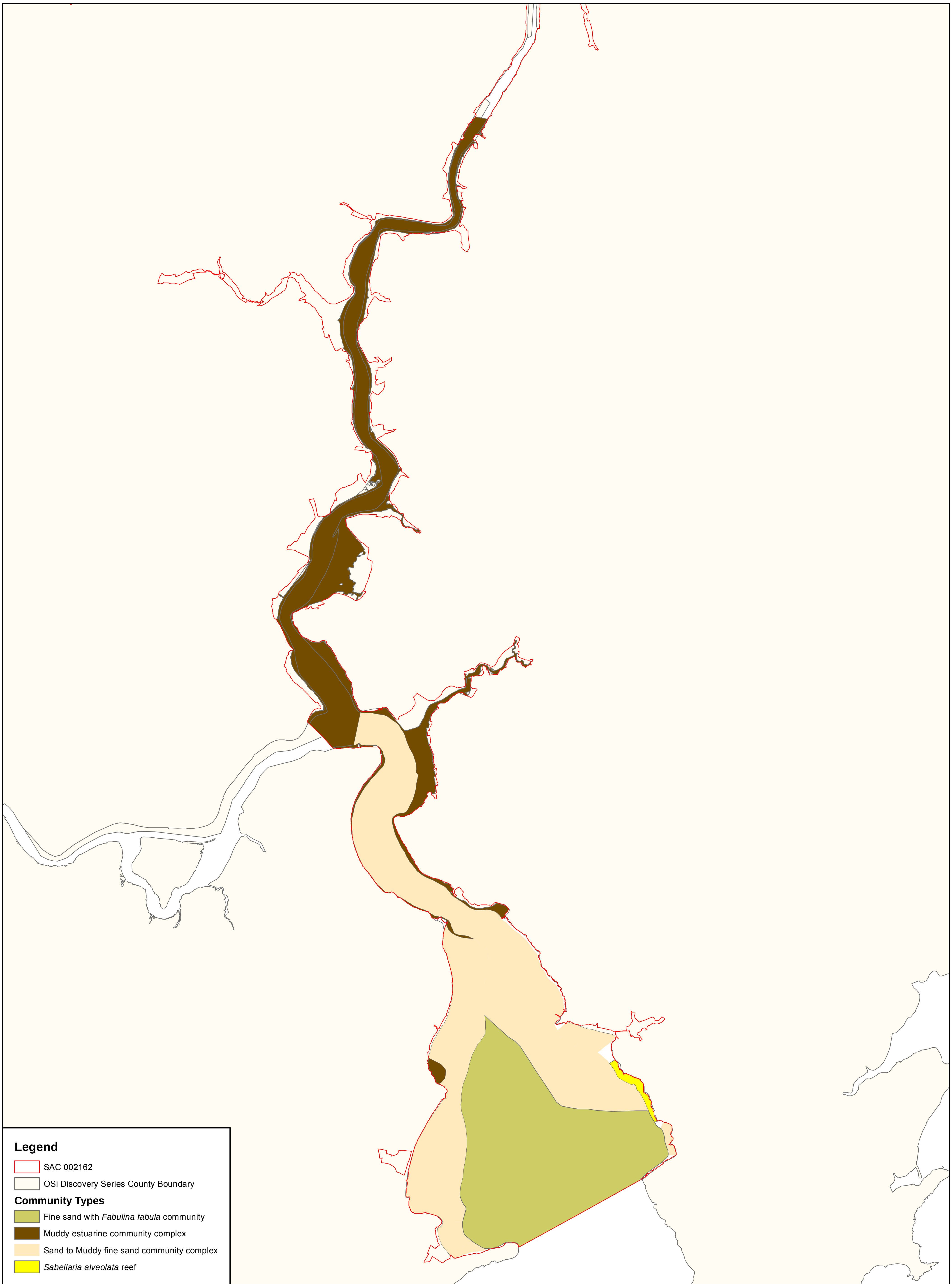
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta.
Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar
comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis
le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

N

**Map Version 1**
**Date: April 2011**

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**MAP 4:**
**RIVER BARROW AND RIVER NORE**
**CONSERVATION OBJECTIVES**
**MARINE COMMUNITY TYPES**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

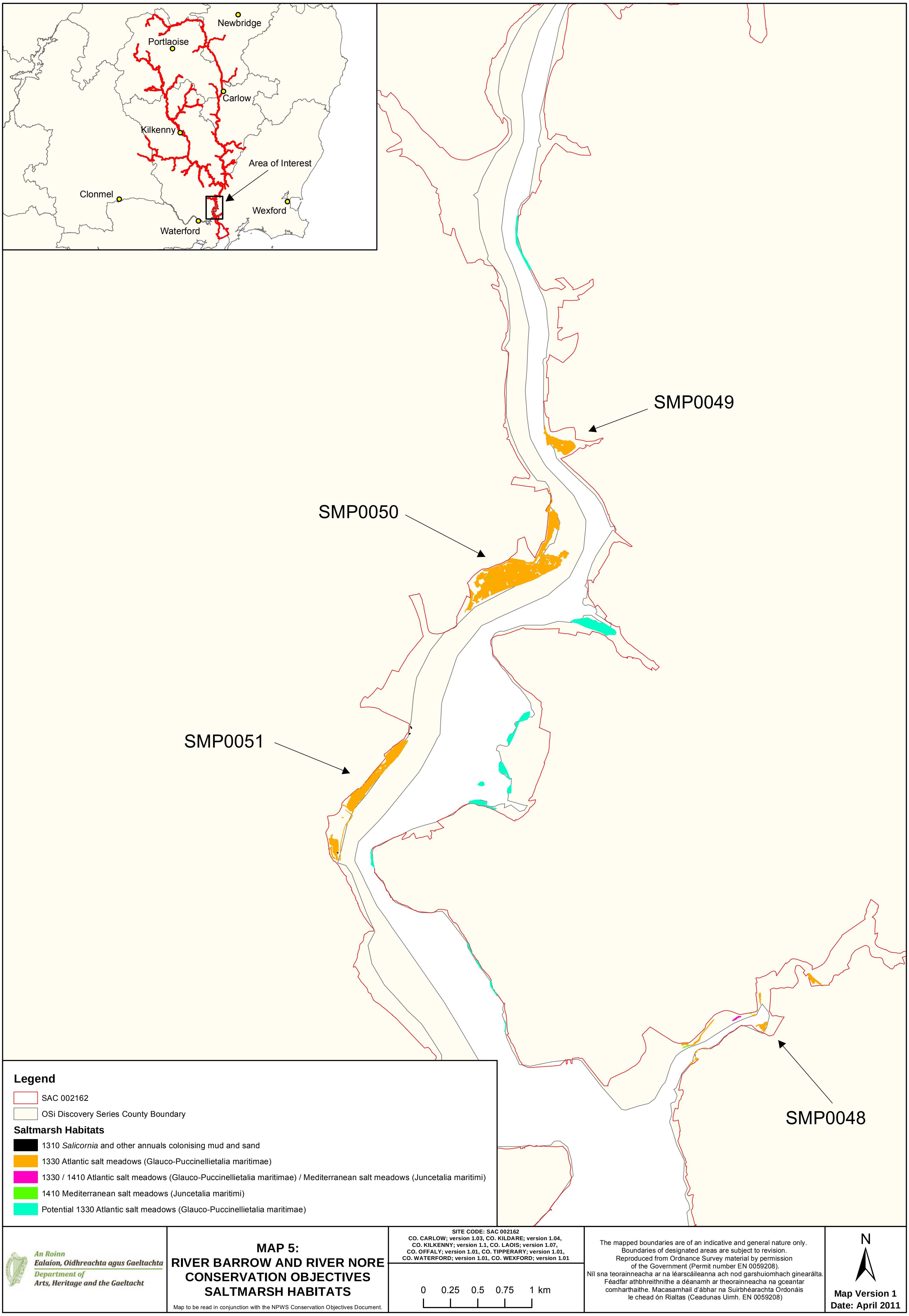
**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**

0 1 2 3 km



N

**Map Version 1**
**Date: April 2011**

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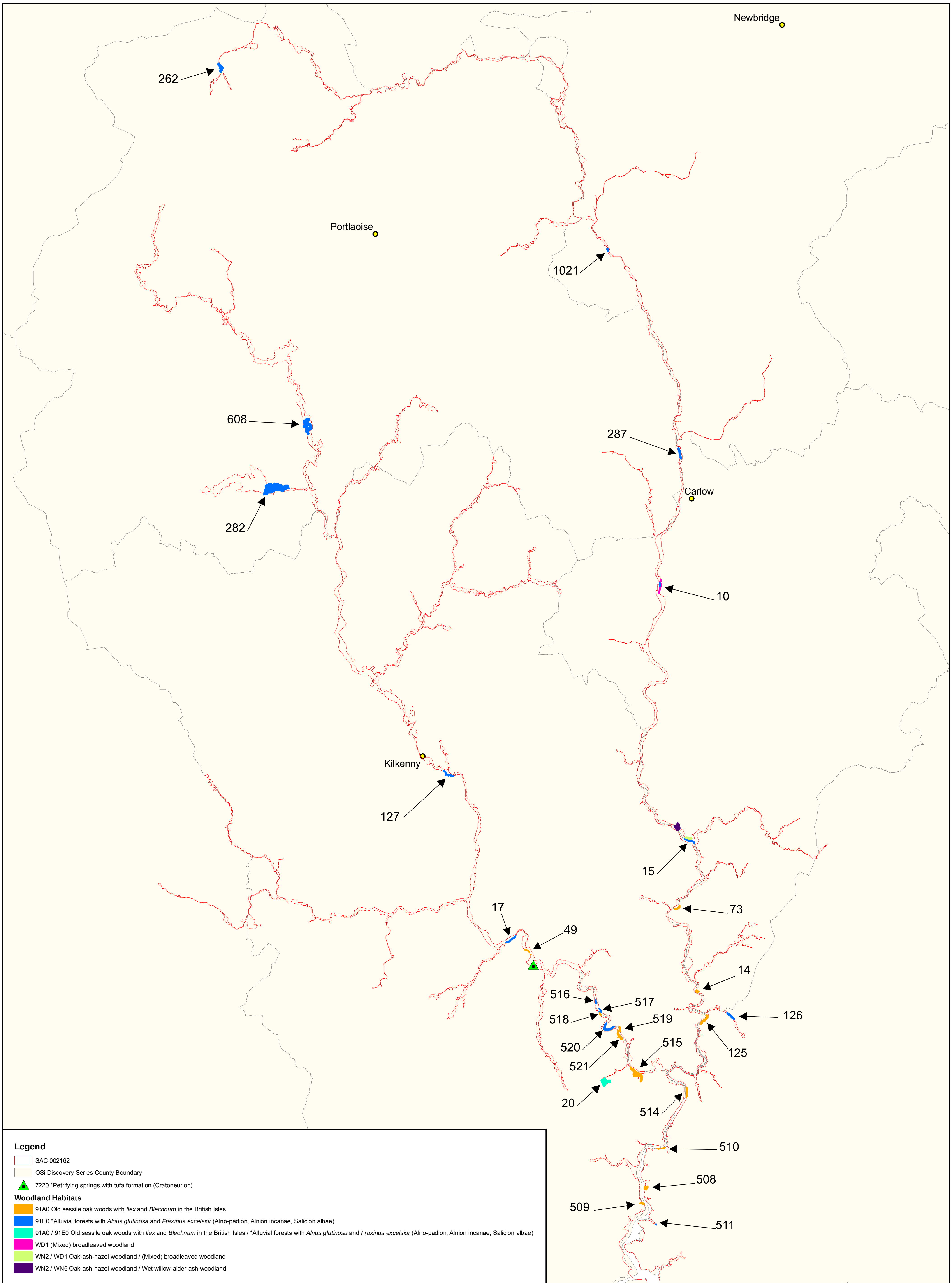
**MAP 5:**
**RIVER BARROW AND RIVER NORE**
**CONSERVATION OBJECTIVES**
**SALTMARSH HABITATS**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**



**Map Version 1**
**Date: April 2011**

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# MAP 6:
# RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES OLD OAK WOODLANDS, ALLUVIAL FORESTS & PETRIFYING SPRINGS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

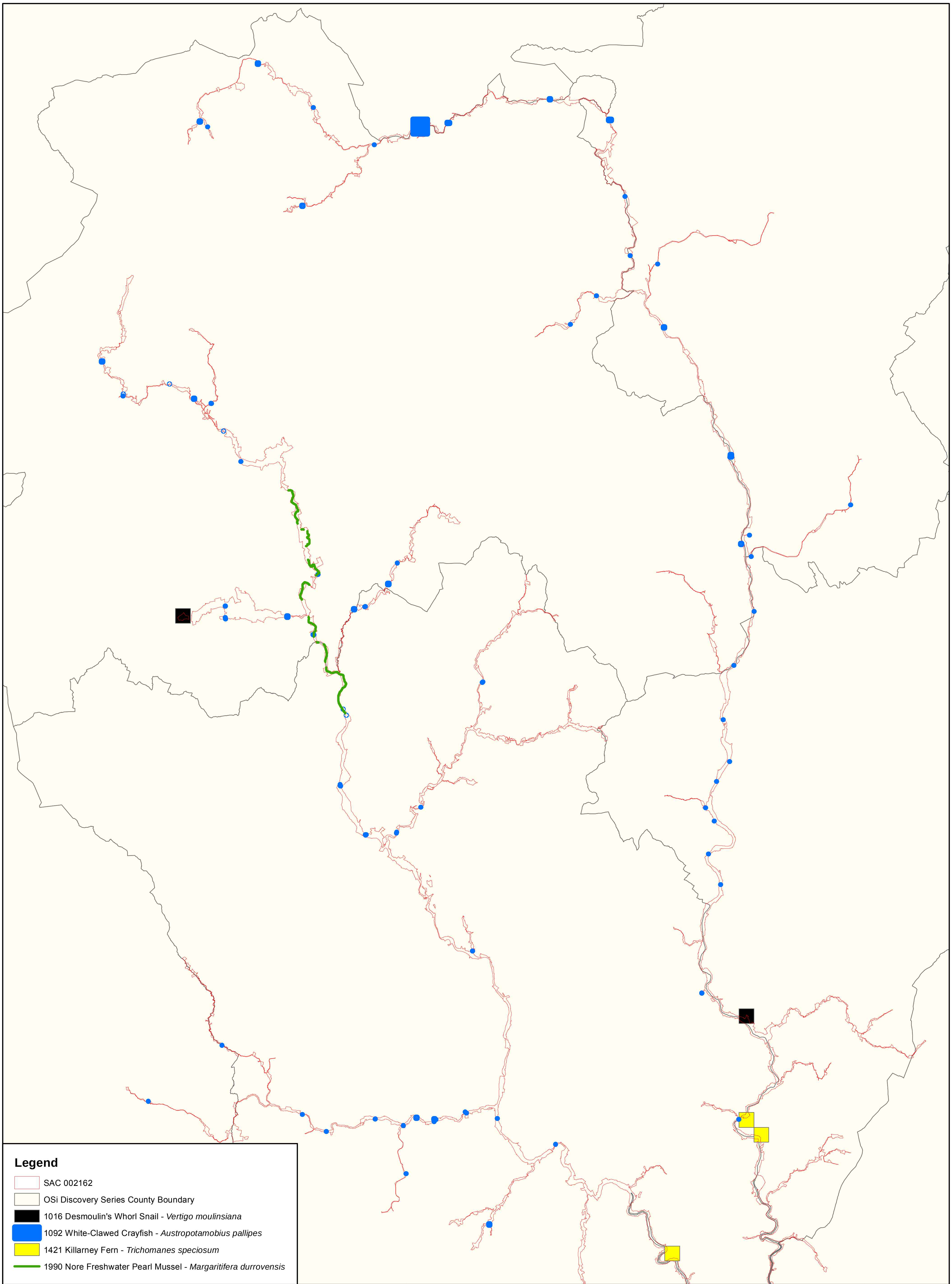
**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**

0 2 4 6 8 10 km



N

**Map Version 1**
**Date: April 2011**

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**MAP 7:**
**RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES DESMOULIN'S WHORL SNAIL, WHITE-CLAWED CRAYFISH, NORE FRESHWATER PEARL MUSSEL & KILLARNEY FERN**

Map to be read in conjunction with the NPWS Conservation Objectives Document.

**SITE CODE: SAC 002162**
**CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01**

0 2 4 6 8 10 km



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**Map Version 1**
**Date: April 2011**

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Department of
Arts, Heritage and the Gaeltacht

**Produced by: National Parks and Wildlife Service,**
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# Conservation Objectives – River Nore SPA

ISSN 2009-4086

# National Parks and Wildlife Service

## *Conservation Objectives Series*

# River Nore SPA 004233

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**Series Editors: Maria Long and Colin Heaslip**
**ISSN 2009-4086**

# Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:
- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

**Notes/Guidelines:**

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

## Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

| | |
|---|---|
| 004233 | River Nore SPA |
| A229 | Kingfisher *Alcedo atthis* |

**Please note that this SPA overlaps with River Barrow and River Nore SAC (002162). The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.**

# Supporting documents, relevant reports & publications

*Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications*

## NPWS Documents

| | |
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| **Year :** | 2008 |
| **Title :** | Waterways Bird Survey 2008 |
| **Author :** | Crowe, O.; Webb, G.; Collins, E.; Smiddy, P. |
| **Series :** | A report commissioned by the National Parks and Wildlife Service and the Office of Public Works, and prepared by BirdWatch Ireland |
| **Year :** | 2010 |
| **Title :** | Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland |
| **Author :** | Cummins, S.; Fisher, J.; Gaj McKeever, R.; McNaghten, l.; Crowe, O. |
| **Series :** | V1 |
| **Year :** | 2013 |
| **Title :** | A review of the SPA network of sites in the Republic of Ireland |
| **Author :** | NPWS |
| **Series :** | Unpublished Report |

## Other References

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| **Year :** | 1977 |
| **Title :** | Breeding, Mortality and Movements of Kingfishers |
| **Author :** | Morgan, R.; Glue, D. |
| **Series :** | Bird Study, 24(1), 15–24 |
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| **Title :** | The Kingfisher |
| **Author :** | Boag, D. |
| **Series :** | Blandford Press, Dorset |
| **Year :** | 1985 |
| **Title :** | The birds of the Western Palaearctic- Volume IV |
| **Author :** | Cramp, S. |
| **Series :** | Oxford University Press, Oxford |
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| **Author :** | Ormerod, S.J.; Tyler, S.J. |
| **Series :** | In: Furness RW, Greenwood JJD, editors. Birds as monitors of environmental change. Chapman & Hall, London |
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| **Author :** | Tucker, G.M.; Heath, M.F. |
| **Series :** | BirdLife International, Cambridge, U.K. |
| **Year :** | 1996 |
| **Title :** | Foods brought to the nest by breeding Kingfishers *Alcedo atthis* in the New Forest of southern England |
| **Author :** | Reynolds S.J.; Hinge M.D.C. |
| **Series :** | Bird Study 43: 96–102 |

| | |
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| **Year :** | 1997 |
| **Title :** | The Birds of the Western Palearctic Concise Edition. Vol. 1 Non-Passerines |
| **Author :** | Snow, D.W.; Perrins, C.M. |
| **Series :** | Oxford University Press |

| | |
|---|---|
| **Year :** | 2001 |
| **Title :** | Family Acedinidae (Kingfishers) |
| **Author :** | Woodall, P.F. |
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|---|---|
| **Year :** | 2010 |
| **Title :** | An assessment of the current distribution and status of the Kingfisher *Alcedo atthis* in Ireland |
| **Author :** | Crowe, O.; Cummins, S.; Gilligan, N.; Smiddy, P.; Tierney, T.D. |
| **Series :** | Irish Birds 9: 41-54 |

| | |
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| **Year :** | 2011 |
| **Title :** | Diet of the Common Kingfisher (*Alcedo atthis*) in relation to habitat type: a summary of results from the Czech Republic |
| **Author :** | Čech M.; Čech P. |
| **Series :** | Sylvia 47: 33–47 |

| | |
|---|---|
| **Year :** | 2012 |
| **Title :** | Fish prey selection by the Common Kingfisher *Alcedo atthis* in Northern Iberia |
| **Author :** | Vilches A.; Miranda R.; Arizaga J. |
| **Series :** | Acta Ornithologica 47(2): 167-175 |

| | |
|---|---|
| **Year :** | 2012 |
| **Title :** | Habitat selection by breeding Common Kingfishers (*Alcedo atthis* L.) in rivers from Northern Iberia |
| **Author :** | Vilches, A.; Miranda, R.; Arizaga, J.; Galicia, D. |
| **Series :** | In Annales de Limnologie-International Journal of Limnology (Vol. 48, No. 3, pp. 289-294). EDP Sciences |

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| **Year :** | 2019 |
| **Title :** | Annex B – Bird species' status and trends report format (Article 12) for the period 2013 – 2018 |
| **Author :** | NPWS |
| **Series :** | Birds Directive - Article 12 Reporting |

| | |
|---|---|
| **Year :** | 2019 |
| **Title :** | Report under the Article 12 of the Birds Directive Period 2008-2012 |
| **Author :** | EEA |
| **Series :** | European Environment Agency. European Topic Centre on Biological Diversity. Pp 1-9 |

| | |
|---|---|
| **Year :** | 2020 |
| **Title :** | Extreme breeding effort of Common Kingfisher (*Alcedo atthis*) |
| **Author :** | Rubáčová, L.; Melišková, M. |
| **Series :** | Tichodroma 32: 43-46 |

| | |
|---|---|
| **Year :** | 2021 |
| **Title :** | Using miniaturized GPS archival tags to assess home range features of a small plunge-diving bird: the European Kingfisher (*Alcedo atthis*) |
| **Author :** | Musseau, R.; Bastianelli, M.; Bely, C.; Rouselle, C.; Dehorter, O. |
| **Series :** | Avian Research, 12(1):30 |

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| **Year :** | 2022 |
| **Title :** | Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species |
| **Author :** | Goodship, N.M.; Furness, R.W. (MacArthur Green) |
| **Series :** | NatureScot Research Report 1283 |
| **Year :** | 2023 |
| **Title :** | Sensitivity of the European Kingfisher (*Alcedo atthis*) to global change: evidence from home range features and contaminations by trace elements and organic pollutants, a case study in the marshes of Western Europe |
| **Author :** | Musseau, R.; Angelier, F.; Bichet, C.; Millet, M.; Rousselle, C.; Moreau, J.; Bustamante, P. |
| **Series :** | 4th international Kingfisher conferencen, Biology, ecology & conservation, Wdecki Landscape Parc, Sep 2023, Tleń, Poland |
| **Year :** | 2024 |
| **Title :** | EPA River Quality Surveys: Biological |
| **Author :** | EPA |
| **Series :** | Enviornmenal Protection Agency Online Resource |

## Conservation Objectives for : River Nore SPA [004233]

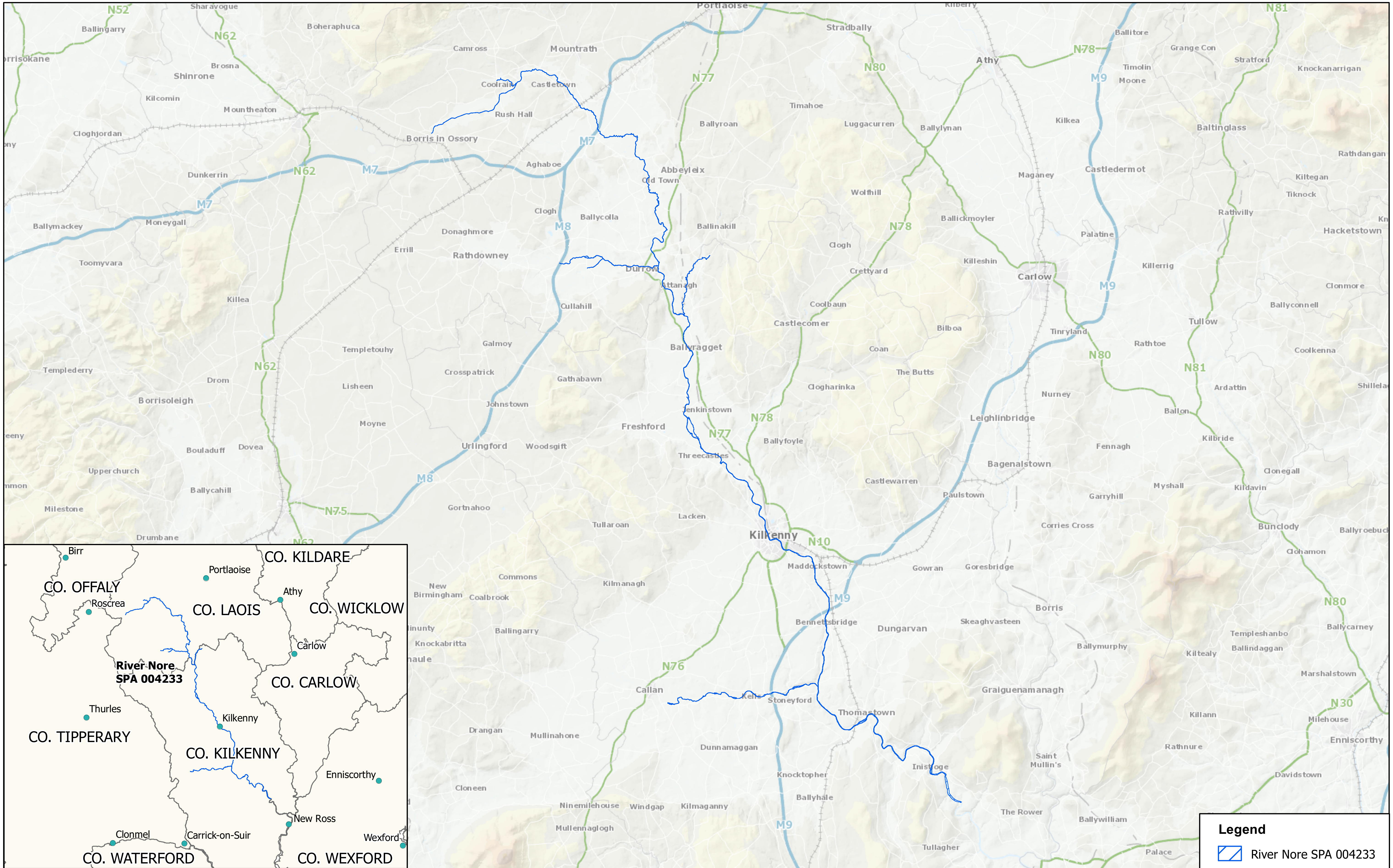
**A229** **Kingfisher *Alcedo atthis***

**To maintain the Favourable conservation condition of Kingfisher in River Nore SPA, which is defined by the following list of attributes and targets:**

| Attribute | Measure | Target | Notes |
|---|---|---|---|
| Population size | Number of breeding territories/pairs | No significant decline in the long term | Kingfisher is a small plunge-diving bird, largely resident and monogamous in the breeding season, found typically along shallow freshwater systems, with some local movement to coastal areas in winter (Snow and Perrins, 1997; Crowe et al., 2010). Almost two-thirds of recoveries in Britain refer to movements of less than 9km (Morgan and Glue, 1977). Widespread in Ireland (NPWS, 2019), it requires slow-moving water that contains thriving prey populations of small fish, and look-out perches from which it can hunt (Snow and Perrins, 1997). The all-Ireland population is estimated at 1,300-2,100 pairs (NPWS, 2013). A survey of six SAC river catchments in 2010 identified this SPA as supporting 16-22 breeding territories/pairs, or up to 1.7% of the all-Ireland population. The measure 'breeding territories' is as per Cummins et al. (2010) and these were estimated based on registrations of birds, birds' activities, and nest holes seen, primarily on the first two survey visits (out of three) |
| Productivity rate | Number of fledged young per confirmed breeding pair | Sufficient productivity to maintain the population trend as stable or increasing | Generally, the setting of a minimum level of productivity to ensure a stable and/or increasing population at a given site ought to be informed by robust estimates of: post-fledging survival; adult survival; and immigration and emigration rates. A lack of comprehensive Irish data precludes the identification of a minimum productivity rate for this species at this site and at the national level. An analysis of available British nest records by Morgan and Glue (1977) estimated that 76 young must survive to breed for every 100 Kingfisher alive at the start of the year, in order to maintain population stability and offset high adult mortality. Typically one to two broods are reared (Snow and Perrins, 1997), though in Central Europe, up to five breeding attempts have been recorded in a single season in Slovakia (Rubáčová and Melišková, 2020) |
| Spatial distribution of territories | Numbers and distribution of occupied territories across site | No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation | Distribution encapsulates the number of locations and areas of potentially suitable habitat for Kingfisher and its availability for use. The suitability and availability of habitats are likely to vary through the season, for example, due to water level changes (due to rainfall, natural variation and other factors). These will affect the spatio-temporal patterns of use of the SPA by the breeding population. Optimal resilience depends on Kingfisher utilising the suitable extent of habitat in the SPA to the maximum extent possible. In 2010, densities of 0.10-0.14 territories/km length of channel were recorded for this site (Cummins et al., 2010), and these were the highest territory abundance recorded in surveys, with the lowest densities (0.04-0.08 territories/km) found on the Barrow and the Munster Blackwater systems (0.05 territories/km). A study of 16 GPS-tagged adult Kingfisher in France (Musseau et al., 2023), estimated mean home range size at 2.5ha (0.25km2) |

| | | | |
|---|---|---|---|
| Extent and quality of nesting banks and other suitable nesting features | Hectares; condition assessment | Sufficient area of high quality nesting habitat to support the population target | Nesting from March to July in Britain, Boag (1982) detailed Kingfisher breeding habitat as being limited by the amount of prey, and the availability of suitable nest sites. Slow-flowing, shallow watercourses with cover along the banks are preferred. In Ireland, they nest in relatively short stretches of suitable banks of less than 10m high (Crowe et al., 2010), but are reliant on suitable fishing conditions (water depth, clarity, and speed of flow). Suitable sand/loam/mud banks (vertical/overhanging) for nesting are necessary to support breeding pairs (Snow and Perrins, 1997; Crowe et al., 2010). Holes in walls, rotten tree stumps, concrete tunnels in canal banks, or burrows of Sand Martin (*Riparia riparia*) are also used. Suitable nest sites located away from the river channel are likely less frequently encountered, but records located over 250m from foraging waters occur (Crowe et al., 2010) and often in a stream or tributary of the main watercourse (Morgan and Glue, 1977) |
| Forage spatial distribution, extent, abundance and availability | Location, hectares, and forage biomass | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target | Kingfisher occur in many wetland habitats, including smaller types (e.g. ditches, ponds, streams), that provide necessary trophic resources and are ecologically connected (Musseau et al., 2021). Kingfisher diet consists predominantly of small fish/aquatic invertebrates which are captured by plunge-diving, typically over shallow freshwater or estuarine waters (Snow and Perrins, 1997). Pelagic and benthic fish species can be taken (Cramp, 1985) e.g. Three-spined Stickleback (*Gasterosteus aculeatus*), Minnow (*Phoxinus phoxinus*), Bullhead (*Cottus gobio*) and Brown Trout (*Salmo trutta*). Kingfisher prey mostly on small-sized fish, typically 40-70mm in length (Reynolds and Hinge, 1996; Čech and Čech, 2011; Vilches et al., 2012). Availability of suitable fishing perches, along shallow stretches of water from which Kingfisher can hunt (Vilches et al., 2012), is also a key requirement |
| Water quality | Water quality indicators | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status | Given that Kingfisher occupy wetlands ecologically connected to the wider landscape, habitat destruction, degradation via pollution (e.g. agricultural run-off; pesticides; increased turbidity) and/or poor management of watercourses (EEA, 2019; Crowe et al., 2010) are a concern. Data are limited for Kingfisher, but Dipper (*Cinclus cinclus*), an exclusively riparian bird, is less abundant where stream acidity and aluminium concentrations increase; its territories are longer at low pH, and clutch and brood sizes are significantly lower (Ormerod and Tyler, 1993). Thus, minimum water quality standards for the site should be met, as set out by the "River Quality Surveys" (Environmental Protection Agency, 2024). Q-values of ≥4 represent satisfactory water quality for Kingfisher. Values are based primarily on the relative proportions of 'pollution sensitive to tolerant macroinvertebrates'. These macroinvertebrates are eaten by both Kingfisher and their prey species (e.g. Brown Trout) |

| | | | |
|---|---|---|---|
| Barriers to connectivity | Number, location, shape and hectares | No significant increase | An adult male Kingfisher is territorial and usually defends its territory from the previous summer (Snow and Perrins, 1997), including necessary access to forage in freshwater habitats ecologically connected to their territory. Along other river systems monitored in 2008, i.e. the River Boyne system, Kingfisher were observed flying out of grass on banks (often short grass) and into fields for 150-200m, where they would disappear out of view (Crowe et al., 2008). Barriers limiting access to this SPA or ecologically important sites outside the SPA will ultimately affect the achievement of targets for population size and/or spatial distribution. Factors such as the number, location, shape and area of potential barriers must be taken into account to determine their potential impact |
| Disturbance to breeding sites | Intensity, frequency, timing and duration | Disturbance occurs at levels that do not significantly impact upon breeding Kingfisher | The impact of any significant disturbance on the SPA's breeding population will ultimately be manifested in the targets, which relate to population demographics (i.e. population size, productivity rate) and the distribution of territories along the linear river catchments. Canalisation of streams and clearance of emergent vegetation to improve drainage result in loss of nesting and feeding habitat and declines in fish numbers (Tucker and Heath, 1994). In Britain, Kingfisher have been known to be at risk locally from human persecution to protect fish stocks (Woodall, 2001), but no evidence of this threat has been reported in Ireland. Likely disturbance distances in relation to human activities are set out in Goodship and Furness (MacArthur Green) (2022). Factors such as intensity, frequency, timing and duration of a (direct or indirect) disturbance source must be taken into account to determine the potential impact upon the targets for population demographics |




MAP 1:
RIVER NORE SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SPA 004233; version 3
CO. KILKENY, LAOIS

0 2 4 8 Kilometres

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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arna atáirgeadh faoin rannán mapála Náisiúnta d'uimhir cheadúnais Táilte Éireann CYAL50351092

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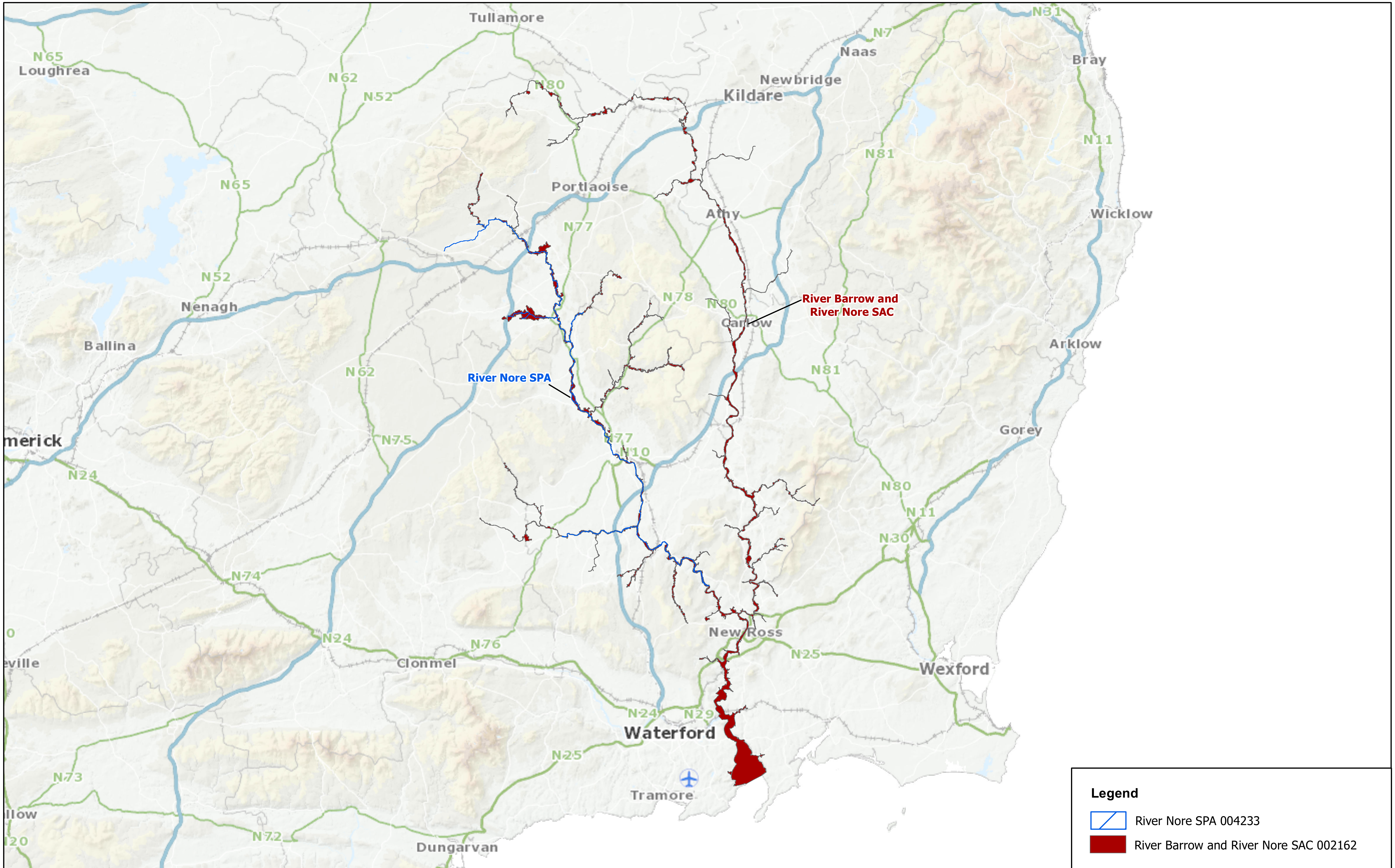
Map version 1
Date: May 2024






**MAP 2:**
**RIVER NORE SPA**
**CONSERVATION OBJECTIVES**
**OVERLAPPING AND ADJACENT SITES**

Map to be read in conjunction with the NPWS Conservation Objectives Document

**SITE CODE:**
**SPA 004233; version 3**
**CO. KILKENNY, LAOIS**

0 5 10 20 Kilometres



N

**Map version 1**
**Date: May 2024**

# AA Appendix 3a

## Examination of the potential for Direct Loss effects to the River Barrow & River Nore SAC

## AA Appendix 3a: Examination of the potential for Direct Loss effects to the River Barrow & River Nore SAC

Life Cycle Phases: The construction phase of the Project has the greatest extent/footprint of works and activities. Operational and decommissioning phase works will generally have a smaller extent than construction phase works, and will take place entirely within the extent of the construction footprint. Therefore, while the evaluation in the table below relates to the Construction Phase of the Project, it is also relevant to the operational and decommissioning life-cycle phases of the Project.

Codes used in the Evaluation table below, along with the Matrix used to determine whether or not adverse impacts will occur to the QI:

| **Project Element Codes** | |
|---|---|
| **WF** | Ballynalacken Windfarm and ancillary works |
| **CLS** | Internal Cable Link and the Tinnalintan Substation (the ICL is that part which is within the Nore_120 sub-basin) |
| **GC** | Ballynalacken Grid Connection, including works within the existing Ballyragget EirGrid Substation compound/GIS building |
| **HR** | Haul Route Works remote from the site - HR1 to HR11 |
| **WP** | Whole Ballynalacken Windfarm Project |
| **CU** | Cumulative with other plans and projects |

| **Mag = Magnitude** | **Likely = Likelihood** | **Will adverse effects to the conservation objectives occur?** |
|---|---|---|
| "*n* ": None/ No Impact | "*n* " No Likelihood | "*n*": No adverse Impact is predicted to occur; |
| VL: Very Low/negligible | U: Impact is very unlikely (<5% likelihood) | Y: Adverse Impact is predicted to occur under normal circumstances; |
| L: Low | P: May occur (5-50% likelihood) | P: Adverse Impact may occur, usually under worst case circumstances) |
| M: Medium | L: Likely to occur (>50% likelihood) | |
| H: High | | |
| VH: Very High | *?: Unknown (magnitude or likelihood)* | |

| **Adverse Impact?** | | **Magnitude** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **?** | **N** | **VL** | **L** | **M** | **H** | **VH** |
| **Likelihood** | **n** | N | N | N | N | N | N | N |
| | **U** | P | N | N | N | N | P | P |
| | **P** | P | N | N | N | P | **Y** | **Y** |
| | **L** | P | N | N | N | **Y** | **Y** | **Y** |

| **Other Codes/Abbreviations** |
|---|
| CO: Conservation Objective |
| M: The Conservation Objective is to **maintain** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |
| R: The Conservation Objective is to **restore** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Estuaries [1130]** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Estuaries [1130] | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community extent | Maintain the natural extent of the *Sabellaria alveolata* reef, subject to natural process. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Mudflats and sandflats not covered by seawater at low tide** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Mudflats and sandflats not covered by seawater at low tide | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 3 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | condition: Muddy estuarine community complex, Sand to muddy fine sand community complex. See map 4 | | | | | | | | | | | | | | | | | | | |
| ***Salicornia* and other annuals colonising mud and sand** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| *Salicornia* and other annuals colonising mud and sand | M | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For the one subsite mapped: Ringville – 0.03ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | erosion and succession. See map 5 | | | | | | | | | | | | | | | | | | | |
| | M | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009). | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Atlantic salt meadows (*GlauconPuccinellietalia maritimae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Atlantic salt meadows (*GlauconPuccinellietalia maritimae*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| <u>**DIRECT LOSS**</u> | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| <u>**Mediterranean salt meadows (*Juncetalia maritimi*)**</u> | | | | | | | | | | | | | | | | | | | | | | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Mediterranean salt meadows (*Juncetalia maritimi*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub*n*communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **European dry heaths [4030]** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| European dry heaths | M | Habitat distribution | No decline from current habitat distribution, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No Significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: sub- | Cover of characteristic sub- shrub indicator | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | shrub indicator species | species at least 25%: gorse (Ulex europaeus) and where rocky outcrops occur bilberry (Vaccinium myrtillus) and woodrush (Luzula sylvatica). Some rock outcrops support English stonecrop (Sedum anglicum), sheep's bit (Jasione montana) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages | | | | | | | | | | | | | | | | | | | |
| | M | Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: browsing | Long shoots of bilberry with Impacts of browsing collectively less than 33% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: positive indicator specie | Cover of positive indicator species at least 60%. This should include plant species characteristic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation composition: bryophyte and non-crustose lichen species | Number of bryophyte or non- crustose lichen species present at least 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: bracken (Pteridium aquilinum) | Cover of bracken less than 10% - however see 'Notes' | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: non-native species | Cover of non-native species less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (Orobanche rapum-genistae) and the legally protected clustered clover (Trifolium glomeratum) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: burning | No Impacts of burning within sensitive areas | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Petrifying springs with tufa formation (*Cratoneurion*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Petrifying springs with tufa formation (*Cratoneurion*) | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Habitat distribution | No decline. See map 6 for recorded location | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Maintain oligotrophic and calcareous conditions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | Maintain typical species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Killarney Fern (*Trichomanes speciosum*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Killarney Fern (*Trichomanes speciosum*) | M | Distribution | No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | | known colonies. No loss of woodland canopy at or near to known locations | | | | | | | | | | | | | | | | | | | |
| | M | Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological conditions: humidity | No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Light levels: shading | No changes due to anthropogenic impacts | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Invasive species | Absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Desmoulin's whorl snail (*Vertigo moulinsiana*)** | | | | | | | | | | | | | | | | | | | | | | |
| | CO | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Desmoulin's whorl snail (*Vertigo moulinsiana*) | M | Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size: adults | At least 5 adult snails in at least 50% of samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population density | Adult snails present in at least 60% of samples per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Area of occupancy | Minimum of 1ha of suitable habitat per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: vegetation | 90% of samples in habitat classes I and II | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | as defined in Moorkens & Killeen (2011) | | | | | | | | | | | | | | | | | | | |
| | M | Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: river flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | deposition of fine sediments | | | | | | | | | | | | | | | | | | | |
| | M | Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | Typical species of the relevant habitat sub-type should be present and in good condition | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Floodplain connectivity | The area of active floodplain at and upstream of the habitat should be maintained | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | At least 5 positive indicator species present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*AlnonPadion, Alnion incanae, Salicion albae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*AlnonPadion, Alnion incanae, Salicion albae*) | R | Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi-mature trees and | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | shrubs; and well-developed herb layer | | | | | | | | | | | | | | | | | | | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Hydrological regime: Flooding depth/height of water table | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: dead wood | At least 30m$^3$/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) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: indicators of local distinctiveness | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) | | | | | | | | | | | | | | | | | | | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | R | Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: indicators of local distinctiveness | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and birch (*Betula pubescens*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Nore freshwater pearl mussel (*Margaritifera durrovensis*)** | | | | | | | | | | | | | | | | | | | | | | |

| **<u>DIRECT LOSS</u>** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Nore freshwater pearl mussel (*Margaritifera durrovensis*) | R | Distribution | Maintain at 15.5km. See map 7 | **VL** | **U** | *n* | **L** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **L** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Population size: adult mussels | Restore to 5,000 adult mussels | **VL** | **U** | *n* | **L** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **L** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length | **VL** | **U** | *n* | **L** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **L** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Population structure: adult 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 | **VL** | **U** | *n* | **L** | **U** | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | **L** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Habitat extent | Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | *n* | *n* | |
| | R | Water quality: Macroinvertebrates and phytobenthos (diatoms) | Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 | **L** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes absent or trace (<5%) | **L** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Substratum quality: sediment | Restore substratum quality- stable cobble | **L** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | and gravel substrate with very little fine material; no artificially elevated levels of fine sediment | | | | | | | | | | | | | | | | | | | |
| | R | Substratum quality: oxygen availability | Restore to no more than 20% decline from water column to 5cm depth in substrate | **L** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Hydrological regime: flow variability | Restore appropriate hydrological regimes | **L** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | *n* | *n* | **VL** | **U** | *n* | |
| | R | Host fish | Maintain sufficient juvenile salmonids to host glochidial larvae | **VL** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | |
| **Atlantic salmon (*Salmo salar*) (only in fresh water)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| | R | Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| Atlantic salmon (*Salmo salar*) (only in fresh water) | R | Salmon fry abundance | Maintain or exceed 0+ fry mean catchment*n*wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Out*n*migrating smolt abundance | No Significant decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Water quality | At least Q4 at all sites sampled by EPA | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Twaite shad (*Alosa fallax*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Twaite shad (*Alosa fallax*) | R | Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure: age classes | More than one age class present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Water quality: oxygen levels | No lower than 5 mg/l | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgal) growth and macrophyte (rooted higher plants) growth | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Sea lamprey (*Petromyzon marinus*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Sea lamprey (*Petromyzon marinus*) | R | Distribution | Access to all water courses down to first order streams | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure of juveniles | At least three age/size groups present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Juvenile density in fine sediment | Juvenile density at least $1/m^2$ | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Brook lamprey (*Lampetra planeri*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Brook lamprey (*Lampetra planeri*) | R | Distribution | Access to all water courses down to first order streams | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure of juveniles | At least three age/size groups of brook/river lamprey present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least $2/m^2$ | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **River lamprey (*Lampetra fluviatilis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| River lamprey (*Lampetra fluviatilis*) | R | Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure of juveniles | At least three age/size groups of river/brook lamprey present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least $2/m^2$ | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **White-clawed crayfish (*Austropotamobius pallipes*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| White*n*clawed crayfish (*Austropotamobius pallipes*) | M | Distribution | No reduction from baseline. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Negative indicator species | No alien crayfish species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disease | No instances of disease | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | At least Q3*n*4 at all sites sampled by EPA | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: heterogeneity | No decline in heterogeneity or habitat quality | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Otter (*Lutra lutra*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Otter (*Lutra lutra*) | R | Distribution | No Significant decline | **L** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | **U** | *n* | **L** | **U** | *n* | **L** | **U** | *n* | Ex-situ context |
| | R | Extent of terrestrial habitat | No Significant decline. Area mapped and calculated as 122.8ha above high-water mark (HWM) and 1136.0ha along riverbanks / around ponds | **L** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | |
| | R | Extent of marine habitat | No Significant decline. Area mapped and calculated as 857.7ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **<u>DIRECT LOSS</u>** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Extent of freshwater (river) habitat | No Significant decline. Area mapped and calculated as 616.6km | **L** | **U** | *n* | **L** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | Ex situ context |
| | R | Extent of freshwater (lake) habitat | No Significant decline. Area mapped and calculated as 2.6ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Couching sites and holts | No Significant decline | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **U** | *n* | |
| | R | Fish biomass available | No Significant decline | **L** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* | |

# AA Appendix 3b

## Examination of the potential for Degradation or Fragmentation effects to the River Barrow & River Nore SAC

## AA Appendix 3b: Examination of the potential for Degradation effects to the River Barrow & River Nore SAC

Life Cycle Phases: The risk of degradation as a result of sediment/contaminant/nutrient-laden runoff is greatest during the construction phase of the Project, with the majority of the works taking place at the windfarm site. During the operational and decommissioning phases groundworks and use of machinery and vehicles will be negligible, with no further forestry felling required. As a result, any effects to water quality in downstream waterbodies will be of negligible magnitude and no adverse effects to the SAC will occur. Therefore, the evaluation in the table below relates to the Construction Phase of the Project.

Codes used in the Evaluation table below, along with the Matrix used to determine whether or not adverse impacts will occur to the QI:

| **Project Element Codes** | |
|---|---|
| **WF** | Ballynalacken Windfarm and ancillary works |
| **CLS** | Internal Cable Link and the Tinnalintan Substation (the ICL is that part which is within the Nore_120 sub-basin) |
| **GC** | Ballynalacken Grid Connection, including works within the existing Ballyragget EirGrid Substation compound/GIS building |
| **HR** | Haul Route Works remote from the site - HR1 to HR11 |
| **WP** | Whole Ballynalacken Windfarm Project |
| **CU** | Cumulative with other plans and projects |

| **Mag = Magnitude** | **Likely = Likelihood** | **Will adverse effects to the conservation objectives occur?** |
|---|---|---|
| "*n*" None/ No Impact | "*n*": No Likelihood | "*n*": No adverse Impact is predicted to occur; |
| VL: Very Low/negligible | U: Impact is very unlikely (<5% likelihood) | **Y**: Adverse Impact is predicted to occur under normal circumstances; |
| L: Low | P: May occur (5-50% likelihood) | **P**: Potential Adverse Impact may occur (usually under worst case circumstances) |
| M: Medium | L: Likely to occur (>50% likelihood) | |
| H: High | | |
| VH: Very High | *?: Unknown (magnitude or likelihood)* | |

| **Adverse Impact?** | | **Magnitude** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **?** | **N** | **VL** | **L** | **M** | **H** | **VH** |
| **Likelihood** | **n** | N | N | N | N | N | N | N |
| | **U** | P | N | N | N | N | P | P |
| | **P** | P | N | N | N | P | **Y** | **Y** |
| | **L** | P | N | N | N | **Y** | **Y** | **Y** |

| **Other Codes/Abbreviations** |
|---|
| CO: Conservation Objective |
| M: The Conservation Objective is to **maintain** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |
| R: The Conservation Objective is to **restore** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |

| DEGRADATION | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Estuaries [1130]** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Estuaries [1130] | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Community extent | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Mudflats and sandflats not covered by seawater at low tide** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Mudflats and sandflats not covered by seawater at low tide | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 3 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | estuarine community complex, Sand to muddy fine sand community complex. See map 4 | | | | | | | | | | | | | | | | | |
| ***<u>Salicornia</u>*** **<u>and other annuals colonising mud and sand</u>** | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| *Salicornia* and other annuals colonising mud and sand | M | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville – 0.03ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: Zonation | Maintain range of saltmarsh habitat Zonations including transitional Zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009). | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

**Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)**

| QI | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | without any physical obstructions | | | | | | | | | | | | | | | | | | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: Zonation | Maintain range of saltmarsh habitat Zonations including transitional Zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

**Mediterranean salt meadows (*Juncetalia maritimi*)**

| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

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| Mediterranean salt meadows (*Juncetalia maritimi*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: Zonation | Maintain range of saltmarsh habitat Zonations including transitional Zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **European dry heaths [4030]** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| European dry heaths | M | Habitat distribution | No decline from current habitat distribution, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: sub-shrub indicator species | Cover of characteristic sub- shrub indicator species at least 25%: gorse (Ulex europaeus) and where rocky | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

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| | | | outcrops occur bilberry (Vaccinium myrtillus) and woodrush (Luzula sylvatica). Some rock outcrops support English stonecrop (Sedum anglicum), sheep's bit (Jasione montana) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages | | | | | | | | | | | | | | | | | | |
| | M | Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: browsing | Long shoots of bilberry with Impactns of browsing collectively less than 33% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: positive indicator specie | Cover of positive indicator species at least 60%. This should include plant species characteristic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: bryophyte and non- | Number of bryophyte or non-crustose lichen species present at least 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

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| | | crustose lichen species | | | | | | | | | | | | | | | | | | | |
| | M | Vegetation composition: bracken (Pteridium aquilinum) | Cover of bracken less than 10% - however see 'Notes' | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: non-native species | Cover of non-native species less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (Orobanche rapum-genistae) and the legally protected clustered clover (Trifolium glomeratum) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: burning | No Impactns of burning within sensitive areas | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Petrifying springs with tufa formation (*Cratoneurion*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Petrifying springs with tufa formation (*Cratoneurion*) | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | *n* | *n* |
| | M | Habitat distribution | No decline. See map 6 for recorded location | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | *n* | *n* |

| QI | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | M | Water quality | Maintain oligotrophic and calcareous conditions | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | M | Vegetation composition: typical species | Maintain typical species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Killarney Fern (*Trichomanes speciosum*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Killarney Fern (*Trichomanes speciosum*) | M | Distribution | No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

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| | | | or near to known locations | | | | | | | | | | | | | | | | | | |
| | M | Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Hydrological conditions: humidity | No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Light levels: shading | No changes due to anthropogenic impacts | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Invasive species | Absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Desmoulin's whorl snail (*Vertigo moulinsiana*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Desmoulin's whorl snail (*Vertigo moulinsiana*) | M | Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Population size: adults | At least 5 adult snails in at least 50% of samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Population density | Adult snails present in at least 60% of samples per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Area of occupancy | Minimum of 1ha of suitable habitat per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Habitat quality: vegetation | 90% of samples in habitat classes I and II as | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| QI | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | defined in Moorkens & Killeen (2011) | | | | | | | | | | | | | | | | | | |
| | M | Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |
| | M | Hydrological regime: river flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |
| | M | Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | *n* | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* |
| | M | Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* |
| | M | Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits | **L** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* |
| | M | Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to | *n* | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* |

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| | M | | prevent excessive deposition of fine sediments | | | | | | | | | | | | | | | | | | |
| | M | Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | **L** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* |
| | M | Vegetation composition: typical species | Typical species of the relevant habitat sub-type should be present and in good condition | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |
| | M | Floodplain connectivity | The area of active floodplain at and upstream of the habitat should be maintained | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation composition: typical species | At least 5 positive indicator species present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | M | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control-NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) | R | Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi- mature trees and | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | shrubs; and well-developed herb layer | | | | | | | | | | | | | | | | | | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Hydrological regime: Flooding depth/height of water table | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* |
| | R | Woodland structure: dead wood | At least $30m^3$/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) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Woodland structure: indicators of local distinctiveness | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) | | | | | | | | | | | | | | | | | | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* |
| **<u>Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles</u>** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | R | Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ensure survival of woodland canopy | | | | | | | | | | | | | | | | | | |
| | R | 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Woodland structure: indicators of local distinctiveness | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and birch (*Betula pubescens*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |

**Nore freshwater pearl mussel (*Margaritifera durrovensis*)**

| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nore freshwater pearl mussel | R | Distribution | Maintain at 15.5km. See map 7 | **L-M** | *n* | *n* | **L** | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (*Margaritifera durrovensis*) | R | Population size: adult mussels | Restore to 5,000 adult mussels | **L-M** | *n* | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length | **L-M** | *n* | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure: adult 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 | **L-M** | *n* | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Habitat extent | Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning | **L-M** | *n* | *n* | **VL** | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Water quality: Macroinvertebrates and phytobenthos (diatoms) | Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 | **L-M** | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** |
| | R | Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes absent or trace (<5%) | **L-M** | **U** | **Y** | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** |
| | R | Substratum quality: sediment | Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially | **L-M** | **U** | **Y** | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | elevated levels of fine sediment | | | | | | | | | | | | | | | | | | |
| | R | Substratum quality: oxygen availability | Restore to no more than 20% decline from water column to 5cm depth in substrate | **L-M** | **U** | **Y** | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** |
| | R | Hydrological regime: flow variability | Restore appropriate hydrological regimes | **L** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |
| | R | Host fish | Maintain sufficient juvenile salmonids to host glochidial larvae | **L** | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | **VL** | **U** | *n* |

**Atlantic salmon (*Salmo salar*) (only in fresh water)**

| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic salmon (*Salmo salar*) (only in fresh water) | R | Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Salmon fry abundance | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Out-migrating smolt abundance | No significant decline | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Water quality | At least Q4 at all sites sampled by EPA | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **M-H** | **U** | **Y** |

| **Twaite shad (*Alosa fallax*)** | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Twaite shad (*Alosa fallax*) | R | Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure: age classes | More than one age class present | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Water quality: oxygen levels | No lower than 5 mg/l | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgal) growth and macrophyte (rooted higher plants) growth | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

| **Sea lamprey (*Petromyzon marinus*)** | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Sea lamprey (*Petromyzon marinus*) | R | Distribution | Access to all water courses down to first order streams | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure of juveniles | At least three age/size groups present | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Juvenile density in fine sediment | Juvenile density at least $1/m^2$ | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

**Brook lamprey (*Lampetra planeri*)**

| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brook lamprey (*Lampetra planeri*) | R | Distribution | Access to all water courses down to first order streams | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure of juveniles | At least three age/size groups of brook/river lamprey present | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

**River lamprey (*Lampetra fluviatilis*)**

| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River lamprey (*Lampetra fluviatilis*) | R | Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | **L-M** | **U** | **Y** | **L** | *n* | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |
| | R | Population structure of juveniles | At least three age/size groups of river/brook lamprey present | **L-M** | **U** | **Y** | **L** | **U** | *n* | **L** | **U** | *n* | **L** | *n* | *n* | **L-M** | **U** | **Y** | **VL** | **U** | *n* |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | L-M | U | Y | L | U | n | L | U | n | L | n | n | L-M | U | Y | VL | U | n |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | L-M | U | Y | L | U | n | L | U | n | L | n | n | L-M | U | Y | VL | U | n |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | L-M | U | Y | L | U | n | L | U | n | L | n | n | L-M | U | Y | VL | U | n |
| **White-clawed crayfish (*Austropotamobius pallipes*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| White-clawed crayfish (*Austropotamobius pallipes*) | M | Distribution | No reduction from baseline. See map 7 | L-M | n | n | L-M | n | n | L-M | U | Y | L | U | n | L-M | U | Y | L | U | Y |
| | M | Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples | L-M | n | n | L-M | n | n | L-M | U | Y | L | U | n | L-M | U | Y | L | U | Y |
| | M | Negative indicator species | No alien crayfish species | L-M | n | n | L-M | n | n | L-M | U | Y | L | U | n | L-M | U | Y | L | U | Y |
| | M | Disease | No instances of disease | L-M | n | n | L-M | n | n | L-M | n | n | L | n | n | L-M | n | n | L | U | n |
| | M | Water quality | At least Q3-4 at all sites sampled by EPA | L-M | n | n | L-M | n | n | L-M | U | Y | L | U | n | M | U | Y | M-H | U | Y |
| | M | Habitat quality: heterogeneity | No decline in heterogeneity or habitat quality | H | n | n | L-M | n | n | L-M | U | Y | L | U | n | M | U | Y | M-H | U | Y |
| **Otter (*Lutra lutra*)** | | | | | | | | | | | | | | | | | | | | | |
| **QI** | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact |
| Otter (*Lutra lutra*) | R | Distribution | No significant decline | L | U | n | n | n | n | n | n | n | n | n | n | L | P | n | VL | U | n |
| | R | Extent of terrestrial habitat | No significant decline. Area mapped and calculated as 122.8ha above high-water mark (HWM) and 1136.0ha | VL | P | n | n | n | n | n | n | n | n | n | n | VL | P | n | n | n | n |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | along riverbanks / around ponds | | | | | | | | | | | | | | | | | | |
| | R | Extent of marine habitat | No significant decline. Area mapped and calculated as 857.7ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Extent of freshwater (river) habitat | No significant decline. Area mapped and calculated as 616.6km | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | *n* | *n* |
| | R | Extent of freshwater (lake) habitat | No significant decline. Area mapped and calculated as 2.6ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* |
| | R | Couching sites and holts | No significant decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **P** | *n* |
| | R | Fish biomass available | No significant decline | **L** | **U** | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | **U** | *n* |

# AA Appendix 3c

# Examination of the potential for Disturbance effects to the River Barrow & River Nore SAC

## AA Appendix 3c: Examination of the potential for Disturbance effects to the River Barrow & River Nore SAC

Life Cycle Phases: The risk of disturbance or displacement as a result of noise and visual intrusion cause by the presence of personnel, operation of machinery and carrying out of works taking place is greatest during the construction phase of the Project, with the majority of works at the windfarm site. During the operational and decommissioning phases the presence of personnel and working machinery and the carrying of works will be negligible, and no watercourse crossing works will be required. As a result, any disturbance of QI species will be of negligible magnitude and no adverse effects to the SAC will occur. Therefore, the evaluation in the table below relates to the Construction Phase of the Project.

Codes used in the Evaluation table below, along with the Matrix used to determine whether or not adverse impacts will occur to the QI:

| **Project Element Codes** | |
|---|---|
| **WF** | Ballynalacken Windfarm and ancillary works |
| **CLS** | Internal Cable Link and the Tinnalintan Substation (the ICL is that part which is within the Nore_120 sub-basin) |
| **GC** | Ballynalacken Grid Connection, including works within the existing Ballyragget EirGrid Substation compound/GIS building |
| **HR** | Haul Route Works remote from the site - HR1 to HR11 |
| **WP** | Whole Ballynalacken Windfarm Project |
| **CU** | Cumulative with other plans and projects |

| **Mag = Magnitude** | **Likely = Likelihood** | **Will adverse effects to the conservation objectives occur?** |
|---|---|---|
| "*n* ": None/ No Impact | "*n* " No Likelihood | "*n*": No adverse Impact is predicted to occur; |
| VL: Very Low/negligible | U: Impact is very unlikely (<5% likelihood) | Y: Adverse Impact is predicted to occur under normal circumstances; |
| L: Low | P: May occur (5-50% likelihood) | P: Adverse Impact may occur, usually under worst case circumstances) |
| M: Medium | L: Likely to occur (>50% likelihood) | |
| H: High | | |
| VH: Very High | *?: Unknown (magnitude or likelihood)* | |

| **Adverse Impact?** | | **Magnitude** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **?** | **N** | **VL** | **L** | **M** | **H** | **VH** |
| **Likelihood** | **n** | N | N | N | N | N | N | N |
| | **U** | P | N | N | N | N | P | P |
| | **P** | P | N | N | N | P | **Y** | **Y** |
| | **L** | P | N | N | N | **Y** | **Y** | **Y** |

| **Other Codes/Abbreviations** |
|---|
| CO: Conservation Objective |
| M: The Conservation Objective is to **maintain** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |
| R: The Conservation Objective is to **restore** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Estuaries [1130]** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Estuaries [1130] | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community extent | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Mudflats and sandflats not covered by seawater at low tide** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Mudflats and sandflats not covered by seawater at low tide | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 3 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | estuarine community complex, Sand to muddy fine sand community complex. See map 4 | | | | | | | | | | | | | | | | | | | |
| ***Salicornia* and other annuals colonising mud and sand** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| *Salicornia* and other annuals colonising mud and sand | M | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville – 0.03ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | erosion and succession. See map 5 | | | | | | | | | | | | | | | | | | | |
| | M | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009). | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Mediterranean salt meadows (*Juncetalia maritimi*)** | | | | | | | | | | | | | | | | | | | | | | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Mediterranean salt meadows (*Juncetalia maritimi*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **European dry heaths [4030]** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| European dry heaths | M | Habitat distribution | No decline from current habitat distribution, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No Significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: sub- | Cover of characteristic sub- shrub indicator | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | shrub indicator species | species at least 25%: gorse (Ulex europaeus) and where rocky outcrops occur bilberry (Vaccinium myrtillus) and woodrush (Luzula sylvatica). Some rock outcrops support English stonecrop (Sedum anglicum), sheep's bit (Jasione montana) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages | | | | | | | | | | | | | | | | | | | |
| | M | Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: browsing | Long shoots of bilberry with Impactns of browsing collectively less than 33% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: positive indicator specie | Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
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| | M | Vegetation composition: bryophyte and non-crustose lichen species | Number of bryophyte or non- crustose lichen species present at least 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: bracken (Pteridium aquilinum) | Cover of bracken less than 10% - however see 'Notes' | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: non-native species | Cover of non-native species less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (Orobanche rapum-genistae) and the legally protected clustered clover (Trifolium glomeratum) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: burning | No Impactns of burning within sensitive areas | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Petrifying springs with tufa formation (*Cratoneurion*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Petrifying springs with tufa formation (*Cratoneurion*) | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat distribution | No decline. See map 6 for recorded location | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Maintain oligotrophic and calcareous conditions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | Maintain typical species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Killarney Fern (*Trichomanes speciosum*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Killarney Fern (*Trichomanes speciosum*) | M | Distribution | No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological conditions: humidity | No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Light levels: shading | No changes due to anthropogenic impacts | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Invasive species | Absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Desmoulin's whorl snail (*Vertigo moulinsiana*)** | **No suitable habitat is located within the site boundary of the windfarm site. The nearest mapped location for this species is Significantly northeast outside the hydrological pathway or within the River Barrow. Desmoulin's Whorl Snail was not observed during Ballynalacken aquatic surveys.** | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Desmoulin's whorl snail (*Vertigo moulinsiana*) | M | Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size: adults | At least 5 adult snails in at least 50% of samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Population density | Adult snails present in at least 60% of samples per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Area of occupancy | Minimum of 1ha of suitable habitat per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: vegetation | 90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: river flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
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| | | | persistence of tufa deposits | | | | | | | | | | | | | | | | | | | |
| | M | Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | Typical species of the relevant habitat sub-type should be present and in good condition | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Floodplain connectivity | The area of active floodplain at and upstream of the habitat should be maintained | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | M | Habitat distribution | No decline, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
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| | M | Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | At least 5 positive indicator species present | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) | R | Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
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| | | | at least 25ha in size and "small" woods at least 3ha in size | | | | | | | | | | | | | | | | | | | |
| | R | Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi- mature trees and shrubs; and well-developed herb layer | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Hydrological regime: Flooding depth/height of water table | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: dead wood | At least $30m^3$/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) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | indicators of local distinctiveness | | | | | | | | | | | | | | | | | | | | |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | R | Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: dead wood | At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: veteran trees | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Woodland structure: indicators of local distinctiveness | No decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | | birch (*Betula pubescens*) | | | | | | | | | | | | | | | | | | | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Nore freshwater pearl mussel (*Margaritifera durrovensis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Nore freshwater pearl mussel (*Margaritifera durrovensis*) | R | Distribution | Maintain at 15.5km. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population size: adult mussels | Restore to 5,000 adult mussels | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure: adult 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 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat extent | Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Water quality: Macroinvertebrates | Restore water quality-macroinvertebrates: EQR greater than 0.90; | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | and phytobenthos (diatoms) | phytobenthos: EQR greater than 0.93 | | | | | | | | | | | | | | | | | | | |
| | R | Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants) | Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes absent or trace (<5%) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Substratum quality: sediment | Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Substratum quality: oxygen availability | Restore to no more than 20% decline from water column to 5cm depth in substrate | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Hydrological regime: flow variability | Restore appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Host fish | Maintain sufficient juvenile salmonids to host glochidial larvae | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| **Atlantic salmon (*Salmo salar*) (only in fresh water)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| | R | Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| Atlantic salmon (*Salmo salar*) (only in fresh water) | R | Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Salmon fry abundance | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | salmon fry/5 minutes sampling | | | | | | | | | | | | | | | | | | | |
| | R | Out-migrating smolt abundance | No Significant decline | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Water quality | At least Q4 at all sites sampled by EPA | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| **Twaite shad (*Alosa fallax*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Twaite shad (*Alosa fallax*) | R | Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Population structure: age classes | More than one age class present | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Water quality: oxygen levels | No lower than 5 mg/l | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgal) growth and macrophyte (rooted higher plants) growth | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Sea lamprey (*Petromyzon marinus*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea lamprey (*Petromyzon marinus*) | R | Distribution | Access to all water courses down to first order streams | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Population structure of juveniles | At least three age/size groups present | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Juvenile density in fine sediment | Juvenile density at least 1/m² | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | **VL** | **U** | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| **Brook lamprey (*Lampetra planeri*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Brook lamprey (*Lampetra planeri*) | R | Distribution | Access to all water courses down to first order streams | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Population structure of juveniles | At least three age/size groups of brook/river lamprey present | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | |
| **River lamprey (*Lampetra fluviatilis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |

| **DISTURBANCE** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River lamprey (*Lampetra fluviatilis*) | R | Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Population structure of juveniles | At least three age/size groups of river/brook lamprey present | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | **VL** | **U** | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | **VL** | **U** | *n* | **VL** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | *n* | *n* | **VL** | *n* | *n* | |
| **White-clawed crayfish (*Austropotamobius pallipes*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| White-clawed crayfish (*Austropotamobius pallipes*) | M | Distribution | No reduction from baseline. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Negative indicator species | No alien crayfish species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disease | No instances of disease | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | At least Q3-4 at all sites sampled by EPA | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: heterogeneity | No decline in heterogeneity or habitat quality | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Otter (*Lutra lutra*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |

| **DISTURBANCE** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Otter (*Lutra lutra*) | R | Distribution | No Significant decline | **L** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | **VL** | **U** | *n* | Ex-situ interaction |
| | R | Extent of terrestrial habitat | No Significant decline. Area mapped and calculated as 122.8ha above high-water mark (HWM) and 1136.0ha along riverbanks / around ponds | **L-M** | **U** | *n* | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | |
| | R | Extent of marine habitat | No Significant decline. Area mapped and calculated as 857.7ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent of freshwater (river) habitat | No Significant decline. Area mapped and calculated as 616.6km | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent of freshwater (lake) habitat | No Significant decline. Area mapped and calculated as 2.6ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Couching sites and holts | No Significant decline | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | *n* | *n* | ex-situ context |
| | R | Fish biomass available | No Significant decline | *n* | **U** | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | **U** | *n* | ex-situ context |

# AA Appendix 3d

## Examination of the potential for Indirect Effects (spread of invasive species) to the River Barrow & River Nore SAC

## AA Appendix 3d: Examination of the potential for Other Indirect effects (spread of invasives) to the River Barrow & River Nore SAC

Life Cycle Phases: The highest risk relating to the spread of invasive species is associated with the construction phase as this phase is associated with the greatest volume of excavations, works in drainage channels and in proximity to natural watercourses, and the greatest movement of machinery and materials into and around the site. However, while the evaluation in the table below relates to the Construction phase, the results also apply to the operational and decommissioning phase as the risk of spreading invasive species is considered to persist in the environment, and there will be some (albeit negligible) groundworks and movement of machinery and inert materials during these phases.

Codes used in the Evaluation table below, along with the Matrix used to determine whether or not adverse impacts will occur to the QI:

| **Project Element Codes** | |
|---|---|
| **WF** | Ballynalacken Windfarm and ancillary works |
| **CLS** | Internal Cable Link and the Tinnalintan Substation (the ICL is that part which is within the Nore_120 sub-basin) |
| **GC** | Ballynalacken Grid Connection, including works within the existing Ballyragget EirGrid Substation compound/GIS building |
| **HR** | Haul Route Works remote from the site - HR1 to HR11 |
| **WP** | Whole Ballynalacken Windfarm Project |
| **CU** | Cumulative with other plans and projects |

| **Mag = Magnitude** | **Likely = Likelihood** | **Will adverse effects to the conservation objectives occur?** |
|---|---|---|
| "*n* ": None/ No Impact | "*n* " No Likelihood | "*n*": No adverse Impact is predicted to occur; |
| VL: Very Low/negligible | U: Impact is very unlikely (<5% likelihood) | **Y**: Adverse Impact is predicted to occur under normal circumstances; |
| L: Low | P: May occur (5-50% likelihood) | P: Adverse Impact may occur, usually under worst case circumstances) |
| M: Medium | L: Likely to occur (>50% likelihood) | |
| H: High | | |
| VH: Very High | *?: Unknown (magnitude or likelihood)* | |

| **Adverse Impact?** | | **Magnitude** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **?** | **N** | **VL** | **L** | **M** | **H** | **VH** |
| **Likelihood** | **n** | N | N | N | N | N | N | N |
| | **U** | P | N | N | N | N | P | P |
| | **P** | P | N | N | N | P | **Y** | **Y** |
| | **L** | P | N | N | N | **Y** | **Y** | **Y** |

| **Other Codes/Abbreviations** |
|---|
| CO: Conservation Objective |
| M: The Conservation Objective is to **maintain** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |
| R: The Conservation Objective is to **restore** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Estuaries [1130]** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Estuaries [1130] | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 2 | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community. See map 4 | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| | M | Community extent | Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Mudflats and sandflats not covered by seawater at low tide** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Mudflats and sandflats not covered by seawater at low tide | M | Habitat area | The permanent habitat area is stable or increasing, subject to natural processes. See map 3 | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| | M | Community distribution | The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex, Sand to muddy fine sand community complex. See map 4 | *n* | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| ***Salicornia* and other annuals colonising mud and sand** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Salicornia and other annuals colonising mud and sand | M | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub- | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | site mapped: Ringville – 0.03ha. See map 5 | | | | | | | | | | | | | | | | | | | |
| | M | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009). | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Atlantic salt meadows (*Glauco-* | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Puccinellietalia maritimae*) | | | succession. For sub-site mapped: Dunbrody Abbey – 1.25ha, Killowen – 2.59ha, Rochestown – 17.50ha, Ringville – 6.70ha. See map 5 | | | | | | | | | | | | | | | | | | | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: sediment supply | Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Mediterranean salt meadows (*Juncetalia maritimi*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mediterranean salt meadows (*Juncetalia maritimi*) | R | Habitat area | Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Dunbrody Abbey – 0.08ha, Rochestown – 0.04ha, Ringville – 6.70ha. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Habitat distribution | No decline, subject to natural processes. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: sediment supply | Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: flooding regime | Maintain natural tidal regime | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Physical structure: creeks and pans | Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: zonation | Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation height | Maintain structural variation within sward | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: vegetation cover | Maintain more than 90% of area outside creeks vegetated. | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation composition: typical species and sub-communities | Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Vegetation structure: negative indicator species: *Spartina anglica* | No Significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **European dry heaths [4030]** | | | | | | | | | | | | | | | | | | | | | | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| European dry heaths | M | Habitat distribution | No decline from current habitat distribution, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat area | Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Physical structure: free-draining, acid, low nutrient soil; rock outcrops | No Significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: sub-shrub indicator species | Cover of characteristic sub-shrub indicator species at least 25%: gorse (Ulex europaeus) and where rocky outcrops occur bilberry (Vaccinium myrtillus) and woodrush (Luzula sylvatica). Some rock outcrops support English stonecrop (Sedum anglicum), sheep's bit (Jasione montana) and wild madder (Rubia peregrina) as well as important moss and lichen assemblages | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: senescent gorse | Cover of senescent gorse less than 50% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: browsing | Long shoots of bilberry with Impactns of browsing collectively less than 33% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: native trees and shrubs | Cover of scattered native trees and shrub less than 20% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation composition: positive indicator species | Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: positive indicator specie | Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: bryophyte and non-crustose lichen species | Number of bryophyte or non-crustose lichen species present at least 2 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: bracken (Pteridium aquilinum) | Cover of bracken less than 10% - however see 'Notes' | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: weedy negative indicator species | Cover of agricultural weed species (negative indicator species) less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: non-native species | Cover of non-native species less than 1% | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: rare/scarce heath species | No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (Orobanche rapum-genistae) and the legally protected clustered clover (Trifolium glomeratum) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation structure: disturbed bare ground | Cover of disturbed bare ground less than 10% (but if peat soil less than 5%) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Vegetation structure: burning | No Impactns of burning within sensitive areas | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Petrifying springs with tufa formation (*Cratoneurion*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Petrifying springs with tufa formation (*Cratoneurion*) | M | Habitat area | Area stable or increasing, subject to natural processes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat distribution | No decline. See map 6 for recorded location | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Maintain oligotrophic and calcareous conditions | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Vegetation composition: typical species | Maintain typical species | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Killarney Fern (*Trichomanes speciosum*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Killarney Fern (*Trichomanes speciosum*) | M | Distribution | No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size | Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population structure: juvenile fronds | At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat extent | No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Hydrological conditions: visible water | Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Hydrological conditions: humidity | No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Light levels: shading | No changes due to anthropogenic impacts | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Invasive species | Absent or under control | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Desmoulin's whorl snail (Vertigo moulinsiana)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Desmoulin's whorl snail (*Vertigo moulinsiana*) | M | Distribution: occupied sites | No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7 | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population size: adults | At least 5 adult snails in at least 50% of samples | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Population density | Adult snails present in at least 60% of samples per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Area of occupancy | Minimum of 1ha of suitable habitat per site | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: vegetation | 90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Habitat quality: Soil moisture levels | 90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011) | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| **Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Magnitude | Likelihood | Adverse Effect? | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Water courses of plain to montane | M | Habitat distribution | No decline, subject to natural processes | **VL** | **U** | *n* | **L** | **u** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | M | Habitat area | Area stable or increasing, subject to natural processes | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Hydrological regime: river flow | Maintain appropriate hydrological regimes | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Substratum composition: Particle size range | The substratum should be dominated by large particles and free from fine sediments | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Vegetation composition: typical species | Typical species of the relevant habitat sub-type should be present and in good condition | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| | M | Floodplain connectivity | The area of active floodplain at and upstream of the habitat should be maintained | **VL** | **U** | *n* | **L** | **U** | *n* | **M** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **L** | **Y** | |
| **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Hydrophilous tall herb fringe | M | Habitat distribution | No decline, subject to natural processes | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **M** | **P** | **Y** | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| communities of plains and of the montane to alpine levels | M | Habitat area | Area stable or increasing, subject to natural processes | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | M | Hydrological regime: Flooding depth/height of water table | Maintain appropriate hydrological regimes | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | M | Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | M | Vegetation compositions: broadleaf herb: grass ratio | Broadleaf herb component of vegetation between 40 and 90% | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | M | Vegetation composition: typical species | At least 5 positive indicator species present | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | M | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*) | **L** | **U** | **Y** | **L-M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) | R | Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed. See map 6 | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi-mature trees and shrubs; and well-developed herb layer | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Hydrological regime: Flooding depth/height of water table | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | 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) | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Woodland structure: veteran trees | No decline | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Woodland structure: indicators of local distinctiveness | No decline | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*) | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Vegetation composition: | Negative indicator species, particularly non-native | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **M** | **M** | **U** | **Y** | **H** | **P** | **Y** | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | negative indicator species | invasive species, absent or under control | | | | | | | | | | | | | | | | | | | |
| **Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | R | Habitat area | Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed. See map 6 | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Habitat distribution | No decline. Surveyed locations shown on map 6 | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | 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 | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland structure: community diversity and extent | Maintain diversity and extent of community types | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland structure: dead wood | At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland structure: veteran trees | No decline | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |
| | R | Woodland structure: indicators of local distinctiveness | No decline | M | U | Y | M | U | Y | M | U | Y | *n* | *n* | *n* | M | U | Y | H | P | Y | |

| **<u>INVASIVE SPECIES</u>** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and birch (*Betula pubescens*) | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | *n* | *n* | *n* | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **M** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| **<u>Nore freshwater pearl mussel (*Margaritifera durrovensis*)</u>** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Nore freshwater pearl mussel (*Margaritifera durrovensis*) | R | Distribution | Maintain at 15.5km. See map 7 | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Population size: adult mussels | Restore to 5,000 adult mussels | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Population structure: recruitment | Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Population structure: adult 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 | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Habitat extent | Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Water quality: Macroinvertebrates and phytobenthos (diatoms) | Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93 | **H** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **M-H** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Substratum quality: Filamentous algae (macroalgae), | Restore substratum quality-filamentous algae: absent or | **M** | **P** | **Y** | **M** | *n* | *n* | **M** | **U** | *n* | *n* | **U** | *n* | **M-H** | **P** | **Y** | **H** | **U** | **Y** | |

| INVASIVE SPECIES | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | macrophytes (rooted higher plants) | trace (<5%); macrophytes absent or trace (<5%) | | | | | | | | | | | | | | | | | | | |
| | R | Substratum quality: sediment | Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment | **M** | **P** | **Y** | **M** | *n* | *n* | **M** | *n* | *n* | *n* | *n* | *n* | **M** | **U** | *n* | **H** | **U** | **Y** | |
| | R | Substratum quality: oxygen availability | Restore to no more than 20% decline from water column to 5cm depth in substrate | **M** | **P** | **Y** | **M** | *n* | *n* | **M** | *n* | *n* | *n* | *n* | *n* | **M** | **U** | *n* | **H** | **U** | **Y** | |
| | R | Hydrological regime: flow variability | Restore appropriate hydrological regimes | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| | R | Host fish | Maintain sufficient juvenile salmonids to host glochidial larvae | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | *n* | **U** | *n* | |
| **Atlantic salmon (*Salmo salar*) (only in fresh water)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Atlantic salmon (*Salmo salar*) (only in fresh water) | R | Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Salmon fry abundance | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Out-migrating smolt abundance | No Significant decline | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| | R | Water quality | At least Q4 at all sites sampled by EPA | **M** | **U** | **Y** | **L** | **U** | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | **M** | **U** | **Y** | **H** | **P** | **Y** | |
| **Twaite shad (*Alosa fallax*)** | | | | | | | | | | | | | | | | | | | | | | |

| **INVASIVE SPECIES** | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Twaite shad (*Alosa fallax*) | R | Distribution: extent of anadromy | Greater than 75% of main stem length of rivers accessible from estuary | M | U | Y | L | U | *n* | L | U | *n* | VL | U | *n* | M | U | Y | L | *n* | *n* | |
| | R | Population structure: age classes | More than one age class present | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | U | Y | L | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning habitats | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | U | Y | L | *n* | *n* | |
| | R | Water quality: oxygen levels | No lower than 5 mg/l | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | U | Y | L | *n* | *n* | |
| | R | Spawning habitat quality: Filamentous algae; macrophytes; sediment | Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgal) growth and macrophyte (rooted higher plants) growth | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | U | Y | L | *n* | *n* | |
| **Sea lamprey (*Petromyzon marinus*)** | | | | | | | | | | | | | | | | | | | | | | |
| | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Sea lamprey (*Petromyzon marinus*) | R | Distribution | Access to all water courses down to first order streams | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Population structure of juveniles | At least three age/size groups present | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Juvenile density in fine sediment | Juvenile density at least 1/m² | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| **Brook lamprey (*Lampetra planeri*)** | | | | | | | | | | | | | | | | | | | | | | |
| | CO | Attribute | Target | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| | R | Distribution | Access to all water courses down to first order streams | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brook lamprey (*Lampetra planeri*) | R | Population structure of juveniles | At least three age/size groups of brook/river lamprey present | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| **River lamprey (*Lampetra fluviatilis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| River lamprey (*Lampetra fluviatilis*) | R | Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Population structure of juveniles | At least three age/size groups of river/brook lamprey present | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| | R | Availability of juvenile habitat | More than 50% of sample sites positive | M | U | Y | L | U | *n* | L-M | U | Y | M | U | Y | M | P | Y | L | *n* | *n* | |
| **White-clawed crayfish (*Austropotamobius pallipes*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| White-clawed crayfish (*Austropotamobius pallipes*) | M | Distribution | No reduction from baseline. See map 7 | H | U | Y | H | U | Y | H | U | Y | *n* | U | *n* | H | U | Y | H | U | Y | |
| | M | Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples | H | U | Y | H | U | Y | H | U | Y | *n* | U | *n* | H | U | Y | H | U | Y | |
| | M | Negative indicator species | No alien crayfish species | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | |
| | M | Disease | No instances of disease | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | *n* | U | *n* | |

| **INVASIVE SPECIES** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | Water quality | At least Q3-4 at all sites sampled by EPA | **H** | **U** | **Y** | **H** | **U** | **Y** | **H** | **U** | **Y** | *n* | **U** | *n* | *n* | **U** | *n* | **H** | **U** | **Y** | |
| | M | Habitat quality: heterogeneity | No decline in heterogeneity or habitat quality | **H** | **U** | **Y** | **H** | **U** | **Y** | **H** | **U** | **Y** | **H** | **U** | **Y** | **H** | **U** | **Y** | **H** | **U** | **Y** | |
| **Otter (*Lutra lutra*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Otter (*Lutra lutra*) | R | Distribution | No Significant decline | **L-M** | **U** | **Y** | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **H** | **U** | **Y** | |
| | R | Extent of terrestrial habitat | No Significant decline. Area mapped and calculated as 122.8ha above high-water mark (HWM) and 1136.0ha along riverbanks / around ponds | **L-M** | **U** | **Y** | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** | |
| | R | Extent of marine habitat | No Significant decline. Area mapped and calculated as 857.7ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Extent of freshwater (river) habitat | No Significant decline. Area mapped and calculated as 616.6km | **L-M** | **U** | **Y** | *n* | *n* | *n* | **VL** | **U** | **Y** | *n* | *n* | *n* | **L-M** | **U** | **Y** | **M** | **U** | **Y** | |
| | R | Extent of freshwater (lake) habitat | No Significant decline. Area mapped and calculated as 2.6ha | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | R | Couching sites and holts | No Significant decline | **L-M** | **U** | **Y** | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | **L-M** | **U** | **Y** | **L** | **U** | **Y** | |
| | R | Fish biomass available | No Significant decline | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

# AA Appendix 4

## Examination of the potential for adverse effects to the River Nore SPA

## Appendix 4: Examination of the potential for adverse effects to the River Nore SPA

Life Cycle Phases: The construction phase of the Project has the greatest extent/footprint of works and activities (direct loss), the greatest volume of excavations and use of fuels/concrete, forestry felling and work in close proximity to natural watercourses (degradation, disturbance, spread of invasive species), and the potential for direct loss, degradation, disturbance or displacement, or indirect effects via the spread of invasive species during the construction phase is evaluated in the table below. Operational and decommissioning phase works will generally have a smaller extent than construction phase works, no works in close proximity to watercourses will be required, negligible levels of noise or presence of personnel/operating machinery. In addition, Kingfisher was not recorded during bird surveys at the windfarm, and is not considered at risk of collision with operating turbines. However, it is considered that the risk of spread of invasive species persists beyond the construction phase of the project.

Codes used in the Evaluation table below, along with the Matrix used to determine whether or not adverse impacts will occur to the QI:

| **Project Element Codes** | |
|---|---|
| **WF** | Ballynalacken Windfarm and ancillary works |
| **CLS** | Internal Cable Link and the Tinnalintan Substation (the ICL is that part which is within the Nore_120 sub-basin) |
| **GC** | Ballynalacken Grid Connection, including works within the existing Ballyragget EirGrid Substation compound/GIS building |
| **HR** | Haul Route Works remote from the site - HR1 to HR11 |
| **WP** | Whole Ballynalacken Windfarm Project |
| **CU** | Cumulative with other plans and projects |

| **Mag = Magnitude** | **Likely = Likelihood** | **Will adverse effects to the conservation objectives occur?** |
|---|---|---|
| *"n "* None/ No Impact | *"n "* No Likelihood | "*n*": No adverse Impact is predicted to occur; |
| VL: Very Low/negligible | U: Impact is very unlikely (<5% likelihood) | Y: Adverse Impact is predicted to occur under normal circumstances; |
| L: Low | P: May occur (5-50% likelihood) | P: Adverse Impact may occur, usually under worst case circumstances) |
| M: Medium | L: Likely to occur (>50% likelihood) | |
| H: High | | |
| VH: Very High | *?: Unknown (magnitude or likelihood)* | |

| **Adverse Impact?** | | **Magnitude** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **?** | **N** | **VL** | **L** | **M** | **H** | **VH** |
| **Likelihood** | **n** | N | N | N | N | N | N | N |
| | **U** | P | N | N | N | N | P | P |
| | **P** | P | N | N | N | P | **Y** | **Y** |
| | **L** | P | N | N | N | **Y** | **Y** | **Y** |

| **Other Codes/Abbreviations** |
|---|
| CO: Conservation Objective |
| M: The Conservation Objective is to **maintain** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |
| R: The Conservation Objective is to **restore** the favourable conservation condition of the QI species/habitat, which is defined by the attributes and targets. |

| **DIRECT LOSS** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kingfisher (*Alcedo atthis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Kingfisher (*Alcedo atthis*) | M | Population size | No Significant decline in the long term | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Spatial distribution of territories | No Significant loss of distribution in the long term, other than that occurring due to natural patterns of variation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status | *n* | *n* | *n* | *n* | *n* | *n* | **L** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Barriers to connectivity | No Significant increase | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disturbance to breeding sites | Disturbance occurs at levels that do not Significantly impact upon breeding Kingfisher | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **<u>DEGRADATION</u>** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **<u>Kingfisher (*Alcedo atthis*)</u>** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Kingfisher (*Alcedo atthis*) | M | Population size | No Significant decline in the long term | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | |
| | M | Spatial distribution of territories | No Significant loss of distribution in the long term, other than that occurring due to natural patterns of variation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status | *n* | *n* | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | **L** | **U** | *n* | |
| | M | Barriers to connectivity | No Significant increase | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disturbance to breeding sites | Disturbance occurs at levels that do not Significantly impact upon breeding Kingfisher | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| DISTURBANCE | | | | WF | | | CLS | | | GC | | | HR | | | WP | | | CU | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kingfisher (*Alcedo atthis*)** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Kingfisher (*Alcedo atthis*) | M | Population size | No Significant decline in the long term | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Spatial distribution of territories | No Significant loss of distribution in the long term, other than that occurring due to natural patterns of variation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Barriers to connectivity | No Significant increase | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disturbance to breeding sites | Disturbance occurs at levels that do not Significantly impact upon breeding Kingfisher | *n* | *n* | *n* | **L** | **U** | *n* | **L** | **U** | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |

| **<u>OTHER INDIRECT EFFECTS – SPREAD OF INVASIVE SPECIES</u>** | | | | **WF** | | | **CLS** | | | **GC** | | | **HR** | | | **WP** | | | **CU** | | | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **<u>Kingfisher (*Alcedo atthis*)</u>** | | | | | | | | | | | | | | | | | | | | | | |
| | **CO** | **Attribute** | **Target** | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | Mag | Likely | Impact | |
| Kingfisher (*Alcedo atthis*) | M | Population size | No Significant decline in the long term | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Productivity rate | Sufficient productivity to maintain the population trend as stable or increasing | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Spatial distribution of territories | No Significant loss of distribution in the long term, other than that occurring due to natural patterns of variation | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Extent and quality of nesting banks and other suitable nesting features | Sufficient area of high quality nesting habitat to support the population target | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | **VL** | **U** | *n* | *n* | *n* | *n* | |
| | M | Forage spatial distribution, extent, abundance and availability | Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Water quality | Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Barriers to connectivity | No Significant increase | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |
| | M | Disturbance to breeding sites | Disturbance occurs at levels that do not Significantly impact upon breeding Kingfisher | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | *n* | |